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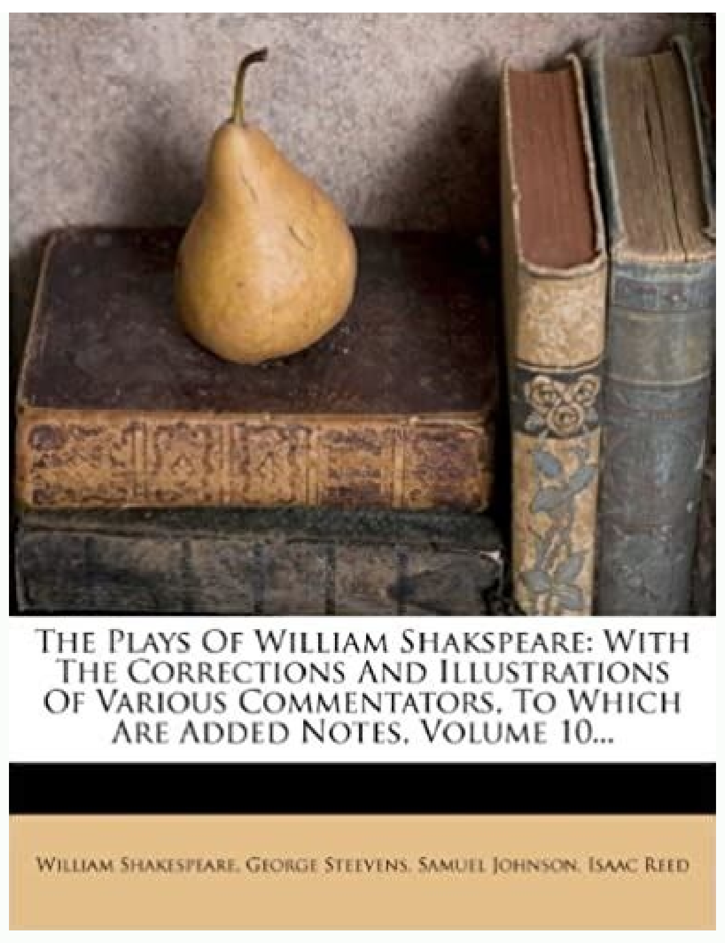

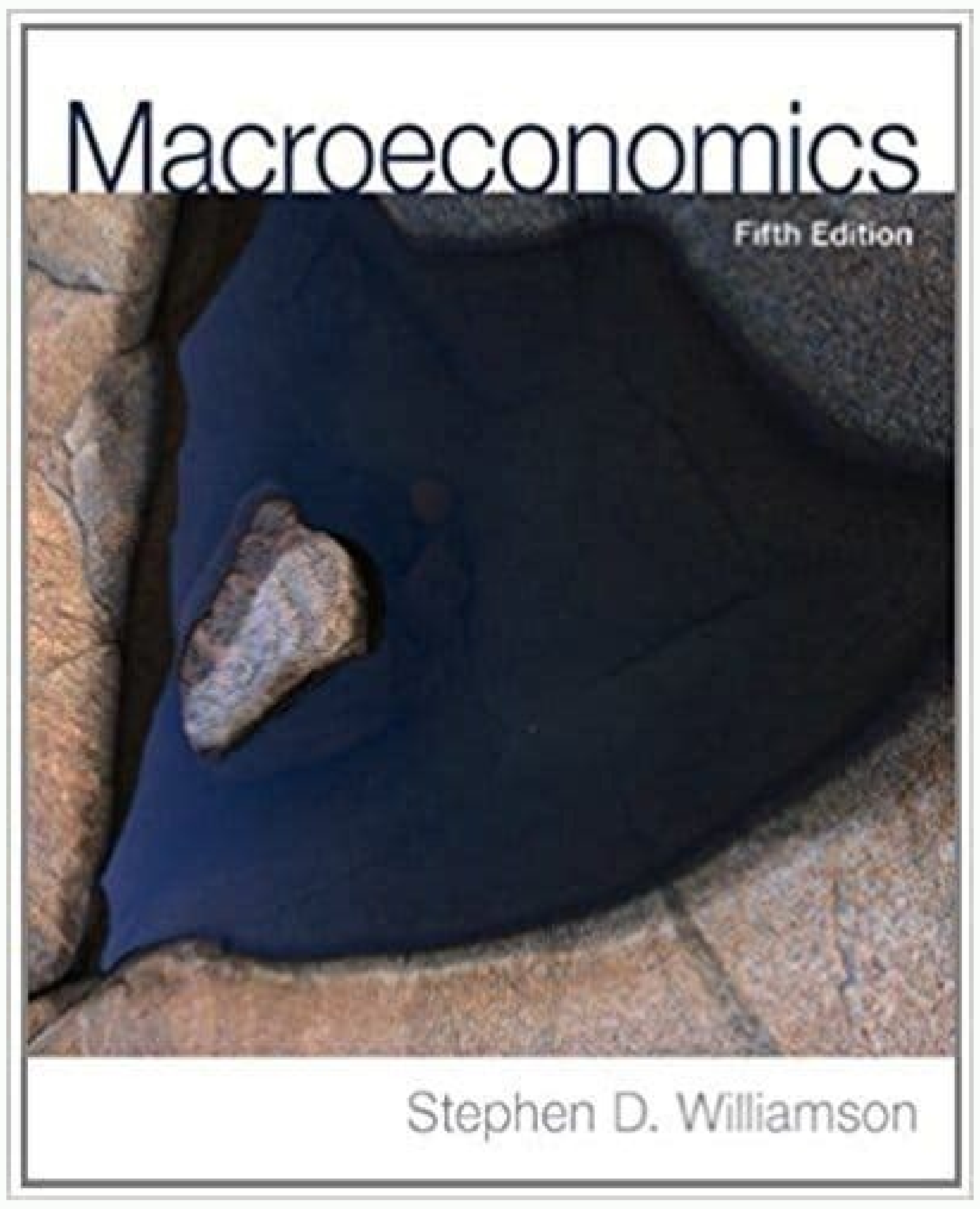

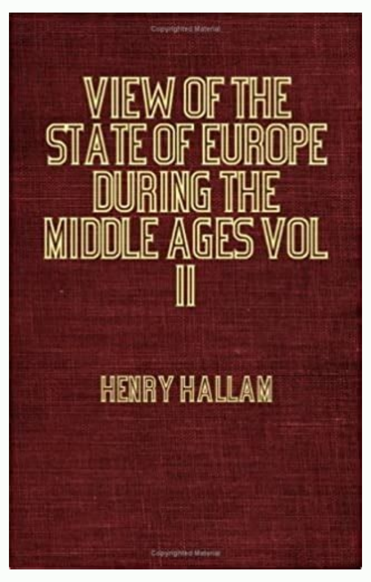

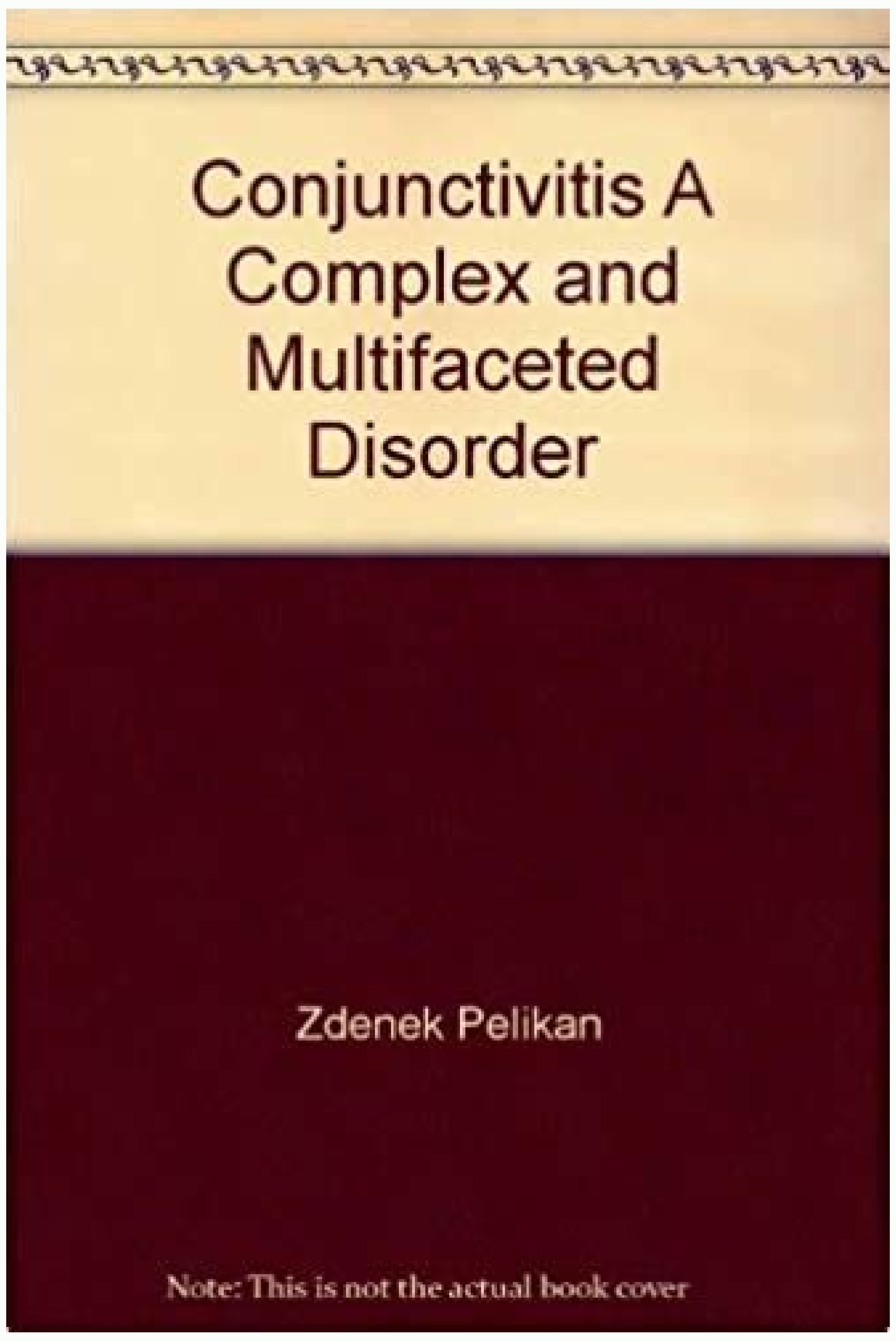

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Fully up-to-date with examples from contemporary culture, politics, and media, this text helps students develop the skills they need to engage meaningfully with the world around them.Chris MacDonald is an associate professor and chair of the Department of Law and Business at the Ted Rogers School of Management and the director of the Jim Pattison Ethical Leadership Education and Research Program at Ryerson University. Lewis Vaughn is an independent scholar and the author of several books, including Writing Philoso...Title:The Power of Critical Thinking: fifth Canadian editionProduct dimensions:552 pages, 10 X 8 X 0.67 inShipping dimensions:552 pages, 10 X 8 X 0.67 inPublisher:Oxford University PressAppropriate for ages:All ages The world’s #1 eTextbook reader for students. VitalSource is the leading provider of online textbooks and course materials. More than 15 million users have used our Bookshelf platform over the past year to improve their learning experience and outcomes. 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xiii From the Publisher The fifth Canadian edition of The Power of Critical Thinking builds on the successful approach used in the previous Canadian editions that have served instructors and students so well. It gives first-time students a comprehensive, engaging, and step-by-step introduction to critical thinking, providing them with the tools they need to apply their critical thinking skills to the real world. The fifth edition retains qualities that will be familiar to long-time users while adding new features to help students use their critical thinking skills in everyday life. Highlights include the following: W Critical Thinki ng Bradford Veley/ CartoonStock Student-friendly tone Without compromising rigour or oversimplifying material, this introductory text is written in an engaging tone that students will enjoy. The authors tackle tough topics with a casual approach, mixed with humour where appropriate, to enhance students' understanding and enjoyment. 1 | The Pow er of hen you were bor n, you were com pletely without ments or values opinions or jud or viewpoints— gand now your hea with them. Opinio d is overflowing ns help you to ma They guide you ke your way thr to success (or fail ough the world. ure), understand sions (or bad), emp ing (or ignorance owerment (or par), good decialysis). Some of and some blind your beliefs truly you. Some are tru enable you, e; some are not. are which? This But the question kind of question— is, which ones a question about is the fundament the quality of you al concern of crit r beliefs—ica l thinking. Determining the quality or value kind of thinkin of your beliefs critical thin g that does this requires though king job best is critical t, and the sity or college edu The systematic e thin king—a skill tha cati valuation t a univeror formulatio directly about wha on seeks to foster. This means n of beliefs that critical thin t you think but or statements king is not rather how you by rational The quality of beli think. standards. efs is not about that you do. A soc what factors cau sed you to have iolo the beliefs moral views. A psy gist might tell you how society "The recipe for has influenced som chologist might perpetual describe how you e of your to certain opinio ignorance is: be r emotions cause satisfied with ns. Your best frie your opinions you to cling nd might claim absorbed most of and content that you have unc your beliefs dire with your know onsciously ctly from your par ledge." lations have mu ents. But none of ch to do with the these specu—Elbert Hub central task of crit Critical thinkin bard ical thinking. g focuses not on what causes a beli believing. A belief ef but on whether is worth believin g, or accepting , if it is worth we have good reas ons to accept it. Critical thinking helps us to asse ss our beliefs most valued beli and core valu efs. Are they es. Consider supported by some of your good reasoning? mac30439_ch01_0 01-032.indd 3 12/20/18 03:55 PM 3 xiv From the Publisher 4 Abundant exercises New and revised exercises draw from contemporary culture, politics, and media to provide students with the practice they need to become confident critical thinkers. Select answers are provided at the back of the book (Appendix B). B elief Re asons for a nd D ou bt Chap te r O bj When Claim ec tives s Conflict son to have good rea to other claims we You will be able m conflicts with that when a clai it. g btin e good dou • understand hav , we s for d information e good ground our backgroun accept, we hav conflicts with that if a claim ely dubiplet • recognize com t is neither bt it. with a claim tha reason to dou e. are confronted to the evidenc that when we for tion our belief son por rea • appreciate pro d uld goo no there is ible, we sho a claim when ous nor fully cred able to believe t it is not reason • realize tha doing so. Emphasis on evaluation of evidence, authority, and credibility Students are encouraged to critically assess evidence and claims put forward by experts, news media, politicians, business leaders, and friends. In each case, the main principles and procedures are explained and illustrated. Experts and Evidence s not. to and what doe You will be able son to eone an expert have good rea what makes som ert opinion, we • understand flicts with exp con m clai a if that to suspend • understand son rea d we have goo about a claim, doubt it. erts disagree t when the exp • realize tha ertise. ity. judgment. eals to author indicators of exp fallacious app using the four • recognize non-experts by true experts from • distinguish PM 12/17/18 04:44 21-173.indd 122 mac30439_ch04_1 236 Par t Thr ee | Arg uments Let's diagram our syllogism about one premise at a politicians and civi time. We can star l servants, diagram t by labelling the empty, overlappin ming diagram like this g circles: , with three Elected officials An updated art program New photos, along with thought-provoking captions, reinforce key concepts in each chapter. Most captions pose questions that will prepare students for in-class discussions and participation. Politicians Civil servants Now, we diagram the first premise To do this, we ("A ll elected offi look only at the cials are civil serv two circles invo "elected official ants"). lved in premise s" circle and the 1—namely the "civil servants" circle entirely. You circle. For now, should literally ignore the other pretend that it is A-statement. So, not there at all. to represent prem Premise 1 is an ise 1, we shade the circle that does not overlap with part of the elected the civil servant officials existing elected s circle. This sign officials are also ifies that all the civil servants: Rigorous attention to detail All exercises, philosophical facts, figures, and diagrams have been checked and validated by a panel of leading experts in the field. Elected officials Politicians Civil servants Notice that, if you just look at the two gram looks exactly circles we're wor like our original king with here, A-statement diag the diaof A-statements ram on page 228 always look like that! . Diagrams mac30439_ch06_2 13-247.indd 236 12/21/18 08:19 PM From the Publisher Enhanced Pedagogy This edition of The Power of Critical Thinking builds on10the| Judging pedagogical approach Scientific Theories that has successfully helped students practise and refine their critical thinking skills. 417 Everyday Problems and Decisions Conspiracy and Vaccines Being a parent means making many critical decisions, including decisions about your child's health care. One of the most important steps in insuring a child's health is making sure that he or she gets properly vaccinated. Standard vaccinations for infants include vaccinations that protect against diphtheria, tetanus, influenza, measles, mumps, rubella, polio, and more. Some of the diseases that these vaccines help to prevent are deadly. Many of them have been virtually eliminated in countries like Canada and the United States, in large part because almost all children are now vaccinated against them. But many of them are still a frequent cause of illness and death in parts of the world where vaccination is unavailable or unaffordable. Some parents in Canada and the United States, however, still opt not to have their children vaccinated. In some cases, they fear the side effects they believe the vaccines to cause. It is true that all vaccines can have side effects, but most of them are very minor (like a sore arm or a mild fever) and more serious side effects are extremely rare. In other cases, parents may believe that the vaccines are simply unnecessary and that their widespread use is the result of an evil scheme, a conspiracy funded by the major pharmaceutical companies that make the vaccines. Is that possible? Perhaps, but is it likely? Parents who choose not to have their children vaccinated are ignoring the guidance of the entire medical profession, the conclusions of epidemiologists (scientists who study the spread of disease), and the advice of every single public health agency. Which theory stands up best when subjected to the tests provided in this chapter and the previous one? Everyday Problems and Decisions boxes allow students to apply their critical thinking skills to real-world issues. 12 Par t On e | ics Some thingsBasthat are logically possible, however, are physically impossible. It's logically possible for Vaughn's dog to fly to another galaxy in 60 seconds. Such an Reasons and Argunot ments astounding performance would violate a principle of logic. But it does violate Reasons provide support for a stat ement. That is, they believing that a statto prov ement laws of science pertaining speed-of-light travel and gravitation; it is therefore ide us with is true grounds . Rea So a statement sons are themselv for expressing a reas es expressed as stat on or reasons is ements. ment is true or used to like sho ly to be true.of w that ano physically impossible. The upshot all this is that, contrary to what some people ther Thi (or stateme s stat com ebination of stat nts) supposedly ements—a stateme providing reasons known as an arg nt for accepting ano um ent. Arg would have us believe, the fact that ther statement— possible doesn't mean it's umentssomething are the main focu is logically are the mos is t important tool s of critical thin we have for eval king; they own and those of uating the truth of stateme and for formulat physically possible. That is,othifers)something isemelogically possible, that doesn't mean it nts (our acceptan ing stat ce. Arg uments are, nts that are trul therefore, essentia y worthy of in all fields. In ever l for the advancement yda y conversation, possible happened or exists—many logically things may not be real. of kno wled debate or an ang people use the wor ge ry exchang d argu argument A group of sta tements in which some of t hem (the premises) are i ntended to support anoth er of them (the conclusion). men e. In critical thin assertion of reas king, however, argu t to indicate a ons in support of ment refers to the a statement. The statements (reasons) given in support of ano ally called the pre In an argumen ther statement mises. The stateme t, a statement are technicor reason give nt that the prem is called the con n in support of ises are intended clusion. We can the conclusion to support define an argumen . t, then, like this ARGUMENT : : A group of stat ements in which premises) are inte some of them (the nded to support another of them conclusion (the conclusion) The following are . some simple argu In an argumen t, the ments: statement tha 1. Because you t the premises want a job that are intended will allow you to to support. world, you sho mak e a difference in uld consider wor the king for a charita Doctors Withou ble organization t like 2. The Globe and Borders. Mail's Report on Business says that heavily in gold. people should inve Therefore, investin 3. When Jose st g in gold is a sma ph takes the bus rt move. , he's always late today, so I'm sure . And he's taki he's going to be ng the bus 4. Yikes! This late. movie is on Net flix, but it was nev It's not a good sign er even shown in when a movie goe theatres. s straight to vide shown in theatres o without ever bein . This one must 5. No one sho be pretty bad. g uld drink a beer brew ed by a giant corp is brewed by a gian oration. Labatt's t corporation, so Blue no one should drin Here are the sam k it. e arguments whe re the parts are easily identified: 1. [Premise] Bec ause you want a job that will allo in the world, [Co w you to make a differen nclusion] you sho ce uld consider wor organization like king for a charita Doctors Withou ble 2. [Premise] The t Borders. Globe and Ma il's Report on should invest hea Bus iness says that vily in gold. [Co people nclusion] Therefo is a smart move. re, investing in gold 3. [Premise] Wh en Joseph takes mac30439_ch10_390-431.indd 417 the bus, he's alw taking the bus tod ays late. [Premis ay, [Conclusion e] And he's] so I'm sure he's going to be late. premise Judging Weird Theories A marginal glossary highlights key terms near Now let's do a detailed evaluation of an extraordinary theory using thetheir TESTfirst mention in the text, reinforformula from Chapter 9. Recall the four steps of the procedure: cing important concepts for students. Step 1. State the theory and check for consistency. Step 2. Assess the evidence for the theory. Step 3. Scrutinize alternative theories. Step 4. Test the theories with the criteria of adequacy. mac30439_ch01_001 -032.indd 12 12/20/18 03:55 PM 12/20/18 03:07 PM xv that doesn't stop them from counting as statements!) They assert that some state of affairs is or is not actual. You may know that a specific statement is true, or you may know that it is false, or you may not know either way. There may be no way From the Publisher to find out at the time if the statement is true or false. There may be no one who believes the statement. But it would be a statement nonetheless. statement (claim) An assertion that something is or is not the case. xvi Review Notes Why Critical Thinking Matters • O ur thinking guides our actions, so it should be of high quality. • If you have never critically examined your beliefs, they are not truly yours. • Critical thinking is one way of defending against the cognitive biases that tend to lead us to false conclusions and bad decisions. • To examine your beliefs is to examine your life. Socrates said: "The unexamined life is not worth living." • Critical thinking involves determining what we're justified in believing, being open to new perspectives, and fairly assessing the views of others and ourselves. • Critical thinking complements our emotions and can enhance our creativity. Review Notes • Critical thinking is thinking outside the box. boxes appear throughout each chapter to reiterate the main points of chapter sections, improving comprehension and making later review more efficient. 4 | Reasons for Belief and Doubt 149 mac30439_ch01_001-032.indd 10 Food For Thought 12/20/18 03:55 PM Fake News Harley Schwadron/www.CartoonStock.com What is "fake news"? There has always been fake news—news presented by sources whose main purpose is to entertain rather than to inform. Tabloids, such as the National Enquirer, are often accused of falsehoods, with some of them even tending to favour silly, sensationalistic headlines along the lines of "Tom Cruise Fathers Space Alien's Baby!" Other sources of "fake" news are more obviously intended to be fun: the satirical news source The Onion reports on "news" stories that are entirely fake but obviously so and clearly aimed at entertaining rather than informing. Unfortunately, the idea of "fake news" took on a new, more sinister meaning during the 2016 US presidential election. During that election, When someone tries to convince you that something really is newsseveral websites and social media ac- worthy, what steps can you take to critically analyze their claim? counts sprang up that were dedicated to spreading false but damaging stories about political candidates. This was fake news in the worst sense of the word. Soon after that problem came to light, Donald Trump began using the term "fake news" to refer to any news story that didn't reflect well on him, including stories reported by reputable, highly reliable news sources, such as CNN and the New York Times. Food for Thought boxes provide addiits money not from selling its product (news) through subscriptions or direct tional, sometimes humorous, sales material but from selling opportunities for other companies to advertise to the news outlet's audience. The organization wants a big audience because big audiences on a topic and challenge students to bring in big advertising dollars. apply the critical thinking skills they Theare pressure on news organizations to turn an acceptable profit is immense and has dibeen growing in the past two decades. Indeed, today many traditional learning. The material is purposely outlets (especially print outlets such as newspapers) are struggling to survive verse in both subject matter andnews format. in the face of competition from online outlets, which tend to be cheaper to run and quicker to update as news unfolds. The old ideal of journalism as primarily a public service and not a cash cow has seldom been able to withstand the corporate push for profits. The effects of this trend on the nature and quality of the news "Everything is being compressed into tiny tablets. You take a little pill of news every day—23 minutes— and that's supposed to be enough." —Walter Cronkite From the Publisher 20 xvii | Basics Pa rt On e n. They for identificatio neatly labelled arg uments. ost never appear are not part of the t tha s ent Arguments alm tem clusion of sta identify the con bedded in a lot ur main task is to usually come em plex and long. Yo com . be rds can wo s of Argument t in the maze hout getting los and premises wit Exer cise 1.1 may be fou h an asterisk (*) rcises marked wit Answers to exe Exercises. Answers to Select nd in Appendix B, ions Review Quest te to critical ical thinking? formulation rela crit is hat W *1. c, evaluation, and terms systemati 2. How do the h how you think or wit thinking? ned with what primarily concer ing nk thi l ica 3. Is crit ing is done that critical think you think? s it mean to say the text, what doe *4. According to s? ional standard l thinking? according to rat a loss of refer to in critica l thinking cause the term critical a lack of critica *5. What does s doe how t, the tex to g din cor Ac 6. ? m? critical thinking personal freedo e does it play in and what vital rol 7. What is logic, ce, on the ten tement? mple of a sen *8. What is a sta . Then give an exa le of a statement mp exa an e Giv 9. . to beng how strongly is not a statement go about decidi same topic, that how should we t, tex the to g 10. Accordin ? lieve a statement arg ument? mises. *11. What is an ent with three pre le mp of an arg um 12. Give an exa se? mi pre a 13. What is stitute an clusion? iefs by itself con *14. What is a con statement of bel an assertion or 't can hy W 15. ent. contain an arg um arg ument? senof disagreement ple passage: Jail e: All expressions an arg ument? Sam n 16. True or fals tai con e sag ing pas ht! low rig fol I'm the ow es kn ger. I *17. Do sage: I know nals should be lon ent? Sample pas tences for crimi contain an arg um iculous—there's lowing passage he. But that's rid dac hea r 18. Does the fol you ed bal tea cur you say that her do that. t herbal tea can ents? no evidence tha rds play in arg um do indicator wo *19. What role words. tor ica ind se mi 20. List three pre words. clusion indicator 21. List three con Hundreds of exercises cover a wide range of topics. They are found throughout each chapter, presented progressively from simple to complex, elementary to more advanced, and familiar to unusual. PA R T O N E B a s i c s PM 12/20/18 03:55 _001-032.indd mac30439_ch01 20 Contemporary Design The design of the fifth Canadian edition reflects the vibrancy and excitement of learning how to think critically without sacrificing content or authoritativeness. mac30439_ch01_00 1-032.indd 1 12/20/18 03:55 PM xviii From the Publisher Aids to Student Learning Chapter openers preview the contents of each chapter with chapter objectives that provide a concise overview of the key concepts to be covered. 1 Chapter summaries at the end of each chapter provide additional support to ensure that students have identified and understood key concepts. f Critical T h e Po w e r o T hin king ec tives g of the nce and meanin and the importa of critical thinking nd the meaning onal standards. • To understa ulation, and rati lsity of state form r fa ion, th o luat tru , eva ed to logic, the terms systematic thinking is relat nd how critical • To understa empowerment. e, and personal ments, knowledg Chap te r O bj rs Why It Matte eliefs. cceptance of b to an the passive a You will be able living" to king is better th ife is not worth why critical thin e unexamined l "Th • appreciate aim e cl f th the relevance o s people • appreciate al thinking make . dubious: "Critic critical thinking emotional," and ing claims are ople cold and un why the follow s pe and ake erst g m und • l thinkin ynical," "Critica too critical or c reativity." s. of c our my eav ene end g is the ng in all human "Critical thinkin of critical thinki the usefulness • appreciate How It Works to atements. You will be able and conclusion. ents and non-st ence, premise, between statem , argument, infer • distinguish pts of reasons . the basic conce and conclusions ises rem • understand int p p pinpo an argument. or words to hel do not contain nd • use indicat es that do and en arguments a between passag stinguish betwe • distinguish conclusions. ontexts and di d premises and nts in various c s, an ume tion arg tify lana • iden uments and exp arg ial, ater superfluous m PM 12/20/18 03:55 01-032.indd 2 mac30439_ch01_0 Writing modules embedded within the end-of-chapter student activities in the first five chapters introduce the rudiments of argumentative essaywriting. 3 | Making Sen Critic al Th in ki ng and W riting Exer ci se From Th es se of Arg um is to Outline In the "Critical Thinking and Wr iting Exercise" second step in wri in Chapter 1, we ting an arg ument saw that the ative essay (after ment, or conclus determining you ion) is to create r thesis statean outline. Outlin other things, the es are useful bec y help to avert disa ause, among ster in the essay-w ing two-thirds of your essay, the riting phase. Ima n discovering tha gine writarg ument cannot t the second pre be supported and mise of your is, in fact, false. the whole arg um You might have ent and start ove to r. thr ow out At the head of you r outline, insert and as precisely as your thesis stateme possible. At ever nt, expressing it y stage of outlini as ment for guidan clearly ng, you can then ce. The premises refer to the stateand conclusion will constitute the of your argumen major points of t (or arguments) your outline. The preliminary out following, for exa line for the essay discussed in the mple, is the module at the end Thesis: Allowing of Chapter 2: coal-burning pow er plants to emit oxide will most more sulphur dilikely increase the incidence of resp iratory illnesses. I. High amount s of sulphur dioxide in the air have bee creases in the inci n linked to indence of asthma II. Many areas and other respirat of the countr y alre ory illnesses. ady have high am dioxide in the air. ounts of sulphur III. Most sulphur dioxide in the air comes from coa plants. l-burning power IV. Therefore, allo wing coal-burnin g power plants to phur dioxide wil emit more sull most likely incr ease the inciden tory illnesses. ce of respiraAfter you clearly state the premis them need to be es, you need to ask yourself whe defended. As we ther any of discussed in the any premise like module at the end ly to be questioned of Chapter 1, by your readers premise itself wil will need suppor l need arg ument t. Tha s to back it up, t is, the should be indicat and the suppor ed in your outline ting arg uments . (Some premises, port because the y are obvious or though, may not generally accept need supyou can support ed.) As discusse a premise (claim) d in this chapte through deduct premises made r, ive or inductive up of examples, arg uments with analogies, empiric research or trustw al evidence (suc orthy observatio h as scientific ns), and authoritat from reliable exp ive judgments (suc erts). Here's how h as those the preceding out tional) supporting line might look arg uments clearly with (ficshown: Thesis: Allowing coal-burning pow er plants to emit oxide will most more sulphur dilikely increase the incidence of resp iratory illnesses. mac30439_ch03_0 63-120.indd 115 12/20/18 05:56 PM ents 115 xix From the Publisher 26 | Basics Pa rt On e ple like you ple. People—peo ns as if they're peo rporations treat corporatio ations don't. Co ech, and corpor 4. It's wrong to spe ce you that free vin to t con righ may try to yers law and me—have the rate an rights, conscience. Corpo all rights are hum also don't have a you and I do. But n. e rights, just like about a corporatio an hum g hin corporations hav is not just society, this for sure . . . there's t we are a fair and and one thing is tha k treated n thin to bee er, ever ians like nev nad e Ca hav a gh nad hou 5. Alt ples in Ca igenous Indigenous peo ment and non-Ind a boldfaced lie. Canadian govern ous comdreds of years, the people in Indigen fairly. Over hun ly. Today, many all they bad s m nes the fair ted our trea about Canadians have nt. . People can talk peoples is abhorre terrible conditions nt of Indigenous munities live in tme trea t tha bt no dou want, but there is 4 | Reasons for s Field Problem one arg ucontains at least ct an entry that t interests you. Sele 1. Find a blog tha conclusion and each premise. that conbut a point of view ment. Identif y the t one ry that presents contains at leas e blog, find an ent entry so that it the 2. From the sam and stay rite e, Rew sibl ry as pos ent at all. ent um l arg ina no orig s tain of the preserve as much arg ument. Try to spaper). ic. town's main new on the same top per (or your own spa new comment that jor ma a site of below it. Find a ted pos nts 3. Go to the web me mise and t has reader com identif y the pre Find a stor y tha opinion!—and ent—not just an presents an arg um conclusion. ent Quiz Self-Assessm 32 Enrique Portillo and brothers Ale laughed, smiled xi Saenz and and joked with Jairo Saenz each other as pro were waiting to secutors said the hear from the U.S y . Justice Departme they can pursue nt about whether the death penalty . The family of 16year-old Kayla Cu they are accuse eva s, the Bre ntwood, N.Y. girl d of slaughterin g in cold Nisa Mickens, 15, glared at them from blood alongside her friend reported. the gallery, the New York Post The two teenage girls were slaught hood near an elem ered in a residen tial neighborentary school on Sept. 13, 2016— Mickens' 16th birthday. Her bod the day before y was in Brentwood, wh ile Cuevas' beaten found on a tree-lined street backyard of a nea body turned up in the wooded rby home a day late r. The two teens wer e lifelong friends had been insepa who friends and rable and shared family said an interest in bas 17. Is the stor y ketball.12 slanted in a way that seems to enc defendants in thi our age readers to believe s case are especia that the 18. Are there inst lly good or bad people? How? ances of loaded or biased langua make the victims ge or emotional in thi s cas app e seem eals 19. What main that source did the rep especially sympathetic? orter use for the problematic? Wh details of this stor y? y? Is that 20. On the ma in page for the Fox News website different. It read, , the headline for "MS -13 monsters this stor y was laugh in court as for heinous murde feds mull death rs of teen girls." penalty Can you see the main page use diff difference? Wh erent wording? y might the icators. ument? ee conclusion ind 1. What is an arg s: indicators and thr t three premise s are not statement icate which one 2. Name at leas ind , ces ten sen owing m? exa ng nki 3. From the foll is our Critical Thi a. On what day ts and e indicators. rantees the righ mples of premis b. Give two exa and Freedoms gua by limits prescribed Charter of Rights ian such reasonable to c. The Canad y . onl iety ject soc sub in it, ocratic dem and free a freedoms set out in d onstrably justifie Water Cafe. law as can be dem ver is at the Blue mises in food in Vancou ported by the pre d. The best sea clusion that is sup con Integrative Ex the ct sele below, ercises 4. From the list with ument: nothing wrong the following arg see o wh pus The ts on cam n't get it. se exercises pertain to den did stu just of y ber the material in Chapt I spoke to a num issue to them, but ers 1–4. 1. What is an d to explain the inductive arg um plagiarism. I trie ent? What is a ded 2. How can bac uctive arg ument kground informa ? tion help us to deductive arg um determine the sou ent or the cogenc PM ndness of a y of an inductive 12/20/18 03:553. Can our backgr one oun ? s d info sic rma | Ba od tion help us to det is valid? If so, how rk. Every go Pa rt On e ermine whether ? If not, why not ver y best wo rk an ur wo arg ument yo 4. st ? be be Is your own exp ost never ng their 01-032.indd 26 ertise more imp mac30439_ch01_0 ort will alm key to putti ortant for determ ductive arg ument writers aren't Your first eff ng and revising is the ining the validity or the strength ird. Good th 8. Revise. a iti d ed of a dean at 5. of an inductive What is an appeal s th draft one? writer know to authority? Is ite a second appealing to aut . need be, wr hority always fall nd on them for ward. If pe de ey th acious? For each of the isions; following arg um afraid of rev ents, specify the say whether it is conclusion and deductive or ind premises, and uctive. If it's ind ts n A, e ix uct nd m ive, pe n say whether it is ssig ed ") in Ap strong or ld Be Permitt or main Writi ng A oning Shou s statement Human Cl fy the thesi say 7 ("Yes, nted. Speci Es ese ad pr Re t en 1. ts the the arg um emise. at contradic and outline pporting pr d a claim th ix A. and each su ich you defen Watching") in Append mac30439_ch04_1 conclusion 21-173.indd 165 paper in wh e's thesis ord On ur yo 0-w No ! ts 50 a urray suppor ("H y 2 all tu say 2. Write ac Es 2 ent in Essay in tem ly. sta ed ing s cit esi ord e th nce acc evidenc in e ide ") th ev om e all ro th at Pretend th s in the Class the details of u may alter 3 ("Electronic and objections constatement. Yo ent presented in Essay premises the claim ion and the the arg um lus y nc ud at is, defend co St e Th th 3. Identif y laptops in to the essay. ether to use Appendix A. ite a two-page rebuttal wh t ou ab e wr oic sidered, then ould not be given a ch ding s sh paper defen that student a 750-word m. t, and write lis ing the classroo low m the fol fro ue iss s? an issue: eir classroom 4. Select ey follow ining to the nes from th s, should th a claim perta n smartpho ing oversea try? professors ba "host" coun ies are operat an eir • Should th mp of co s anadian e standard • When C ethical standards or th workers? are h c alt o r n he t t educe Canadia andator y for a carbon ta x to attemp flu shots be m tute • Should nadian provinces insti Ca gases? • Should greenhouse emissions of Belief and Do ubt 165 Student activities are included at the end of each chapter; they reinforce concepts and ideas through a variety of formats, including the following: 12/20/18 06:21 PM • "Field Problems" that invite students to apply newly acquired and refined critical thinking skills to real-world problems. • "Self-Assessment Quizzes" that allow students to test their understanding of the material. • "Integrated Exercises" that help students to bring information and techniques from multiple chapters together, ensuring that their understanding of critical thinking is comprehensive. 12/20/18 dd 32 01_001-032.in mac30439_ch 03:55 PM • "Writing Assignments" that allow students to apply their knowledge and practice working in longer formats such as essays. xx From the Publisher Supplements The Power of Critical Thinking also includes a comprehensive online ancillary package, available at www.oupcanada.com/MacDonaldVaughn5Ce, along with a new Dashboard. An instructor's manual, a test generator, and a comprehensive set of PowerPoint slides are available to those teaching the course. A student study guide is also available online. Dashboard is an integrated online learning and assessment platform that delivers a simple, informative, and textbook-specific experience. It connects students and instructors in a way that simplifies the learning experience to save time and put students progress first. The Power of Critical Thinking, Fifth Canadian Edition Welcome to the Dashboard to accompany The Power of Critical Thinking, 5Ce. From here you can access your syllabus, go directly to assignments and quizzes, and communicate with your instructor and your classmates. Click or touch one of the buttons above to access direct links to the task you wish to perform. Dashboard for The Power of Critical Thinking includes the following: • Integrated e-book • Test bank • Chapter summaries • Key terms lists • Interactive flash cards for students • Self-grading quizzes for students • Venn diagram modules Dashboard can be packaged with The Power of Critical Thinking or can be purchased on its own. Contact your sales and editorial representative or email for more information. Preface The fifth edition of the Canadian version of The Power of Critical Thinking is a truly Canadian volume. The current edition features examples and topics that will be familiar to Canadian students, and all 10 of the Essays for Evaluation at the back of the book are by Canadian authors. We've also updated many of the end-of-chapter exercises, expanded explanations of key concepts, and added several new text boxes, including one on the role of critical thinking in religious belief in Chapter 1 and another on eyewitness testimony in Chapter 4. As always, we've worked hard to keep the book practical and informal yet rigorous. We like to think it's about as much fun as a textbook can be, while remaining informative and providing students with tools they can use. Acknowledgements As everybody knows, critical thinking textbooks are easy to write and require almost no effort at all. Just kidding! A book like this is the product of plenty of hard work by real people, including people other than those lucky enough to have their names on the front cover. Among those who deserve thanks, I'd like to begin at the very top of the list, with my friends at Oxford University Press, especially Stephen Kotowych and Kerry O'Neill, for their uncommon patience and support and for the very high quality of their work. In addition, I would like to thank several anonymous reviewers for their excellent feedback and suggestions. I'd also like to blame the reviewers and editors for any mistakes that you may find. But you're a critical thinker, so you'll see right through me. In fact, of course, I bear responsibility for whatever mistakes remain. If you spot a mistake—and if you're really sure it's a mistake!— let me know. Finally, as always, I would like to thank Professor Nancy Walton, who inspires me every day to be both a more critical thinker and a more charitable interpreter of other people's points of view. xxii Preface Reviewers We gratefully acknowledge the contributions of the following reviewers, whose thoughtful comments and suggestions have helped to shape this new edition: Gerald Beaulieu, University Of Manitoba Peter Denton, International College of Manitoba Leland Harper, Siena Heights University Shereen Hassanein, Seneca College Thomas Mathien, University of Toronto Clifford Roberts, University of Victoria Krzysztof Swiatek, MacEwan University Brian Zamulinski, University of Saskatchewan Chris MacDonald Ted Rogers School of Management Ryerson University PART ONE Basics 1 The Power of Critical Thinking Chapter Objectives • To understand the meaning of critical thinking and the importance and meaning of the terms systematic, evaluation, formulation, and rational standards. • To understand how critical thinking is related to logic, the truth or falsity of statements, knowledge, and personal empowerment. Why It Matters You will be able to • appreciate why critical thinking is better than the passive acceptance of beliefs. • appreciate the relevance of the claim "The unexamined life is not worth living" to critical thinking. • understand why the following claims are dubious: "Critical thinking makes people too critical or cynical," "Critical thinking makes people cold and unemotional," and "Critical thinking is the enemy of creativity." • appreciate the usefulness of critical thinking in all human endeavours. How It Works You will be able to • • • • • distinguish between statements and non-statements. understand the basic concepts of reasons, argument, inference, premise, and conclusion. use indicator words to help pinpoint premises and conclusions. distinguish between passages that do and do not contain an argument. identify arguments in various contexts and distinguish between arguments and superfluous material, arguments and explanations, and premises and conclusions. 1 | The Power of Critical Thinking 3 W Bradford Veley/CartoonStock hen you were born, you were completely without opinions or judgments or values or viewpoints—and now your head is overflowing with them. Opinions help you to make your way through the world. They guide you to success (or failure), understanding (or ignorance), good decisions (or bad), empowerment (or paralysis). Some of your beliefs truly enable you, and some blind you. Some are true; some are not. But the question is, which ones are which? This kind of question—a question about the quality of your beliefs— is the fundamental concern of critical thinking. Determining the quality or value of your beliefs requires thought, and the kind of thinking that does this job best is critical thinking—a skill that a university or college education seeks to foster. This means that critical thinking is not directly about what you think but rather how you think. The quality of beliefs is not about what factors caused you to have the beliefs that you do. A sociologist might tell you how society has influenced some of your moral views. A psychologist might describe how your emotions cause you to cling to certain opinions. Your best friend might claim that you have unconsciously absorbed most of your beliefs directly from your parents. But none of these speculations have much to do with the central task of critical thinking. Critical thinking focuses not on what causes a belief but on whether it is worth believing. A belief is worth believing, or accepting, if we have good reasons to accept it. Critical thinking helps us to assess our beliefs and core values. Consider some of your most valued beliefs. Are they supported by good reasoning? critical thinking The systematic evaluation or formulation of beliefs or statements by rational standards. "The recipe for perpetual ignorance is: be satisfied with your opinions and content with your knowledge." —Elbert Hubbard 4 Part One | Basics The better the reasons, the more likely the belief is to be true. Critical thinking offers us a set of standards embodied in techniques, attitudes, and principles that we can use to assess beliefs and determine if they are supported by good reasons. After all, we want our beliefs to be true—to be good guides for dealing with the world—and critical thinking is the best tool we have for achieving this goal. Here's one way to wrap up these points in a concise definition: CRITICAL THINKING: The systematic evaluation or formulation of beliefs or statements by rational standards. logic The study of good reasoning, or inference, and the rules that govern it. Critical thinking is systematic because it involves distinct procedures and methods. It entails evaluation and formulation because it's used both to assess existing beliefs (yours or someone else's) and to arrive at new ones. And it operates according to rational standards because it involves beliefs that are judged by how well they are supported by reasons. The effort involved in thinking critically is well worth it because it is one of the few tools we have to counteract the natural limitations of the human brain. Some of those limitations are pretty easy to spot, of course. All of us make mistakes of reasoning from time to time: we fail to give enough attention to key facts, we forget things, we jump to conclusions, and so on. But some errors of reasoning are more common than others. Some are so common that psychologists have studied them and given them names. These are called "cognitive biases," and evidence suggests that some of them are nearly universal. For example, we tend to judge facts differently depending on just how they are stated, or "framed." We might react quite positively to an announcement that a struggling company had been able to "save" 300 jobs (out of 1000) but quite negatively to an announcement that the company was "laying off" 700 people (out of 1000)—even though the result is exactly the same. Framing the issue in terms of jobs saved—which sounds like a good thing—makes us think more positively about the whole scenario. Here's another example of cognitive bias: if you ask people to estimate how likely it is that the average Canadian will die in a car crash compared to how likely it is that he or she will die in a plane crash, they're likely to overestimate the relative likelihood of dying in a plane crash, just because they've seen scary images on TV of planes crashing and can readily call those images to mind. (In reality, even those who fly frequently are much less likely to die in a plane crash than in a car crash.) In general, we tend to overestimate how common dramatic events are and underestimate how common more boring events are. We know that mistakes of reasoning like these are common, and it's easy to see how they can lead to bad conclusions and bad decisions—bad decisions about how to invest our time, bad decisions about how to travel, bad decisions about what to eat, and so on. Our best defence is to look at the facts carefully and think critically. Critical thinking, of course, involves logic. Logic is the study of good reasoning, or inference, and the rules that govern it. But critical thinking is broader than logic because it involves not only logic but also the examination of the truth or 1 | The Power of Critical Thinking falsity of individual statements, the evaluation of arguments and evidence, the use of analysis and investigation, and the application of many other skills that help us to decide what to believe or do. Ultimately, what critical thinking leads you to is knowledge, understanding, and—if you put these to work—empowerment. In Chapters 2 and 3, you'll get a more thorough grounding in critical thinking and logical argument as well as plenty of opportunities to practise your new skills. Consider this chapter an introduction to those important lessons. Focus on soaking up the big ideas. They will help you to prepare for the skills you'll learn in later chapters. Why It Matters In large part, who we are is defined by our actions and choices, and our actions and choices are guided by our thinking—so our thinking had better be good. Almost every day we are hit by a blizzard of assertions, opinions, arguments, and pronouncements from all directions. They all try to get us to believe, to agree, to accept, to follow, to submit. If we care whether our choices are right and our beliefs true, if we want to rise above blind acceptance and random choices, we need to use the tools provided by critical thinking. Food For Thought Dumb and Dumber Confidence Often when we lack knowledge about something, that's bad. But when we don't know that we lack knowledge, that's worse. At least, that's the view of researchers who studied the effects of this kind of doubleedged ignorance (Journal of Personality and Social Psychology, December 1999). In several studies, the researchers assessed the ability of study participants in areas that demanded "knowledge, wisdom, or savvy"— 100% logical reasoning, English grammar, and humour. The results: people whose abilities were very weak tended to greatly overestimate them. Those who got the lowest test scores thought they had achieved much higher scores. The data suggested that the overestimations arose because the subjects couldn't distinguish accuracy from error. They didn't know what they didn't know. Ironically, when the re0% None Experience Expert searchers helped the participants to improve their abilities and increase their knowledge, the partici- The Dunning-Kruger Effect Some people are unskilled and yet don't know it. How can pants could recognize their limitations. difficulties in recognizing one's own incompetence lead Increase your knowledge and recognize your to inflated self-assessments? limitations—isn't that what critical thinking helps Kruger, J., Dunning, D. (1999). Available at pubmed/10626367. you do? 5 xkcd.com 6 Part One | Basics Of course, we always have the option of taking the easy way out. We can simply grab whatever beliefs or statements come blowing by in the wind, adopting viewpoints either because others hold them or because they make us feel good. But then we give up control over our lives and let the wind take us in some random direction as if we had no more say in the outcome than a leaf in a storm. A consequence of going with the wind is a loss of personal freedom. If you passively accept beliefs that have been handed to you by your parents, your culture, your teachers, or social media, then those beliefs are not really yours. You just happened to be in a certain place and time when they were handed out. If they are not really yours and if you still let them guide your choices and actions, then they—not you—are in charge of your life. Your beliefs are yours only if you critically examine them for yourself and decide that they are supported by good reasons. Of course, thinking critically is not only important because of how it matters for ourselves. It is also important because of the impact that our decisions have on "By three methods we may other people. If we are parents, then we ought to think critically about the health learn wisdom: First, by reflection, which is noblest; care choices we make on behalf of our children. If we are professionals, we have second is by imitation, a duty to think critically about the advice and guidance we offer our clients or which is easiest; and third patients. And all of us have an obligation to think critically in order to make good by experience, which is the choices about how we treat our shared environment—whether that means keepbitterest." —Confucius ing our shared classroom environment tidy or preserving our natural environment for future generations. Our choice to apply critical thinking skills is not an all-or-nothing decision. Each of us already uses critical thinking to some degree in our lives. We often evaluate reasons for (and against) believing that someone famous has committed a crime, that one candidate in an election is better than another, that regulation of biotechnology should be strengthened or weakened, that we should buy a particular kind of car, that a new friend is trustworthy, that one university is better than another, that the piece of legislation being considered in Parliament would be bad for the environment, or that buying stock in Apple is a good investment. But the more urgent consideration is not just whether we sometimes use critical thinking, but how well we use it. Many people, however, will reject all of this— and maybe you are one of them. Such people believe that critical thinking—or what they assume to be critical thinking—makes a person excessively critical or cynical, emotionally cold, and creatively Many people doubt other people's critical thinking skills, constrained. For example, there are some who think that anything that sounds like logic and rationality but how often do they stop to examine their own? 1 | The Power of Critical Thinking Everyday Problems and Decisions What Should I Believe? Decisions about what to believe are some of the most important decisions we ever make. What we believe shapes who we are, and our beliefs guide us in what we decide to do. Decisions about what to believe, in other words, are the foundations for all of our other decisions. Consider the importance of each of the following decisions about what to believe: Whether I believe . . . the flu is a serious public health risk that a particular politician is honest I can afford mortgage payments that my neighbour's dog is friendly that a particular country is safe to visit influences whether I . . . get a flu shot. vote for her. buy a house. pat it on the head or stay clear. take my vacation there. must be negative—designed to attack someone else's thinking and score points by putting people in their place. A few of them take the word "critical" here to mean "negative" or "whiny" or "picky." Now, no doubt some people try to use critical thinking primarily for offensive purposes—for example, to score cheap points in a debate—but this approach goes against critical thinking principles. The critical in critical thinking is used in the sense of "exercising or involving careful judgment or judicious evaluation." Critical thinking is about determining what we are justified in believing, and that involves an openness to other points of view, a tolerance for opposing perspectives, a focus on the issue at hand, and fair assessments of arguments and evidence. Food For Thought Passion and Reason "Reason is, and ought only to be the slave of the passions." That's what Scottish philosopher David Hume wrote in his Treatise on Human Nature (1738). What did he mean by this? He meant roughly that reason, far from being at odds with emotion, is best thought of as serving it. Our emotions (or "passions" as Hume referred to them) tell us what we want; our reason tells us what to do about it, based in part on what we can reasonably believe will be effective in achieving our goals. Our passions, for example, may tell us that we want to become a lawyer—perhaps because we want to promote justice and defend the innocent. But it is reason that helps us to get there. Reason tells us that, in order to become a lawyer, we need to study hard during our undergraduate careers, get good grades, and go to law school. 7 8 Part One | Basics Some people fear that if they apply critical thinking to their lives, they will become cold and unemotional—just like a computer that works strictly according to logic and mathematical functions. But this fear is misplaced. Critical thinking and feelings actually work best together. Certainly, part of thinking critically is ensuring that we don't let our emotions distort our judgments, but critical thinking can also help us to clarify our feelings and deal with them more effectively. Our emotions often need the guidance of reason. If you're angry at a friend because she broke a promise, reason might prompt you to look into the situation further, perhaps to find out that your friend actually had a valid excuse for breaking that promise. Likewise, our reasoning needs our emotions. It is our feelings that motivate us to action, and without motivation our reasoning would never get off the ground. Then there's the dubious assumption that critical thinking is the enemy of creativity. To some people, critical thinking is a sterile and rigid mode of thought that limits the imagination, hinders artistic vision, and prevents "thinking outside the box." But critical thinking and creative thinking are not opposed to one another. Good critical thinkers can let their imaginations run free, just like anyone else. They can create and enjoy poetry, music, art, literature, and plain old fun in the same way and to the same degree as the rest of the world. Critical thinking can complement creative thinking because it is needed to assess and enhance the creation. Scientists, for example, often dream up some very far-fetched theories (an important part of doing science). These theories pop into their heads in the same way that the idea for a great work of art appears in the mind of a painter. But then scientists use all of their critical thinking skills to evaluate what they have produced (as artists sometimes do)—and this critical examination enables them to select the most promising theories and to weed out those that are unworkable. (We'll return to the notion of testing theories in Chapter 10.) In a very important sense, critical thinking just is thinking outside the box. When we passively absorb the ideas we encounter, when we refuse to consider any alternative explanations or theories, when we conform our beliefs to the wishes of the group, and when we let our thinking be controlled by bias, stereotypes, superstition, and wishful thinking, that's when we are deep, deep in the box. But when we have the courage to think critically, we can rise above all that. When we are willing to put our beliefs on trial in the court of critical reason, we open ourselves up to new possibilities, the dormant seeds of creativity. Critical thinking covers a lot of territory. It's used across the board in all disciplines, all areas of public life, all the sciences, all sectors of business, and all occupations. It has played a major role in all the great endeavours of humankind— scientific discoveries, technological innovations, philosophical insights, social and political movements, literary creation and criticism, judicial and legal reasoning, democratic nation-building, and more. The lack of critical thinking has also left its mark. Many of the great tragedies of history—including wars, massacres, holocausts, tyrannies, bigotries, epidemics, and witch hunts—grew out of famines of the mind where clear, careful thinking was much too scarce. 1 | The Power of Critical Thinking 9 Food For Thought Creativity and critical thinking are inseparable in the field of architecture. Facing regulatory constraints (building codes, municipal bylaws), physical constraints (structural requirements, material limitations), and project-specific constraints (client desires and budget), an architect adds his or her personal experience, knowledge of precedent, and abstract problem- solving to develop a clear physical design solution. The most creative architectural designs result from a complex web of information, skillfully As you work your way through this book, think about the interpreted. In architecture school, it is the design cri- parallels between the field of architecture and the general task of critical thinking. tique session or 'crit' that prepares architects for this design process. Each student's design is presented to a group of fellow students, professors, and practitioners; its merits are tested, difficult questions are asked, and alternatives suggested. This process of critical thinking, over time, hones the architect's creative skills. —Eric Fruhauf, OAA. Professor of Architecture, Civil, and Building Science at Algonquin College, Ottawa. How It Works As you can see, critical thinking has extremely broad applications. Principles and procedures used to evaluate beliefs in one discipline can be used to assess beliefs in many other arenas (and we will examine several of those in detail in Chapter 11). But the basics of good critical thinking are the same everywhere. Here are the common threads that make them universal. Claims and Reasons Critical thinking is a rational, systematic process that we apply to beliefs of all kinds. Of course, we can really only evaluate beliefs that are made explicit; for obvious reasons, it's hard to evaluate beliefs that are kept hidden from us. We can only evaluate our own beliefs once we say (or maybe admit!) to ourselves, "This is what I believe." And we can only evaluate other people's beliefs by looking at the things those people actually say or write. So although we are interested in evaluating the quality of beliefs in general, we are mostly limited to evaluating beliefs that someone makes explicit by making some statement or claim. (We'll say something about the role unstated beliefs can play in arguments and about how to bring them to light and assess them in Chapter 3.) Eric Fruhauf Architecture: Creativity through Critical Thinking 10 Part One | Basics A statement is an assertion that something is or is not the case. The following are all statements: • • • • • • • • Nate Fakes/Cartoon Stock • • • • • A triangle has three sides. I am cold. You are a liar. You are not a liar. I see blue spots before my eyes. 7 + 5 = 12 7 + 5 = 11 You should never make fun of someone's disability. Canada is farther north than Mexico. The best explanation for his behaviour is that he was drunk. The capital of Canada is Winnipeg. Rap music is better than Celtic fiddle music. An electron is a sub-atomic particle. So statements, or claims, are the kind of things that are either true or false. (Notice that at least three of the claims above are definitely false, but that doesn't stop them from counting as statements!) They assert that some state of affairs is or is not actual. You may know that a specific statement is true, or you may know that it is false, or you may not know either way. There may be no way to find out at the time if the statement is true or false. There may be no one who believes the statement. But it would be a statement nonetheless. How can we reveal hidden beliefs in order to evaluate them? statement (claim) An assertion that something is or is not the case. Review Notes Why Critical Thinking Matters • O ur thinking guides our actions, so it should be of high quality. • If you have never critically examined your beliefs, they are not truly yours. • Critical thinking is one way of defending against the cognitive biases that tend to lead us to false conclusions and bad decisions. • To examine your beliefs is to examine your life. Socrates said: "The unexamined life is not worth living." • Critical thinking involves determining what we're justified in believing, being open to new perspectives, and fairly assessing the views of others and ourselves. • Critical thinking complements our emotions and can enhance our creativity. • Critical thinking is thinking outside the box. 1 | The Power of Critical Thinking 11 Food For Thought Religious Faith and Critical Thinking There are those who argue that faith and reason are incompatible. However, much theology and philosophy of religion are the result of thinking critically about religious ideas (often contrary to the preferences of religious authorities). Faith is not "believing something without proof." Rather, faith is sometimes described as "trusting without reservation," and thus the way we reason about matters of faith is more like the way we reason about relationships. That is to say, it's usually less about demonstrating the validity of a proposition than about describing the way the world appears to be from the position of faith. This requires the instruments of critical thought no less than any other area of human inquiry: it requires the use of evidence, it requires us to reason validly from premises to conclusions, and it requires the ability to respond to and account for objections. Critical reasoning thus comes into play whenever a faithful person experiences doubt and then has to make sense of that doubt. Or when a faithful person meets with objections and has to formulate a response. Within that context, critical reasoning is essential for understanding what communities of faith claim to believe and how they justify those beliefs. —Scott Paeth, Professor, Religious Studies, Peace, Justice and Conflict Studies, DePaul University, Chicago Some of the thoughts we express, though, do not express statements: • • • • • Does a triangle have three sides? Is that cheese? Turn that music off! Hey, dude. ROFL! The first two sentences are questions, the third is a command, the fourth is a greeting, and the fifth is an exclamation that is common in email and text messaging. None of them asserts that something is or is not the case. They are meaningful things to say, but they're not statements. They are not the sorts of things that are capable of being either true or false. When you're engaged in critical thinking, you're mostly either evaluating statements or formulating them. In both cases your primary task is to figure out how strongly to believe them. The strength of your belief should depend on the quality of the reasons in favour of the statements. Statements backed by good reasons are worthy of strong acceptance. Statements that fall short of this standard deserve only weaker acceptance at best. Sometimes you may not be able to assign any substantial weight at all to the reasons for or against a statement—there simply may not be enough evidence to decide rationally. Generally, when that happens, good critical thinkers do not just randomly choose to accept or reject a statement. They suspend judgment until there is enough evidence to make an intelligent decision. 12 Part One | Basics Reasons and Arguments argument A group of statements in which some of them (the premises) are intended to support another of them (the conclusion). premise In an argument, a statement that is intended to support the conclusion. conclusion In an argument, the statement that the premises are intended to support. Reasons provide support for a statement. That is, they provide us with grounds for believing that a statement is true. Reasons are themselves expressed as statements. So a statement expressing a reason or reasons is used to show that another statement is true or likely to be true. This combination of statements—a statement (or statements) supposedly providing reasons for accepting another statement—is known as an argument. Arguments are the main focus of critical thinking; they are the most important tool we have for evaluating the truth of statements (our own and those of others) and for formulating statements that are truly worthy of acceptance. Arguments are, therefore, essential for the advancement of knowledge in all fields. In everyday conversation, people use the word argument to indicate a debate or an angry exchange. In critical thinking, however, argument refers to a set of statements. We can define an argument, then, like this: ARGUMENT: A group of statements in which some of them (the premises) are intended to support another of them (the conclusion). The following are some simple arguments: 1. Because you want a job that will allow you to make a difference in the world, you should consider working for a charitable organization like Doctors Without Borders. 2. The Globe and Mail's Report on Business says that people should invest heavily in gold. Therefore, investing in gold is a smart move. 3. When Joseph takes the bus, he's always late.

And he's taking the bus today, so I'm sure he's going to be late. 4. Yikes! This movie is on Netflix, but it was never even shown in theatres. It's not a good sign when a movie goes straight to video without ever being shown in theatres. This one must be pretty bad. 5. No one should drink a beer brewed by a giant corporation. Labatt's Blue is brewed by a giant corporation, so no one should drink it. Here are the same arguments where the parts are easily identified: 1. [Premise] Because you want a job that will allow you to make a difference in the world, [Conclusion] you should consider working for a charitable organization like Doctors Without Borders. 2. [Premise] The Globe and Mail's Report on Business says that people should invest heavily in gold. [Conclusion] Therefore, investing in gold is a smart move. 3. [Premise] When Joseph takes the bus, he's always late. [Premise] And he's taking the bus today, [Conclusion] so I'm sure he's going to be late. 1 | The Power of Critical Thinking 4. Yikes! [Premise] This movie is on Netflix, [Premise] but it was never even shown in theatres. [Premise] It's not a good sign when a movie goes straight to video without being shown in theatres. [Conclusion] This one must be pretty bad. 5. [Premise] No one should drink a beer brewed by a giant corporation. [Premise] Labatt's Blue is brewed by a giant corporation. [Conclusion] So no one should drink it. The arguments above are all quite different. They are all on very different topics. And some have just one premise, while others have two or three. Some are about what we should believe is true, while others are about what we believe should be done. But what all of these arguments have in common is that reasons (the premises) are offered to support or prove a claim (the conclusion). This logical link between premises and conclusion is what distinguishes arguments from all other kinds of discourse. This mental process of reasoning from a premise or premises to a conclusion based on those premises is called inference. We infer the conclusion of an argument from its premise or premises. Being able to identify arguments, to pick them out of a larger chunk of non-argumentative writing if need be, is an important skill on which many other critical thinking skills are based. Next, consider this passage: Universal pharmacare would cost the Canadian government about $20 billion, which would have to be paid for through taxes. The - Canadian government has considered introducing such a plan. That $20 billion paid through taxes would be less than the total amount currently being paid by Canadians privately for their prescriptions. Is there an argument here? No. This passage consists of several claims, but no reasons are presented to support any particular claim (conclusion). This passage can be turned into an argument, though, with some minor editing: Universal pharmacare would cost the Canadian government about $20 billion, which would have to be paid for through taxes. The Canadian government has considered introducing such a plan. The $20-billion plan would cost less than the total amount currently being paid by Canadians for their prescriptions. The Canadian government should go ahead and institute universal pharmacare. Now we have an argument because reasons are given for accepting a conclusion. Here's another passage: Allisha used the online banking app on her iPhone to check the balance of her chequing account. It said that the balance was $125. Allisha was stunned that it was so low. She called her brother to see if he had been playing one of his stupid pranks. He said he hadn't. She wondered: was she the victim of bank fraud? 13 "What danger can ever come from ingenious reasoning and inquiry? The worst speculative skeptic ever I knew was a much better man than the best superstitious devotee and bigot." —David Hume inference The process of reasoning from a premise or premises to a conclusion based on those premises. 14 Part One | Basics Where is the conclusion? Where are the reasons? There are none. This is a little story built out of descriptive claims, but it's not an argument. It's not trying to convince you, the reader, of anything. It could be turned into an argument if, say, some of the claims were restated as reasons for the conclusion that bank fraud had been committed. Being able to distinguish between passages that do and do not contain arguments is a very basic skill—and an extremely important one. Many people think that if they have clearly stated their beliefs on a subject, they have presented an argument. But a mere declaration of beliefs never counts as an argument. Often such assertions of opinion are just a jumble of unsupported claims without an argument of any kind. A writer or speaker of these claims gives the readers or listeners no grounds for believing the claims. In writing courses, this kind of absence of supporting premises is sometimes called a "lack of development." Here are two more examples of discussion without argument: Recently, a high school football game in New Brunswick was called off after one of the teams, Moncton's École l'Odyssée Olympiens, saw nine players leave the field with head injuries. The words spoken afterward by an opposing coach laid bare an uncomfortable truth. "That's how football is," Scott O'Neal of Sackville's Tantramar Titans told CBC . The problem is not the way the game is played so much as it is the nature of the sport itself. (Editorial, Globe and Mail, 22 October 2017) These tax changes will make income taxes more fair for Canadians, particularly those of us who have income tax deducted from each of our paycheques. Those crying foul over proposed changes to federal tax laws say that they are concerned about how these changes will affect their ability to manage their lives, including repayment of their student loans, the cost of having and raising children, and the ability to save for retirement. (Carol Ogden [letter], Vancouver Sun, 4 September 2017) explanation A statement or statements intended to tell why or how something is the case. The passage about football seems to be moving toward expressing an opinion (which may or may not be justified), but no reasons supporting a conclusion are offered. Note the contentious tone in the second passage, which is part of a letter to the editor. This passage sounds like part of an argument—it certainly expresses an opinion. But in the section that is shown, there is no argument. It's just a point of view presented without any support at all. Sometimes people also confuse explanations with arguments. An argument gives us reasons for believing that something is the case—that a claim is true or at least probably true. An explanation, though, tells us why or how something is the case. 1 | The Power of Critical Thinking 15 Arguments have something to prove; explanations do not. Look carefully at this pair of statements: 1. Adam obviously stole the money—he was the only one with access to it. 2. Yes, Adam stole the money, but he did it because he needed it to buy food. Statement 1 is an argument. Statement 2 is an explanation. Statement 1 tries to show that something is the case—that Adam stole the money—and the reason offered in support of this statement is that he alone had access to it. That's why we should believe that he did it. Statement 2 does not try to prove that something is the case (that Adam stole the money). Instead, it attempts to explain why something is the case (why Adam stole the money). Statement 2 takes for granted that Adam stole the money and then tries to explain why he did it. In a different context, of course, the fact that Adam had a motive—hunger—that might tend to make people steal could be offered as a reason to believe that he did, in fact, steal on this occasion. But in the absence of such a context, this sentence is most naturally read as an explanation rather than an argument. (Note that explanations can sometimes be used as parts of arguments. When they play that role, explanations are powerful intellectual and scientific tools that help us to understand the world; that is why this text has several chapters in Part 4 devoted to explanations used in this way.) It's not always easy to recognize an argument and to locate both premises and a conclusion, but there are a few tricks that can make the job more manageable. For one, there are indicator words that are frequently included in arguments and signal that a premise or conclusion is present. For example, in argument 1, presented earlier in this chapter, the indicator word because tips us off to the presence of the premise "Because you want a job that will allow you to make a difference in the world." In argument 2, therefore points to the conclusion "Therefore, investing in gold is a smart move." Here are some common premise indicators: because in view of the fact given that seeing that as due to the fact that being that since assuming that for the reason that inasmuch as as indicated by for the reason being These words almost always introduce a premise—something given as a reason to believe some conclusion. And here are some common conclusion indicators: therefore it follows that thus we can conclude that which implies that so consequently hence it must be that as a result which means that ergo indicator words Words that are frequently included in arguments and signal that a premise or conclusion is present. 16 Part One | Basics Using indicator words to spot premises and conclusions, however, is not foolproof. They're just good clues. You will find that some of the words just listed are used when no argument is present. For example, • I am here because you asked me to come. • I haven't seen you since Canada Day. • He was so sleepy he fell off his chair. The words "because," "since," and "so" are very often used as indicator words, but they are not being used that way in the sentences above. Note also that arguments can be put forth without the use of any indicator words: We must each take steps to protect our environment. We can't rely on the government—federal and provincial regulators already have their hands full. Government can't be everywhere at once, and they usually get involved only after some environmental catastrophe has already happened. Individual responsibility is the key. As you may have noticed from these examples, the basic structure of arguments can vary in several important ways. For one thing, arguments can have any number of premises. Arguments 1 and 2 on pages 12–13 have one premise; arguments 3 and 5 each have two premises; and argument 4 has three premises. In extended arguments that often appear in essays, editorials, reports, blog postings, speeches, and other works, there can be many more premises. Also, the conclusion of an argument may not always appear after the premises. As in the above argument about the environment, the conclusion may be presented first. Occasionally, the conclusion of an argument can be disguised as a question— even though a question is usually not a claim at all. (For purposes of examining such arguments, we may need to rewrite the conclusion as a statement; in some arguments, we may also need to do the same for the premises.) Most of the time readers have no difficulty discerning what the implied conclusion is, even when it is stated as a question. See for yourself: Do you think for one minute that backbench Liberals in Parliament will be happy about the prime minister's refusal to have a serious debate about electoral reform? A lot of Liberal Members of Parliament were elected by constituents who have very strong views about the need to change the way elections are currently run in this country. "I respect faith, but doubt is what gets you an education." —Wilson Mizner The opening sentence of this passage is a question, but the answer is one that the writer assumes will be clear and obvious to the reader—namely, "no." Probably the best advice for anyone trying to uncover or dissect arguments is this: Find the conclusion first. Once you figure out what claim someone is trying to prove, it becomes much easier to isolate the premises being offered in support of it. Ask yourself, "What claim is this writer or speaker trying to persuade me to 1 | The Power of Critical Thinking 17 Review Notes Claims, Reasons, and Arguments • • • • Statement (claim): An assertion that something is or is not the case. Premise: A statement given in support of another statement. Conclusion: A statement that premises are used to support. Argument: A group of statements in which some of them (the premises) are intended to support another of them (the conclusion). • Explanation: A statement or statements asserting why or how something is the case. • Indicator words: Words that are frequently found in arguments and signal that a premise or conclusion is present. believe?" If the writer or speaker is not trying to convince you of anything at all, of course, then there is no argument to examine. Arguments in the Rough As you've probably guessed by now, in the real world arguments almost never appear neatly labelled as they are here. In everyday life, arguments usually come embedded in a tangle of other sentences that serve many other functions besides articulating an argument. They may be long and hard to follow. And sometimes a passage that sounds like an argument isn't one. Your main challenge is to identify the conclusion and premises without getting lost in all the "background noise." Consider this passage: [1] A.L. Jones used flawed reasoning in his letter yesterday praising this newspaper's decision to publish announcements of same-sex unions. [2] Mr Jones asserts that same-sex unions are a fact of life and therefore should be acknowledged by the news media as a legitimate variation on social partnerships. [3] But the news media are not in the business of endorsing or validating lifestyles. [4] They're supposed to report on lifestyles, not bless them. [5] In addition, by validating same-sex unions or any other lifestyle, the media abandon their objectivity and become political partisans—which would destroy whatever respect people have for news outlets. [6] All of this shows that the news media—including this newspaper—should never endorse lifestyles by announcing those lifestyles to the world. There's an argument here, but it's surrounded by additional, unnecessary material. The conclusion is sentence 6—"All of this shows that the news media— including this newspaper—should never endorse lifestyles by announcing those lifestyles to the world." Since we know what the conclusion is, we can identify the premises and separate them from other information. Sentences 1 and 2 are 18 Part One | Basics not premises; they're background information about the nature of the dispute. Sentence 3 presents the first premise, and sentence 4 is essentially a restatement of that premise. Sentence 5 is the second premise. Stripped clean of non-argumentative material, the argument looks like this: [Premise] The news media are not in the business of endorsing or validating lifestyles. [Premise] In addition, by validating same-sex unions or any other lifestyle, the media abandon their objectivity and become political partisans—which would destroy whatever respect people have for news outlets. [Conclusion] All of this shows that the news media—including this newspaper—should never endorse lifestyles by announcing those lifestyles to the world. Now see if you can spot the conclusion and premises in this one: [1] You have already said that you love me and that you can't imagine spending the rest of your life without me. [2] Once, you even tried to propose to me. [3] And now you claim that you need time to think about whether we should be married. [4] Well, everything that you've told me regarding our relationship has been a lie. [5] In some of your letters to a friend you admitted that you were misleading me. [6] You've been telling everyone that we are just friends, not lovers. [7] And worst of all, you've been secretly dating someone else. [8] Why are you doing this? [9] It's all been a farce! "In all affairs it's a healthy thing now and then to hang a question mark on the things you have long taken for granted." —Bertrand Russell And you thought that romance had nothing to do with critical thinking! In this passionate paragraph, an argument is alive and well. The conclusion is in sentence 4: "Everything that you've told me . . . has been a lie." Sentence 9, the concluding remark, is essentially a repetition of the conclusion. Sentences 1, 2, and 3 are background information on the current conflict. Sentences 5, 6, and 7 are the premises, the reasons that support the conclusion. And sentence 8 is an exasperated query that's not part of the argument. You will discover that in most extended argumentative passages, the premises and conclusions make up only a small portion of the total number of words. A part of the text is background information and restatements of the premises or conclusion. Most of the rest consists of explanations, digressions, examples or illustrations, and descriptive passages. As you can see, learning the principles of critical thinking or logic requires at least some prior knowledge and ability. But you may wonder (especially if this is your first course in critical or logical reasoning), "Where does this prior knowledge and ability come from?"—and do you have these prerequisites? Fortunately, the answer is yes. Since you are, as the ancient Greek philosopher Aristotle says, a rational animal, you already have the necessary equipment—namely, a logical sense that helps you to reason in everyday life and enables you to begin honing your critical reasoning. 1 | The Power of Critical Thinking Summary Critical thinking is the systematic evaluation or formulation of beliefs, or statements, by rational standards. Critical thinking is systematic because it involves distinct procedures and methods. It entails evaluation and formulation because it's used both to assess existing beliefs (yours or someone else's) and to devise new ones. And it operates according to reasonable standards in that beliefs are judged according to the reasons and reasoning that support them. Critical thinking matters because our lives are defined by our actions and choices and our actions and choices are guided by our thinking. Critical thinking helps to guide us toward beliefs that are worthy of acceptance and that can help us to be successful in life, however we define success. A consequence of not thinking critically is a loss of personal freedom. If you passively accept beliefs that have been handed to you by your family and your culture, then those beliefs are not really yours. If they are not really yours and you let them guide your choices and actions, then they—not you—are in charge of your life. Your beliefs are yours only if you examine them critically for yourself to see if they are supported by good reasons. Some people believe that critical thinking will make them cynical, emotionally cold, and creatively constrained. But there is no good reason to believe that this is the case. Critical thinking does not necessarily lead to cynicism. It can complement our feelings by helping us sort them out. And it doesn't limit creativity— it helps to perfect it. Critical thinking is a rational, systematic process that we apply to beliefs of all kinds. As we use the term here, belief is just another word for statement or claim. A statement is an assertion that something is or is not the case. When you're engaged in critical thinking, you are mostly either evaluating a statement or trying to formulate one. In both cases your primary task is to figure out how strongly to believe the statement (on the basis of how likely it is to be true). The strength of your belief will depend on the strength of the reasons in favour of the statement. In critical thinking, an argument is not a fight but a set of statements— statements supposedly providing reasons for accepting another statement. The statements given in support of another statement are called the premises. The statement that the premises are used to support is called the conclusion. An argument, then, is a group of statements in which some of them (the premises) are intended to support another of them (the conclusion). Being able to recognize an argument is an important skill on which many other critical thinking skills are based. The task is made easier by indicator words that are often found in arguments and signal that a premise or conclusion is present. Premise indicators include for, since, and because. Conclusion indicators include so, therefore, and thus. 19 20 Part One | Basics Arguments almost never appear neatly labelled for identification. They usually come embedded in a lot of statements that are not part of the arguments. Arguments can be complex and long. Your main task is to identify the conclusion and premises without getting lost in the maze of words. Exercise 1.1 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. Review Questions *1. What is critical thinking? 2. How do the terms systematic, evaluation, and formulation relate to critical thinking? 3. Is critical thinking primarily concerned with what you think or with how you think? *4. According to the text, what does it mean to say that critical thinking is done according to rational standards? *5. What does the term critical refer to in critical thinking? 6. According to the text, how does a lack of critical thinking cause a loss of personal freedom? 7. What is logic, and what vital role does it play in critical thinking? *8. What is a statement? 9. Give an example of a statement. Then give an example of a sentence, on the same topic, that is not a statement. 10. According to the text, how should we go about deciding how strongly to believe a statement? *11. What is an argument? 12. Give an example of an argument with three premises. 13. What is a premise? *14. What is a conclusion? 15. Why can't an assertion or statement of beliefs by itself constitute an argument? 16. True or false: All expressions of disagreement contain an argument. *17. Does the following passage contain an argument? Sample passage: Jail sentences for criminals should be longer. I know I'm right! 18. Does the following passage contain an argument? Sample passage: I know you say that herbal tea cured your headache. But that's ridiculous—there's no evidence that herbal tea can do that. *19. What role do indicator words play in arguments? 20. List three premise indicator words. 21. List three conclusion indicator words. 1 | The Power of Critical Thinking 22. Give an example of a sentence that uses the word because as something other than an indicator word. *23. What is probably the best strategy for trying to find an argument in a complex passage? 24. True or false: All good arguments contain indicator words. Exercise 1.2 Which of the following are statements? Which are not? *1. Should I go to class today? 2. Being able to express your political point of view in public is a fundamental right. 3. Do not allow your prejudices to distort your thinking. *4. Given that you believe in free speech, do you agree that racists have the right to express themselves freely on campus? 5. Should our religious beliefs be guided by reason, emotion, faith, or all three? 6. Nachos! *7. Eating at that new breakfast place was a terrible mistake. 8. Maybe you should take a nap. 9. The burgers at Burg-o-Rama made me sick. *10. What have you done to serve your country? Exercise 1.3 Which of the following passages contain arguments? For each argument you find, specify what the conclusion is. *1. Nachos are delicious and easy to make. So they're the perfect study food. 2. Nachos are delicious and easy to make, which is why I make them whenever I'm studying. 3. Where is Alexei planning on taking his annual vacation this year? 4. This weather is perfect for going to the beach! There's also a discount on surfing lessons that's good today only! 5. Stop! You're hurting me! 6. If you light that cigarette in here, I will leave the room. *7. Independence Day: Resurgence was a terrible movie, and not even Liam Hemsworth could save it. 8. I know that David Hume was the greatest philosopher of the last 500 years because my philosophy professor taught us that in class. 9. Iron Man was a better superhero movie than Thor because technology is just way cooler than mythology. 21 22 Part One | Basics 10. "Whether our argument concerns public affairs or some other subject, we must know some, if not all, of the facts about the subject on which we are to speak and argue. Otherwise, we can have no materials out of which to construct arguments." (Aristotle, Rhetoric) *11. If guns are outlawed, then only outlaws will have guns. Don't outlaw guns. 12. Many believe that there is no soul and the mind is simply a result of electrical and chemical signals interacting in the brain. So they think that consciousness is a purely physical phenomenon. I reject this notion! 13. "The Toronto Maple Leafs are the best hockey team in Canada," said Omar. "No way," said Nadia. "The Vancouver Canucks can beat them any day of the week." 14. Are NHL teams really good for local business? A recent article says that's not necessarily the case. According to the article, "Ivey School of Business economist Mike Moffat says that while it could very likely aid in that respect, studies show that the overall economic impact of sports teams is typically low." (Canadian Business, 31 May 2011). *15. "U.S. President Donald Trump has been using the powers of his office to make grand gestures that reflect his election campaign promises of last year. Under close scrutiny, however, his grandest gestures have no effect beyond their publicity value. Canada should pursue its trade negotiations with the United States on the assumption that Mr. Trump is aiming for another grand, empty gesture." (Editorial, Winnipeg Free Press, 17 October 2017) 16. "Canada's economy has been unambiguously strong for about a year, according to the high-frequency data Statistics Canada collects every month. Gross domestic product probably will expand by at least three per cent this year, something that some economists thought our aging and relatively unproductive economy might never do again. The unemployment rate (6.2 per cent in August) is about as low is it ever gets, and could push lower still. The median household income in Canada is about $70,000, roughly 10 per cent more than a decade ago, according to census figures released last month. That's an excellent number, considering household wealth in the United States barely grew over the same period." (Kevin Carmichael, Canadian Business, 6 October 2017) Exercise 1.4 Which of the following contains an argument? For each argument, specify both the conclusion and the premise or premises. *1. It's a law of economics that if prices go up, demand will fall. So raising the price of our shoes is sure to dampen sales. 2. You have neglected your duty on several occasions, and you have been absent from work too many times. You are not fit to serve in your current position. 3. Racial profiling is not an issue for white people, but it is a serious issue for visible minorities. 1 | The Power of Critical Thinking *4. The flu epidemic on the east coast is real. Government health officials say so. And I personally have read at least a dozen news stories that characterize the situation as a "flu epidemic." 5. People who place their trust in financial bloggers are crazy. If these bloggers were any good, they'd all be rich and wouldn't need to spend their time writing advice for other people. 6. Those protesters think the city should close down our local animal shelter because the animals are making too much noise. I bet they like to kick kittens in their spare time too. People who don't love animals make me sick. *7. "A question that often comes up is whether you can be both fat and fit. The short answer to that question is yes. You can be both fat and fit in the same way that you can be both blond and left handed." (Christopher Labos, Montreal Gazette, 1 November 2017) 8. "Growing up in Calgary in the years following the end of the Second World War, my siblings and I always accompanied our dad, Gordon Hill, to the Remembrance Day observations at the Jubilee Auditorium. "We knew about our great-uncle who had died in the First World War, and that our dad had been a fighter pilot in the Second World War. "Dad didn't talk much to us then about his war experiences, but we could always tell that this day was almost sacred to him. Of the 11 people he signed up with, three returned, and one person out of every three he worked with in Europe was killed in the line of duty. We realized how lucky we were to have our dad, much less to have our lives at all." (Eleanor Creasey, letter to the editor, Calgary Herald, 7 November 2014) 9. Investing in my new restaurant is a sure thing! A number of restaurant critics have said my poutine is the best in town. Also, my mom says my cooking is amazing. *10. Like the moon is my love, shining above the ocean of my dreams. 11. Dianne's blog is always interesting. Her commentaries are tough, but they're always fair. Her blog should definitely be on your reading list! Exercise 1.5 For each of the following conclusions, write at least two premises that could reasonably be offered in support of it. Your proposed premises can be entirely imaginary. To come up with premises, think of what kind of statement (if true) would persuade a reasonable person to believe the conclusion. Example Conclusion: Google would be a good company to work for. Premise 1: Google has been consistently profitable for several years now. Premise 2: Google has a casual and fun-loving workplace culture. 23 24 Part One | Basics 1. Canada is the best place to live in the world. 2. My mom is a very good boss. *3. Indigenous peoples in Canada have the right to hunt and fish on their traditional lands. 4. The president of our school is a good leader. 5. The president of our school is a bad leader. *6. When it comes to animals, MacDonald doesn't know what he's talking about. 7. The mayor doesn't seem to understand the rules related to the ethics of "conflict of interest." 8. If Steve Jobs came back to life, he'd hate the new, bigger iPhone too. *9. The Internet is the best tool that law enforcement officials have against terrorists. 10. Pornography is good for society. 11. Pornography is bad for society. *12. The Walking Dead is the greatest series in the history of television. 13. Students are right to be protesting against rising tuition. 14. Reading about history's great leaders is awesome. Exercise 1.6 For each of the following sets of premises, write a conclusion that would be supported by the premises (your conclusion should depend at least in part on all of the premises). Neither the conclusion nor the premises need actually to be true. Example Premise 1: The price of your shares in the stock market will continue to decline for at least a year. Premise 2: Anyone with shares whose price will continue to decline for at least a year should sell now. Conclusion: You should sell now. 1. Premise 1: You don't know how to drive. Premise 2: You don't like the smell of pizza. *2. Premise 1: Several Canadian cities have banned smoking in bars and restaurants. Premise 2: Bans on smoking in bars and restaurants typically result in lower rates of smoking overall. 3. Premise 1: The president of the university is very unhappy with the dean. Premise 2: The president has the power to remove deans from their positions. *4. Premise 1: All married people are happier than unmarried people. Premise 2: You are married. 1 | The Power of Critical Thinking 5. Premise 1: Thérèse will be happy if the government passes a law that will make it easier for her mom to immigrate to Canada. Premise 2: It looks like the government is indeed about to pass a new law that will make it easier for people like Thérèse's mom to immigrate. 6. Premise 1: If you don't believe in God, then there is nothing to make you act ethically. Premise 2: You don't believe in God. 7. Premise 1: Adding long-term bonds to an investment portfolio will lower its return. Premise 2: Luke just added long-term bonds to his investment portfolio. *8. Premise 1: There is a great deal of pornography of all kinds on the Internet. Premise 2: Laws in Canada essentially allow everyone access to the Internet. Premise 3: A society that allows access to pornography doesn't care about its children. 9. Premise 1: People who don't recycle their cans and bottles aren't serious about sustainability. Premise 2: People who aren't serious about sustainability don't care about the environment. Premise 3: Françoise doesn't recycle at all. Exercise 1.7 For each of the following passages, determine whether or not there is an argument present. If so, identify the premises and the conclusion. *1. Advertising is not manipulative as some people seem to think. The main thing advertising does is to provide us with information about products. And ads that don't provide much information are really just trying to entertain us, not manipulate us. 2. Ted Rogers (founder of Rogers Communications) turned the tiny media company he inherited from his father into a multi-billion-dollar corporation. He was renowned for his passion and energy. And he donated millions of dollars to worthy charities. Ted Rogers was a great leader. *3. "Is there archaeological evidence for the [Biblical] Flood? If a universal Flood occurred between five and six thousand years ago, killing all humans except the eight on board the Ark, it would be abundantly clear in the archaeological record. Human history would be marked by an absolute break. We would see the devastation wrought by the catastrophe in terms of the destroyed physical remains of pre-Flood human settlements. . . . Unfortunately for the Flood enthusiasts, the destruction of all but eight of the world's people left no mark on the archaeology of human cultural evolution." (Kenneth L. Feder, Frauds, Myths, and Mysteries) 25 26 Part One | Basics 4. It's wrong to treat corporations as if they're people. People—people like you and me—have the right to free speech, and corporations don't. Corporations also don't have a conscience. Corporate lawyers may try to convince you that corporations have rights, just like you and I do. But all rights are human rights, and one thing is for sure . . . there's nothing human about a corporation. 5. Although Canadians like to think that we are a fair and just society, this is a boldfaced lie. Indigenous peoples in Canada have never, ever been treated fairly. Over hundreds of years, the Canadian government and non-Indigenous Canadians have treated them badly. Today, many people in Indigenous communities live in terrible conditions. People can talk about our fairness all they want, but there is no doubt that treatment of Indigenous peoples is abhorrent. Field Problems 1. Find a blog that interests you. Select an entry that contains at least one argument. Identify the conclusion and each premise. 2. From the same blog, find an entry that presents a point of view but that contains no argument at all. Rewrite the entry so that it contains at least one argument. Try to preserve as much of the original entry as possible, and stay on the same topic. 3. Go to the website of a major newspaper (or your own town's main newspaper). Find a story that has reader comments posted below it. Find a comment that presents an argument—not just an opinion!—and identify the premise and conclusion. Self-Assessment Quiz 1. What is an argument? 2. Name at least three premise indicators and three conclusion indicators. 3. From the following sentences, indicate which ones are not statements: a. On what day is our Critical Thinking exam? b. Give two examples of premise indicators. c. The Canadian Charter of Rights and Freedoms guarantees the rights and freedoms set out in it, subject only to such reasonable limits prescribed by law as can be demonstrably justified in a free and democratic society. d. The best seafood in Vancouver is at the Blue Water Cafe. 4. From the list below, select the conclusion that is supported by the premises in the following argument: I spoke to a number of students on campus who see nothing wrong with plagiarism. I tried to explain the issue to them, but they just didn't get it. 1 | The Power of Critical Thinking They didn't understand that using other people's work without giving them credit is just like stealing. And they didn't seem to think plagiarism hurts anyone, even though it means that other students who do their own work are at a disadvantage. a. University students are not intelligent. b. Plagiarism is illegal. c. Some university students should learn more about ethical arguments related to plagiarism. d. University students generally don't respect the law. 5. Does the following passage contain an argument? If it does, specify the conclusion. You would be a fool to believe that any corporation other than Facebook is the most powerful corporation on Earth. If you don't understand the power that Facebook has, you must have been living under a rock for the last five years. The truth of the matter is obvious. 6. Does the following passage contain an argument? If it does, specify the conclusion. "The news" is an invaluable part of how we understand and relate to the world. But news is only one kind of storytelling, only one way to make sense of the world. There are other powerful and meaningful forms of storytelling practiced by artists—by singers, poets, dancers, and more—that can help us to make a different kind of sense out of our shared experiences. In moments of crisis, the power of artists to heal, to unite, to challenge inequalities, and to reaffirm our faith in each other and in our community's values, is tangible. It is, in fact, essential. Without culture, as I wrote in my book, there is no future. (Simon Brault, Ottawa Citizen, 22 October 2014) 7. Does the following passage contain an argument? If it does, specify the conclusion. People either love or hate Game of Thrones. People who watch the show seem to be obsessed with it. People who don't watch the show actually brag about the fact that they've never seen a single episode. There's probably no show on TV in recent years that polarizes viewers—and non-viewers!—more radically. Which of the following sentences and sentence fragments are likely to be conclusions, and which are likely to be premises? 8. Therefore, British Columbia's forests will need to be managed carefully if they are to be sustainable. 9. I mean, given that you didn't even pass first-year Physics! 10. This suggests that you're likely to vote Conservative in the next election. 11. Based on all the excitement surrounding the football team. 12. It follows that making racist comments should be a crime. 27 28 Part One | Basics For questions 13–15, write at least two premises for each of the conclusions. You can make up the premises, but you must make sure that they support the conclusion. 13. Eyewitness evidence is the best kind of evidence there is. 14. Computers will never be able to play Jeopardy well enough to beat humans reliably. 15. Dean Brown, who for years was "the voice of the Ottawa Senators," is the best hockey announcer in sports broadcasting today! Read the following argument. Then in questions 16–20, supply the information requested. [1] Is global warming a real threat? [2] Or is it a hoax dreamed up by the Chinese to put us at a competitive disadvantage? [3] Some politicians apparently think that the idea of global climate change is nonsense. [4] But a recent study showed them to be wrong. [5] Reputable government agencies have studied the issue and published convincing conclusions. [6] Such reports generally give no support to the idea that global warming isn't happening and that we should all go back to sleep. [7] Instead, they suggest that global warming is definitely real and that it could have catastrophic consequences if ignored. [8] For example, global climate change could cause heat waves, extreme weather, and water shortages in many parts of North America. [9] There are many such reports, including a very influential one from the United Nations. [10] Yes, our political leaders need to accept that global warming is real. [11] It is as real as hurricanes and ice storms. Identify by number all the sentences in the argument that fulfill each of the following roles: 16. Conclusion 17. Premise or premises 18. Background information 19. Repetition of conclusion or premise 20. Example or illustration Critical Thinking and Writing Exercise This is the first of five end-of-chapter lessons, or modules, designed to help you think about, plan, and write good argumentative essays. The modules are progressive, starting here with a few fundamentals of the writing process and then later covering basic guidelines and concepts that can help you to think critically and write intelligently about arguments and issues. Though each module is linked in some fashion to material in the corresponding chapters, they are meant to serve as a stand-alone (though cumulative) tutorial to be used as your instructor sees fit. 1 | The Power of Critical Thinking Arguments and Argumentative Essays As we note in this chapter, an argument is a group of statements in which some of them (the premises) are intended to support another of them (the conclusion). This combination of statements-supporting-another-statement is not only the basic structure of an argument, it's the general design of an argumentative essay. An argumentative essay tries to support a particular conclusion or position on an issue by offering reasons to support that conclusion. Arguments (in the critical thinking sense) are not passionate exchanges of unsupported views or pointless contests of the is-too/is-not variety, and neither are argumentative essays. A mere sequence of statements expressing your views is not an argument. And several pages of such statements do not constitute an argumentative essay. In an argumentative essay, your main task is to provide rational support for a claim. (In an English writing class, this claim might be called your "thesis statement.") If you are successful, you will have shown that there are good reasons to accept your view of things. Readers who think critically may well be persuaded by your arguments. If you write well, you may be able to make your essay even more persuasive through rhetorical or stylistic devices that add emphasis, depth, and vividness to your writing. No one wants to read a boring essay. What you should not do, however, is rely entirely on non-argumentative elements to persuade your audience. Strong emotional appeals, for example, can indeed persuade some people some of the time, but they really prove nothing. In truly effective argumentative essays, the primary persuasive device is the provision of good reasons. Basic Essay Structure Good argumentative essays generally contain the following elements, though not necessarily in the order shown here: • • • • • Introduction (or opening) Statement of thesis (the claim to be supported) Argument supporting the thesis Assessment of objections Conclusion In the introduction, you want to do at least two things: (1) grab the reader's attention and (2) provide background information for the thesis. Effective attention-grabbers include boldly stated conclusions, compelling quotations, interesting anecdotes, opinions of experts, shocking or unexpected claims, and vivid imagery. Whatever attention-grabbers you use, they must be related to the topic of the essay. There's no use telling a good story if it has nothing to do with your thesis. Providing background for your thesis often means explaining why your topic is important, telling how you became concerned, or showing that there is a problem 29 30 Part One | Basics to be solved or a question to be answered. Very often the introduction, sometimes consisting of no more than a sentence or two, is laid out in the first paragraph of the essay. In general, the shorter the introduction, the better. The thesis statement also usually appears in the first paragraph. This is the statement that you hope to support or prove in your essay; it is the conclusion of the argument that you intend to present. You want to state the thesis in a single sentence and do so as early as possible in the essay. Your thesis statement is like a compass to your readers, guiding them through your essay from premise to premise, showing them a clear path. It also helps you stay on course by reminding you to keep every part of the essay related to your single unifying idea. Your thesis statement should be restricted to a claim that can be defended in the space allowed (often only 750 to 1000 words). Not restricted enough: "Tuition is too high." Better: "Tuition increases at Degrassi College are unacceptable." Better still: "The recent tuition increase at Degrassi College is unnecessary for financial reasons." (More on how to devise a properly restricted thesis statement in a moment.) The main body of the essay is the fully developed argument supporting the thesis. This means that the basic essay structure consists of the thesis statement followed by each premise or reason that supports the thesis. Each premise in turn is stated clearly, explained and illustrated sufficiently, and supported by examples, statistics, expert opinion, and other evidence. Sometimes you can develop the essay very simply by devoting a single paragraph to each premise. At other times, each premise may demand several paragraphs. In any case, you should develop just one point per paragraph, and every paragraph should be clearly related to the thesis statement. A sketch of the argument for the Degrassi College essay, then, might look like this: • Premise: If the college has a budget surplus, then a tuition increase is unnecessary. • Premise: The college has had a budget surplus for the last five years. • Premise: If the college president says that the school is in good shape financially and therefore doesn't need a tuition increase, then it's probably true that the school doesn't need a tuition increase. • Premise: In an unguarded moment, the president admitted that the school is in good shape financially and therefore doesn't need a tuition increase. • Thesis statement: Therefore, the recent tuition increase at Degrassi College is probably unnecessary for financial reasons. Good argumentative essays also include an assessment of objections—an honest effort to take into account any objections that readers are likely to raise about the thesis statement or its premises. When you deal with such objections in your essay, you lend credibility to it because you're making an attempt to be fair and thorough. In addition, when you carefully examine objections, you can often see ways 1 | The Power of Critical Thinking to make your argument or thesis statement stronger. It isn't necessary to consider every possible objection, just the strongest or the most common ones. Sometimes it's best to deal with objections when you discuss premises that are related to them. At other times it may be better to handle objections near the end of the essay after defending the premises. Finally, your essay—unless it's very short—must have a conclusion. The conclusion usually appears in the last paragraph of the essay. Usually it reiterates the thesis statement (though usually not in exactly the same words). If the argument is complex or the essay is long, the conclusion may contain a summary of the argument. Good conclusions may reassert the importance of the thesis statement, challenge readers to do something about a problem, tell a story that emphasizes the relevance of the main argument, or bring out a disturbing or unexpected implication of a claim defended in the body of the essay. Guidelines for Writing the Essay 1. Determine your thesis statement. Do not write on the first thesis idea that pops into your head. Select a topic you're interested in, and narrow its scope until you have a properly restricted thesis statement. Research the topic to find out what issues are being debated. When you think you have an idea for a thesis statement, stop. Dig deeper into the idea by examining the arguments associated with that claim. Choose a thesis statement that you think you can defend. If you come to a dead end, start the process over. 2. Create an outline. Establish the basic framework of your outline by writing out your thesis statement and all the premises that support it. Then fill in the framework by jotting down what points you will need to make in defence of each premise. Decide what objections to your argument you will consider and how you will respond to them. (Note: An argument diagram of the sort discussed in Chapter 3 can also serve as a kind of essay outline.) 3. Write a first draft. As you write, don't be afraid to revise your outline or even your thesis statement. Writing will force you to think carefully about the strengths and weaknesses of your argument. 4. Stay on track. Make sure that each sentence of your essay is clearly related somehow to your thesis statement and argument. 5. Zero in on your audience. Decide what audience your essay is intended for and write to them. Is it readers of the local paper? Fellow students? People who are likely to disagree with you? 6. Support your premises. Back up the premises of your argument with examples, expert opinion, statistics, analogies, and other kinds of evidence. 7. Let your final draft sit. If possible, when you've finished writing your paper, set it aside and read it the next day. You may be surprised how many mistakes this fresh look can reveal. If you can't set the essay aside, ask a friend to read it and give you some constructive criticism. 31 32 Part One | Basics 8. Revise. Your first effort will almost never be your very best work. Every good writer knows that editing and revising is the key to putting their best work forward. If need be, write a second draft and a third. Good writers aren't afraid of revisions; they depend on them. Writing Assignments 1. Read Essay 7 ("Yes, Human Cloning Should Be Permitted") in Appendix A, and outline the argument presented. Specify the thesis statement or main conclusion and each supporting premise. 2. Write a 500-word paper in which you defend a claim that contradicts the thesis statement in Essay 2 ("Hurray! No One's Watching") in Appendix A. Pretend that all the evidence cited in Essay 2 actually supports your thesis statement. You may alter the details of the evidence accordingly. 3. Study the argument presented in Essay 3 ("Electronics in the Classroom") in Appendix A. Identify the conclusion and the premises and objections considered, then write a two-page rebuttal to the essay. That is, defend the claim that students should not be given a choice about whether to use laptops in the classroom. 4. Select an issue from the following list, and write a 750-word paper defending a claim pertaining to the issue: • Should professors ban smartphones from their classrooms? • When Canadian companies are operating overseas, should they follow Canadian ethical standards or the standards of their "host" country? • Should flu shots be mandatory for health care workers? • Should Canadian provinces institute a carbon tax to attempt to reduce emissions of greenhouse gases? 2 The "Environment" of Critical Thinking Chapter Objectives • To appreciate that there are ways to (1) detect errors in our thinking, (2) restrain the attitudes and feelings that can distort our reasoning, and (3) achieve a level of objectivity that makes critical thinking effective. • To understand that the most common barriers to critical thinking can be sorted into two categories: (1) those that arise because of how we think and (2) those that occur because of what we think. Category 1: How We Think You will be able to • detect and overcome self-interested thinking by (1) watching out for instances when your deliberations get personal, (2) being alert to ways that critical thinking can be undermined, and (3) ensuring that no relevant evidence or ideas have been left out. • appreciate how group thinking can distort critical thinking. • understand the meaning of peer pressure, appeal to popularity, and stereotyping and be able to cite examples of each. Category 2: What We Think You will be able to • understand what a world view is and how certain specific ideas in a world view can undermine critical thinking. • critique the notion of subjective relativism. • critique the notion of social relativism. • define philosophical skepticism and explain how it relates to critical thinking. 34 Part One | Basics C ritical thinking does not happen in a vacuum but in an "environment" that is often hostile to it. It takes place in the minds of real people who almost always have thoughts and feelings and experiences that, if those people are not careful, would sabotage critical reasoning at every turn. Recall our definition of critical thinking: The systematic evaluation or formulation of beliefs or statements by rational standards. This implies, of course, that several factors must be present for the process of critical thinking to be possible. If the process fails to be systematic, or falls short of being a true evaluation or rigorous formulation, or ignores rational standards, then critical thinking can't happen. Because we are fallible (capable of making errors), there are thousands of ways that this failure of reason could occur. And there is no cure for our fallibility. We should expect, then, that thinking critically will often be difficult and even unpleasant, and indeed it is. But there are ways to (1) detect errors in our thinking, (2) restrain the attitudes and feelings that can distort our reasoning, and (3) achieve a level of objectivity that makes critical thinking possible. Doing all this—and doing it consistently—requires awareness, motivation, and practice. If we are to think critically, we must be aware not only of what is involved in good critical thinking but also of what can result from sloppy thinking. Then we must practise avoiding the pitfalls and using the skills and techniques that critical thinking requires. And we must be motivated to do all of this because it is unlikely that we will use critical thinking very much if we can't appreciate its value—if we can't appreciate its value, we would have little motivation to make the extra effort. We can sort the most common barriers to critical thinking into two main categories: (1) those hindrances that arise because of how we think and (2) those that occur because of what we think. There is some overlap in these categories, since how people think is often a result of what they think and vice versa. But in general, category 1 barriers are those that come into play because of psychological factors (our fears, attitudes, motivations, and desires), and category 2 barriers are those that arise because of certain philosophical ideas we have (our beliefs about beliefs). For example, a category 1 hindrance is a psychological tendency to shape our opinions to match those of our peers. A common category 2 problem is the belief that objectivity in thinking is impossible or that we really don't know anything or that we don't truly know what we think we know. In this chapter we review the most common category 1 and 2 barriers to critical thinking and practise uncovering and neutralizing them. Finding the motivation to learn these lessons well and to watch for these barriers is up to you. Category 1: How We Think No one is immune to category 1 barriers. We all have psychological tendencies and habits that affect our behaviour and shape our thinking. They tend to stick around, haunting our minds until we have the awareness and the will to break free of them. 2 | The "Environment" of Critical Thinking 35 As humans we spend a great deal of time protecting, maintaining, and comforting our own mental framework, our own selves—a perfectly natural urge that does no harm until we push our self-serving efforts too far. How far is too far? From the standpoint of critical thinking, we have taken things too far when we accept claims for no good reason—when our thinking is no longer systematic and rational. In an effort to protect ourselves, we often distort our own judgment and thereby raise our risk of error, which is ironically a risk to ourselves. Self-interested thinking takes several There's nothing wrong with the life-affirming belief that you are special as an individual, but how might this perspective cloud your forms. We may decide to accept a claim solely judgment of the world around you? because it advances, or coincides with, our interests. You may think, "I believe the province should lower the sales tax on anything bought at a convenience store because I own a convenience store," or "I am against all forms of gun control because I am a hunter," or "This university should not raise tuition fees—because I am a student and I don't want to pay more tuition." There is nothing inherently wrong with accepting a claim that happens to advance your own interests. The problem arises when you accept a claim solely because it furthers your interests. Self-interest (or anyone's interests, for that matter) alone simply cannot establish the truth of a claim. If you base your beliefs on self-interest alone, you are abandoning critical thinking. Here's a classic example of self-interested thinking inspired by the film Twelve Angry Men: Twelve jurors sit in a room deliberating over whether to find the defendant guilty of murder. The accused is a Puerto Rican teenager who has grown up in the rough and impoverished streets of the inner city. At first, all but one juror (the jury foreman) vote guilty. The foreman persuades the other jurors to examine the evidence once again. Their deliberations go on for hours, and as they do, the prosecution's case slowly falls apart. Apparently damning evidence that had seemed so strong earlier is now shown to be full of holes. They take another vote, but this time 11 jurors, including the foreman, vote not guilty, while one man (juror number 10) insists that the other jurors are deluded and that the boy is undoubtedly guilty. The jurors ask him to explain his reasons. He angrily insists again that the boy is guilty, but he can't provide any evidence or reasons that suggest the boy's guilt. He just rants at the other jurors, muttering something about his dead son and Puerto Jack Ziegler/The New Yorker Collection/The Cartoon Bank Am I Really Special? Part One | Basics Ricans being "no good" and "against everything I believe in." Finally the other jurors think they understand what's behind the seemingly irrational stance of juror number 10: he wants to convict the boy for personal reasons—perhaps because he wants to avenge his son's death, because he feels threatened by ethnic minorities, because he had been wronged by another Puerto Rican boy, or because of some other bias that has nothing to do with the guilt or innocence of the defendant. In this example, the other members of the jury eventually realize that the judgments of juror number 10 are self-serving and linked to his own emotional needs. What gave him away? An obvious clue is his emotional insistence on his own point of view. But an even more telling clue is his clear rejection of all relevant evidence. The reasons for acquitting are perfectly clear to the other jurors, but he won't (or can't) consider them. In everyday life, these two clues often signal the presence of powerful self-interest at work. The influence of self on your thinking can take another form. You may be tempted to accept claims for no other reason than that they help you save face. We all like to think of ourselves as excelling in various ways. We may believe that we are above average in intelligence, integrity, talent, compassion, physical beauty, athletic ability, or other things. And we not only like to think such things about ourselves; we want to be seen that way by others as well. But sometimes things happen that should lead us to doubt whether we really are that way. The challenge comes when we accept or reject claims just to cover up the cracks in our self-image. You make Showtime/The Kobal Collection/Art Resource 36 In Twelve Angry Men, one juror, for personal reasons, holds out for a guilty verdict despite overwhelming evidence that the accused is innocent. How often do you think this kind of self-interested thinking occurs in real-life juries? 2 | The "Environment" of Critical Thinking a mistake, but you can't admit it's your fault because being at fault would require you to adjust your self-image in unflattering ways. You behave badly, and you try to justify your behaviour. You make a judgment or observation that turns out to be wrong, and you're too embarrassed or proud to admit it. In such circumstances, it may be tempting to let our beliefs be shaped by our wishes in order to "save face"— that is, in order to preserve our image of ourselves. But accepting, and then relying on, such false beliefs is unlikely to serve us well in the long run. (In Chapter 4 we'll learn that sometimes self-interested thinking can even alter our perceptions.) The consequences of self-centred thinking can be self-destructive. In the realm of critical thinking, this devotion to yourself can prevent careful evaluation of claims, limit critical inquiry, blind you to the facts, provoke self-deception, encourage rationalizations, lead you to suppress or ignore evidence, and promote wishful thinking. And these mistakes can decrease your chances of success (however you define success) and limit your personal growth, maturity, and self-awareness. This tendency toward being self-centred can also leave you wide open to propaganda and to manipulation by people who want to appeal to your personal desires and prejudices. How easy would it be for people to control your choices and thoughts if they told you exactly what you wanted to hear? (There are in-depth discussions of these lapses in critical thinking in Chapters 4 and 5.) When examining a claim or making a choice, how can you overcome the excessive influence of your own psychological needs? Sometimes you can do it only with great effort, and sometimes the task is much easier, especially if you remember these three guidelines: • Watch out when things get personal. • Be alert to ways that critical thinking can be undermined. • Ensure that nothing has been left out. Watch out When Things Get Personal You are most likely to let your self-interest get in the way of clear thinking when you have a big personal stake in the conclusions you reach. You may be deeply committed to a particular view or belief, or you may desperately want a particular claim to be false or unjustified, or you may be devoted not to particular claims but rather to any claims that contradict those of someone you dislike. Such excessive enthusiasm can wreck any attempt at a careful, fair evaluation of a claim. The twentieth-century philosopher Bertrand Russell argues that the passionate holding of an opinion is a sure sign of a lack of reasons to support the opinion: When there are rational grounds for an opinion, people are content to set them forth and wait for them to operate. In such cases, people do not hold their opinions with passion; they hold them calmly, and set forth their reasons quietly. The opinions that are held with passion are always those for which no good ground exists; indeed the passion is the measure of the holder's lack of rational conviction.1 37 "To be conscious that you are ignorant is a great step to knowledge." —Benjamin Disraeli (prime minister of the United Kingdom, 1874–80) 38 Part One | Basics Food For Thought When We Construct the Facts Ourselves XAOC/Thinkstock Psychologists have long known that a lot of what we experience is subconsciously fabricated by our own brains. That is, our own desires and expectations help to form many of our perceptions, memories, and beliefs. Here are a few examples that have been carefully documented by scientific research: • Often, what we think we see in vague stimuli turns out to be something that our minds have made up. We stare at the clouds and convince ourselves When you look at this outlet, do you see two surprised human-like that we see the shapes of bun- faces, one above the other? nies, bearded men, and Donald Trump's hairdo. We hear words and animal noises in garbled audio (like records played backward). This phenomenon is known as pareidolia. To this day, tabloid newspapers and websites run stories on the Great Stone Face of Mars, a supposed one-mile-wide stone monument built by aliens. That's what some people say they see in a very fuzzy 1976 NASA photograph of the Martian surface. Scientists say it's a natural formation like a thousand others in the area. A later NASA photo was much clearer and showed that the "face" was just an illusion of shadows and wishful thinking. • There are probably hundreds of stories about ghosts and aliens showing up in people's bedrooms. Whatever is going on here, the explanation certainly doesn't need to be supernatural. Researchers have shown that when people are in that drowsy state just before sleep, they often have weird hallucinations known as hypnagogic imagery. These images come on suddenly, are not under the sleeper's control, and can seem as real as physical objects in the room. Images range from faces in the dark to ghostly shapes and coloured geometric shapes. • Research has shown that our memories, even ones that seem very clear, are not exact copies of past events. The recall of eyewitnesses, for instance, is notoriously unreliable. In the act of recall, they try to reconstruct a memory—but the reconstruction is frequently inexact, resulting in distortions and missing details. The subconscious process of building memories this way is known as confabulation. Stress can exaggerate these problems. Our memories can be drastically changed if we later come across new information—even if the new information is brief and flimsy. Most amazing of all, our expectations about the way things should be can insert or delete elements of a memory. If we expect to see a gun in the hand of a bank robber, we may remember exactly that even though no gun was involved. Part of the job of critical thinking, of course, is to counteract all these tendencies—or at least help you to recognize them when they happen. 2 | The "Environment" of Critical Thinking The dead giveaway that you are skewing your thinking is a surge of strong emotions (like the one that gripped juror number 10). If your evaluation or defence of a position evokes anger, passion, or fear, your thinking could be prejudiced or clouded. It is possible, of course, to be emotionally engaged in an issue and still think critically and carefully. But most of the time, getting worked up over a claim or conclusion is reason enough to suspect that your thinking is not as clear as it should be. The rule of thumb is this: if you sense a rush of emotions when you deal with a particular issue, pause for a moment. Think about what's happening and why. Then continue at a slower pace and with greater attention to the basics of critical reasoning, double-checking to ensure that you are not ignoring or suppressing evidence or getting sloppy in your evaluations. Be Alert to Ways That Critical Thinking Can Be Undermined If you understand the techniques and principles of critical thinking, and you have practised applying them in a variety of situations, you are more likely than not to detect your own one-sided, self-centred thinking when it occurs. An alarm should go off in your head: "Warning—faulty reasoning ahead!" When your alarm sounds, double-check your thinking, look for lapses in arguments and claims, and weed them out. Everyday Problems and Decisions Self-Concept and Consumerism It is always important to watch out when things get personal. One of the situations in which this is particularly important is when someone is trying to sell you something. Of course, there is a sense in which buying consumer goods should be personal—after all, more often than not you are buying things for yourself, and your own desires and values have a proper role to play. However, advertisers and salespeople may try to make purchases personal in another sense: they may try to convince you that having their product is essential to your self-concept, your own understanding of who you are. In such situations, it is worth taking a step back and asking: • Is my sense of worth really tied to how expensive my jeans are? • Does having a car with more horsepower make me more powerful? • Is this shampoo really going to go beyond cleaning my hair to make me a happier person? Consumer purchases can be important decisions: if they are going to be personal, they should be your decisions, not someone else's! 39 40 Part One | Basics Ensure That Nothing Has Been Left Out A common flaw in reasoning is the failure to consider evidence or arguments that do not support your preferred claims or positions. For example, you may secretly want a particular claim to be true, so you knowingly or unknowingly look for evidence in its favour but ignore evidence against it. The chances of making this mistake increase substantially when you believe that things you value are at stake. This kind of preferential treatment for some statements over others is part of a common phenomenon called selective attention (see Chapter 8). In selective attention, we notice certain things and ignore others—usually without even being aware that we're doing it. We may ignore facts that contradict our beliefs and seek out facts that support them. Scientific research has repeatedly confirmed this behaviour. In a typical study, researchers showed subjects both evidence for and evidence against the reality of extrasensory perception (ESP). Subjects who already doubted the existence of ESP recalled both kinds of evidence accurately. But subjects who already believed in ESP remembered both kinds of evidence as proving ESP. They somehow recalled even the disconfirming evidence as supporting their belief in ESP! The remedy for this problem is to make a conscious effort to look for opposing evidence. Don't consider your evaluation of a statement or argument finished until you've carefully considered all the relevant reasons, including ones that don't support your own pet views. Ask yourself, "What is the evidence or reasons against this Food For Thought Is It Unethical to Believe without Good Reasons? If you happen to believe something that isn't actually true, is that anyone else's business? Some philosophers have argued that it is not just unfortunate but morally wrong to believe a claim without justification or evidence. One of them is the famous biologist Thomas Henry Huxley. Another is the mathematician W.K. Clifford (1845–79). This is how Clifford states his view: It is wrong always, everywhere, and for anyone, to believe anything upon insufficient evidence. If a man, holding a belief which he was taught in childhood or persuaded of afterwards, keeps down and pushes away any doubts which arise about it in his mind . . . and regards as impious those questions which cannot easily be asked without disturbing it—the life of that man is one long sin against mankind.2 Clifford thought that belief without evidence is immoral because our actions are guided by our beliefs, and if our beliefs are unfounded, our actions (including morally significant actions) are likely to be bad ones. And after all, the actions that we take, based upon our beliefs, often affect others. What will be the result if a parent falsely believes in the power of a homeopathic remedy to cure a child's serious illness? What if someone takes our ill-founded advice and invests in a new restaurant that is unlikely, in fact, to succeed? 2 | The "Environment" of Critical Thinking Review Notes Avoiding Self-Interested Thinking • • • • • Watch out when things get personal and you become emotionally invested in an issue. Beware of the urge to distort your thinking to save face. Be alert to ways that critical thinking can be undermined. Ensure that nothing has been left out of consideration. Avoid selective attention. Make a conscious effort to look for opposing evidence. statement?" Doing so is often psychologically difficult. Our natural tendency is to look for evidence that supports our views. But a willingness to look for opposing evidence is a key element of intellectual honesty. This approach is at the heart of science. A basic principle of scientific work is not to accept a favoured theory until competing (alternative) theories are thoroughly examined (more on this in Chapter 10). The Power of the Group In the television series Star Trek: The Next Generation, the crew of the starship Enterprise encounters an unusual threat: the Borg. The Borg is a collective of individual minds that have been stripped of individuality and merged into a single group-mind with evil intentions. Much of the Borg storyline (which spans several episodes) is about the dignity and importance of individualism as opposed to the conformism of the Borg hive. The idea of losing one's self in the monolithic Borg is presented as a profound tragedy—a theme that strikes a chord with humans. Individualism, independence, and freedom of thought are what we want and what we must have. Or at least, that's what we say. Although we frequently proclaim the importance of individualism, we humans spend a great deal of our time trying to conform to groups or be part of them. We want to belong, we want the safety and comfort of numbers, and we want the approval of our beloved tribe. All of that is perfectly normal. We are, after all, social creatures. Conformist tendencies are a fact of life and are in some cases useful. But trouble appears when our conformism hampers—or obliterates—critical thinking. We all belong to multiple groups—family, work groups, gender, church, clubs, professional societies, political parties, advocacy groups, you name it—and we can be susceptible to pressure from all of them. Much of the time there is intense pressure to fit into groups and to adopt the ideas, attitudes, and goals endorsed by them. Sometimes the influence of the group is subtle but strong, and it can occur in the most casual, unofficial gatherings. The claims and positions adopted by the group can be implicit, never spoken, and yet still be well understood. The Facebook group, the cluster of Christians or Muslims or Jews who happen to meet 41 42 Part One | Basics Netflix/Allstar on the bus, the collection of peers who support the same political cause—all of these groups can exert a surprising influence on the beliefs of the members of those groups. Group pressure to accept a statement or to act in a certain way has several different faces (some of which we cover in more detail in later chapters). When we're talking about the pressure to conform that comes from your peers, it's called—not surprisingly— peer pressure. When we're talking about Similar to the Borg, the Mind Flayer from Stranger Things has the an argument that tries to support a conclutelepathic ability to take command of his army, along with a human sion on the basis of the mere popularity of a character, Will. How can critical thinking help you to avoid hive belief, that's known, appropriately enough, mind mentality? as an appeal to popularity (also known as an appeal to the masses). In all cases, the lapse in critical thinking comes from the fact that the views or behaviour of the peer pressure Group pressure to accept or group alone is taken as reason to support a claim (see Chapter 5). reject a claim solely on the Group pressure can happen quickly. For example, if you're listening to a speech basis of what one's peers by a member of your own political party, you may immediately find yourself posithink or do. tively disposed toward the speaker—not because you agree with him or her but because he or she is a member of your group or because you see other people in the appeal to popularity (or to the masses) audience around you nodding their heads. The fallacy of arguing that Group pressure can also take a while to have an effect. Consider this example: a claim must be true merely because a substantial number of people believe it. "Believe nothing, no matter where you read it, or who said it, no matter if I said it, unless it agrees with your own reason and your own common sense." —The Buddha Aimee has just become a new member of the Eco-Awareness Club on campus. She's been considering joining ever since Frosh Week. She's away from home for the first time and hasn't made very many new friends. She likes to feel that she belongs to something, and she shares most of the group's beliefs. And the club includes some of the smartest and most active students on campus, so being part of the club makes her feel like part of the "in" crowd. She soon finds out that she agrees with members of the club on every social and political issue—except one. Everyone else in the group is strongly in favour of decriminalizing possession of marijuana. Aimee is against it because she's read a lot about it and the arguments against decriminalization seem to be stronger than the arguments in favour. But she doesn't want to jeopardize her membership in the club—or her new friendships—over this one issue. So when the topic comes up, she stays quiet. The arguments she hears from her new friends seem faulty. But as time goes on, she stops thinking about the arguments and tries not to think about the topic at all. Over time, her views on the subject start to change, until finally she finds herself being wholeheartedly in favour of decriminalizing marijuana. 2 | The "Environment" of Critical Thinking 43 Marty Bucella Here, the need to belong slowly overcomes critical reasoning in a specific subject area (decriminalization of marijuana). On other topics, Aimee may be an astute critical thinker. There's another kind of group influence that we have all fallen prey to: the pressure that comes from assuming that our own group is the best, the right one, the chosen one, and all other groups are, well, not as good. You can see this kind of ethnocentrism in religions, political parties, generations, social classes, and many other groups. The assumption that your group is better than others is at the heart of prejudice. If we are honest with ourselves, most of us recognize that we are susceptible to this force. This we-are-better pressure is probably the most powerful of all. We all have certain beliefs, not because we have thought critAppeals to popularity have been wreaking havoc in the world for ically about them but because our parents centuries. Are there times when you have agreed with someone raised us to believe them or, because of the simply because they were a member of your group? flow of conversation, our social group has instilled them in us. That is, we may believe what we believe—and assume that "A great many people think our beliefs are better than anyone else's—because we were born into a family or sothey are thinking when they ciety that maintains such views. We may be a Catholic or a Conservative or a racist are really rearranging their primarily because we were born into a Catholic or Conservative or racist family prejudices." or society. Like the influence of the self, this external pressure can lead to wishful —William James (American thinking, rationalization, and self-deception. Group thinking can also easily genphilosopher and psychologist) erate narrow-mindedness, resistance to change, and stereotyping. (Again, more on these problems in Chapters 4 and 5.) stereotyping As comfortable as our inherited beliefs are, when we accept them without Drawing conclusions about good reason we risk error, failure, and delusion. And as we discussed in Chapter people based merely on their 1, if we have certain beliefs solely because they were given to us, they are not really membership in some group. our beliefs. The sign of a maturing intellect is having the will and the courage to gradually eliminate those beliefs that we come to realize are groundless. For critical thinkers, the best way to deal with the power of the group is to make a conscious effort to proportion your belief to the strength of reasons. We should only hold strongly to those beliefs for which there are strong reasons. After thinking critically about claims favoured by groups, you may find that the claims are actually on solid ground and you really do have good reason to accept them. Or you may find that there is no good reason for believing them, and so you don't accept them. Either way, critical thinking will give you a clearer view of the group and yourself. 44 Part One | Basics Food For Thought Prejudice, Bias, and Racism Canada, Department of National Defence/Library and Archives Canada/PA-112539 Group pressure often leads to prejudice, bias, and racism. (To a lesser extent, so does self-interest.) But what do these terms mean? Prejudice in its broadest sense is a judgment or opinion—whether positive or negative—based on insufficient reasons. To be prejudiced literally means to pre-judge—to judge before we have the relevant information. But usually the term is used in a more narrow sense to mean a negative or adverse belief (most often about people) without sufficient reasons. At the heart of prejudice, then, is a failure of critical thinking. And the use of critical thinking is an important part of eradicating prejudiced views. Bias is another word for prejudice, both in the general and the narrow sense. Sometimes the word is also used to mean a simple inclination of temperament or outlook—as in "My bias is in favour of tougher laws." Racism is a lack of respect for the value and rights of people of different races or geographical origins. Usually this attitude is based on prejudice—specifically an unjustified belief that one group of people is somehow superior to another. During World War II, Canadians of Japanese heritage were removed from their homes and sent to internment camps by the Canadian government. They were not charged with crimes but were subject to harsh treatment simply because of their heritage. In this image, a Canadian navy officer interrogates a Japanese-Canadian fisherman while confiscating his boat. How does this historical moment illustrate prejudice, bias, and/or racism? 2 | The "Environment" of Critical Thinking 45 Critical thinking then is independent thinking. That's why, to many people, those who have most dramatically achieved independent thinking—the Aristotles, the Einsteins, the Shakespeares, the Michelangelos—are heroes. Category 2: What We Think A world view is a philosophy of life, a set of fundamental ideas that helps us make sense of a wide range of important issues in life. The ideas are fundamental in that they help to guide us in the evaluation or acceptance of many other less basic ideas. They are answers to the "big questions" of life, such as "What do I know?" "Is knowledge possible?" "What is real and what is not?" "How do I know which actions are morally right?" "Are people basically good or bad?" The interesting thing about world views is that we all have one; all of us have adopted (or inherited) certain fundamental ideas about the world. You may have unknowingly absorbed the ideas from your family or society, and you may not have thought much about them, but you have a world view nonetheless. Even the rejection of all world views is a world view. Elements of some world views—certain fundamental but problematic ideas— may undermine critical thinking. These notions can give rise to category 2 barriers to critical reason, for they may affect our thinking through the content of our beliefs. world view A philosophy of life; a set of fundamental ideas that helps us to make sense of a wide range of important issues in life. A world view defines for us what exists, what should be, and what we can know. Subjective Relativism Like science, critical thinking is based on a number of propositions that few people would think to question. Science, for example, is based on the proposition that the world is publicly understandable—that the world has a certain structure (independent of what anyone thinks or prefers), that we can know the structure, and that this knowledge can, in principle, be acquired by anyone. Think, for example, of the idea that the Earth revolves around the sun. This is true independent of anyone's beliefs or preferences, and its truth can be verified by anyone who takes Review Notes Avoiding Group Pressure on Your Thinking • Group pressure can come in the form of peer pressure, appeals to popularity, and appeals to common practice. • Group-centred thinking can degenerate into narrow-mindedness, resistance to change, and stereotyping. • The best way to defend yourself against group thinking is to always proportion your acceptance of a claim according to the strength of reasons. 46 Part One | Basics subjective relativism The idea that truth depends on what someone believes. subjectivist fallacy Accepting the notion of subjective relativism or using it to try to support a claim. the time to check carefully. Critical thinking is based on similar ideas. Among the most basic is the notion that the truth of a claim does not depend on what a person thinks. That is, your believing that something is true does not make it true. The alternative idea that truth depends on what someone believes is called subjective relativism, and if you accept this notion or use it to try to support a claim, you are said to be committing an error of reasoning known as the subjectivist fallacy. This view says that truth depends not on the way things are but solely on what someone believes. Truth, in other words, is relative to individuals. Truth is a matter of what a person believes—not a matter of how the world is. This means that a given proposition can be true for one person but not for another. If you believe that the Earth revolves around the sun, then it is true (for you) that the Earth revolves around the sun. If someone else believes the opposite—that the sun revolves around the Earth—then it is true (for her) that the sun revolves around the Earth. You've probably encountered subjective relativism more often than you realize. You may have heard someone (maybe even yourself!) say, "This is my truth, and that's your truth" or "This statement is true for me." Subjective relativism can undermine critical thinking in a fundamental way. In large part, critical thinking is about determining whether statements are true or false. But if we were able to make a statement true just by believing it to be true, then critical thinking would be unnecessary. The subjectivist fallacy, they say, may be an attempt to excuse avoiding the tough job of critical inquiry. Most philosophers see the situation this way: we use critical thinking to find out whether a statement is most likely to be true or false. Objective truth is about the world, about the way the world is regardless of what we may believe about it. To put it differently, there is a way the world is, and our beliefs do not make it that way. The world is the way it is, regardless of how we feel about it. These same philosophers would probably be quick to point out exceptions to the rule and to point out that some objective truths are about our subjective states or inner processes. It might be true—objectively true—for example, that you're feeling pain right now. But if so, the claim that you are feeling pain right now is an objective truth about your subjective state. I could be wrong about whether you are in pain, even if you could not be wrong about that yourself. Also, they would readily admit that there are some things about ourselves that obviously are relative because they are one way for us and another way for someone else. You may prefer chocolate ice cream, and someone else may prefer vanilla. The deliciousness of chocolate ice cream is then relative to you. But the truth about these states of affairs—the fact that you prefer one while I prefer the other—is not itself relative. Subjective relativism (as well as other forms of relativism) is controversial, and we needn't spend much time on it here. But you should know at least that philosophers have (through the use of critical thinking!) uncovered some odd implications of subjective relativism, ones that seem to render it implausible. First, they 2 | The "Environment" of Critical Thinking 47 Food For Thought Constructing Your Own World—from the News Many social commentators worry that the wild diversity of news sources that characterizes the modern world actually poses a problem: each of us gets to choose news sources—TV news, websites, and so on— that only reinforce our own points of view. Once upon a time, our grandparents all watched the same handful of news broadcasts and read the same newspapers. On one hand, this meant they had to rely upon a relatively small number of sources, but it also meant that they were—literally!—all on the same page. TV news had to maintain a degree of neutrality and broadcast stories that were of interest to people from a wide range of political and social points of view. They couldn't cater to any one group and had to try to please everybody. Today, with hundreds of cable channels and thousands of news sources online, each of us can exclusively rely on news sources whose editorial slant and story choices we find particularly interesting and comforting. While listening to views that correspond to our own may be enjoyable, listening only to such views can be dangerous. After all, we expand our world views and mature emotionally by listening to diverse views. We may not always agree with what we hear, but we can learn much from hearing what issues are important to people who differ from us. point out that if we could make a statement true just by believing it to be true, we would each be infallible. We could not possibly be in error about anything that we sincerely believed. We could never be mistaken about where we parked the car or what the capital of Nigeria is or which planet is the largest or the smallest. Personal infallibility is, of course, absurd, and this is a pretty compelling argument against subjective relativism. But many critics think the biggest problem with subjective relativism is that it's self-defeating. It defeats itself because its truth implies its falsity. The relativist says, "All truth is relative." If this statement is objectively true, then it refutes itself because if it is objectively true that "All truth is relative," then the statement itself is an example of an objective truth, which is precisely the kind of truth that it denies exists! So if "All truth is relative" is objectively true, it is objectively false. Social Relativism To escape the difficulties of subjective relativism, some people posit social relativism, the view that truth is relative to societies. The idea here is that truth depends not on your own beliefs but on your society's collective beliefs. So a claim can be true for the Chinese but false for Americans, true for college students but false for public officials, true for Protestants or Muslims but false for atheists. To many, this kind of relativism, like the subjective kind, also seems to render critical thinking pointless. After all, why bother to think critically when your own society's traditional beliefs are, by definition, always true? social relativism The view that truth is relative to societies. 48 Part One | Basics "What we need is not the will to believe, but the will to find out." —Bertrand Russell Social relativism is attractive to many because it seems to imply an admirable egalitarianism—the notion that the beliefs of different societies are all in some important sense equal. And in general, respect for other cultures is a good thing. But we shouldn't confuse the idea that all societies are worthy of equal respect with the idea that all claims are worthy of equal respect. The former is an important moral principle; the latter is a recipe for disaster. In fact, a lot of philosophers maintain that social relativism has most of the same defects that subjective relativism has. For example, according to social relativism, individuals may not be infallible but societies are. In other words, it implies that the beliefs of whole societies cannot possibly be mistaken. But this notion of societal infallibility is no more plausible than the idea of individual infallibility. Is it plausible that no society has ever been wrong about anything—never been wrong about the causes of disease, the best form of government, the number of planets in our solar system, the existence of witches, or the beliefs behind the Nazi policies that resulted in the killing of six million Jews? Critics like to point out that just as subjective relativism is self-defeating, so is social relativism. The claim that "all truth is relative to societies" is self-defeating because if it is objectively true, it is an example of an objective truth—true for all people everywhere. And that means that the claim (that all truth is relative) must be objectively false. In summary, if you accept relativism, you may be tempted to care very little about critical thinking, and that would be your loss. Fortunately, there is no good reason why you should neglect critical thinking in the name of relativism.3 Skepticism philosophical skepticism The view that we know much less than we think we do or that we know nothing at all. philosophical skeptics Those who embrace philosophical skepticism. If knowledge were impossible, critical thinking—as a way of coming to know the truth or falsity of claims—would seem to be out of a job. Most of us, though, believe that we can acquire knowledge. We feel confident that we know a great many things—that we are alive, that our shoes are a certain colour, that there is a tree on the lawn, that the Earth is not flat, that rabbits cannot fly, that 2 + 2 = 4. But not everyone would agree that we can truly know such things. There are some who believe that we know much less than we think we do or perhaps even nothing at all. This view is known as philosophical skepticism, and thinkers who raise doubts about how much we know are known as philosophical skeptics. This is no place to dive into a debate on skepticism, but we can take a quick look at the most important type of philosophical skepticism and see what, if anything, it has to do with critical thinking. This form of skepticism says that knowledge requires certainty—if we are to know anything, we must be certain of it. This means that our knowledge isn't really knowledge unless it is beyond any possibility of doubt. If knowledge requires certainty, however, there is very little that we know because there are always considerations that can undermine our certainty. There is always, it seems, room for at least some doubt. 2 | The "Environment" of Critical Thinking But a more reasonable approach is to say that our knowledge does not require absolute certainty. All of us can cite many situations in which it does seem reasonable to say we have knowledge—even though we do not have absolutely conclusive reasons. We might claim to know, for example, that it is raining, that our dog has spots, that we were born, and that the moon is not made of green cheese—even though we are perhaps not absolutely certain of any of these. These examples seem to be among many examples of things that we do know. It makes sense to say that we know them not because they are beyond all possible doubt but because they are beyond all reasonable doubt. For practical purposes, that is enough. Doubt is always possible, but it is not always reasonable or useful. Rejecting a reasonable claim to knowledge just because of the bare possibility that you may be wrong is neither reasonable nor necessary. Critical thinking does have a job to do in our efforts to acquire knowledge. Its task, however, is not to help us find claims that we cannot possibly doubt but instead to help us evaluate claims that vary in degrees of reasonable doubt—that is, from claims that we have very little reason to doubt to claims that we have very strong reason to doubt. Summary Critical thinking takes place in a mental environment consisting of our experiences, thoughts, and feelings. Some elements in this inner environment can sabotage our efforts to think critically or can at least make critical thinking more difficult. Fortunately, we can exert some control over these elements. With practice, we can detect errors in our thinking, restrain attitudes and feelings that can disrupt our reasoning, and achieve enough objectivity to make critical thinking possible. The most common of these hindrances to critical thinking fall into two main categories: (1) those barriers that crop up because of how we think and (2) those that occur because of what we think. The first category is composed of psychological factors such as our fears, attitudes, motivations, and desires. The second category is made up of certain troublesome philosophical beliefs, such as subjective relativism or social relativism. None of us is immune to the psychological obstacles. Among them are the products of egocentric thinking. We may accept a claim solely because it advances our interests or just because it helps us save face. To overcome these pressures, we must (1) be aware of strong emotions that can warp our thinking, (2) be alert to ways that critical thinking can be undermined, and (3) ensure that we take into account all relevant factors when we evaluate a claim. The first category of hindrances also includes those that arise because of group pressure. These obstacles include conformist pressures from groups that we belong to and ethnocentric urges to think that our own group is superior to others. The best defence against group pressure is to proportion our beliefs according to the strength of reasons. 49 50 Part One | Basics We may also have certain beliefs that can undermine critical thinking (the second category of hindrances). Subjective relativism is the view that truth depends solely on what someone believes—a notion that may make critical thinking look pointless. But subjective relativism leads to some strange consequences. For example, if subjective relativism were true, each of us would be infallible. Also, subjective relativism has a logical problem—it's self-defeating. Its truth implies its falsity. There are no good reasons to accept this form of relativism. Social relativism is the view that truth is relative to societies—a claim that would also seem to make critical thinking unnecessary. But this notion is undermined by the same kinds of problems that plague subjective relativism. Philosophical skepticism is the doctrine that we know much less than we think we do. One form of philosophical skepticism says we cannot know anything unless the belief is beyond all possible doubt. But this is not a plausible criterion for knowledge. To count as knowledge, claims need not be beyond all possible doubt but beyond all reasonable doubt. Exercise 2.1 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. Review Questions *1. According to the text, what are the essential ingredients of critical thinking? 2. What are the two main categories of common barriers to critical thinking? 3. What did W.K. Clifford say about the morality of believing claims? 4. What is peer pressure? *5. From the standpoint of critical thinking, what event signals that we have allowed our bias in favour of ourselves to go too far? 6. According to the text, what is the difference between self-interested thinking and face-saving thinking? *7. When are you most likely to let your self-interest get in the way of clear thinking? 8. According to the text, what should you do if you sense a rush of emotion when you think about a particular issue? 9. What is selective attention? What is a remedy for this problem? 10. According to the text, how might selective attention affect your thinking when you are examining evidence for or against a claim? *11. How might the influence of a group that you belong to affect your attempts to think critically? 12. What are some of the possible consequences of self-centred thinking? 2 | The "Environment" of Critical Thinking 13. What is the appeal to popularity? *14. What is a world view? 15. What is social relativism? 16. According to the text, how could social relativism make critical thinking unnecessary? *17. Is critical thinking concerned with the objective or the subjective truth of claims? 18. How is subjective relativism different from philosophical skepticism? 19. What is philosophical skepticism? 20. Why is it incorrect to say that knowledge requires certainty? *21. What kind of doubt is involved in the acquisition of knowledge? Exercise 2.2 Indicate whether each of the following passages most likely contains examples of self-interested thinking, face-saving, or group pressure. *1. Christopher: Corporations have the same rights as humans. Andrew: What makes you think that? Christopher: I've got money invested in several corporations, and if corporate rights aren't protected, my investment would be in danger. I could be ruined financially! 2. Ying: My laptop is better than Julio's. Feng: Why do you think yours is better than his? Do you agree that they both have the same processor and their other performance stats are similar? Ying: Well, yes. Feng: Do you agree that all the other indicators of quality are nearly identical? Ying: Yes, but mine is still better. 3. Don't waste your inheritance by donating to feed the homeless. They're mostly just drug addicts anyway. But I'm involved with a great charity that would put that money to good use. *4. Yeah, she broke up with me. But the breakup had nothing to do with me. She's just too flaky to be in a relationship. 5. I don't agree with immigrants' claims that they are being treated badly at the border. If I endorsed those claims, every friend I've got would turn their backs on me. 6. Amanda: The new Spider-Man movie was terrible. There was nothing good about it at all. Ben: But it's #1 at the box office. When Dave and Theresa and I went to see it, we all loved it. Amanda: Well, come to think of it, the movie did have some great action scenes. And Tom Holland, who played Spider-Man, is a very good actor. 51 52 Part One | Basics *7. Hinduism is superior to all other religions. I was raised Hindu, and all my relatives are Hindus. This is the only religion I've known, and everyone I know and trust tells me it's the one true religion. 8. Don't tell me this class isn't useful! I've been teaching it for years, and I certainly know what I'm doing! 9. Moosehead is the best beer in the world. I've never tried any of those weird foreign beers, and I don't intend to. *10. If my friend Professor Snyder is teaching the class, my daughter is guaranteed to get an "A." I think Professor Snyder is the ideal person to teach the class. 11. Free speech should not extend to those who defend terrorists. Right now they are allowed to state their views on the Internet and many other places. That's just not how I was raised. Exercise 2.3 Read each of the following claims. Then select from the list any statements that, if true, would constitute good reasons for accepting the claim. Be careful: In some questions, none of the choices are correct. *1. John: The newspaper account of the charges of pedophilia lodged against Father J. Miller, a Catholic priest in our town, are likely false. a. The charges come from a single source who is a known liar. b. John is a Catholic. c. Important evidence that would exonerate Father Miller was not mentioned in the newspaper account. d. The town is predominately Catholic. 2. Alice: You should always buy vegetables that have been grown locally. a. Alice owns a local vegetable farm. b. Studies show that locally grown vegetables are substantially more environmentally friendly. c. You've noticed that the food seems to be better at restaurants that feature locally grown food. d. Alice has a degree in sustainability. *3. Janette: The rate of violent crime among native-born Canadians is lower than it is among immigrants. a. Janette's family has lived here in Canada for over 100 years. b. Janette's family immigrated to Canada in 2017. c. Janette is a member of her community's Neighbourhood Watch group. d. Janette has a degree in criminology. 4. Nanako: You should visit Japan for your next holiday. a. Nanako was born in Japan and knows how beautiful it is there. b. Nanako knows you well enough to know what kind of vacation you would enjoy. 2 | The "Environment" of Critical Thinking c. Nanako's brother owns a travel agency that specializes in trips to Japan. d. You've told Nanako before that you've always wanted to visit Asia. 5. ACME Inc. can supply us with the best materials at the lowest price. a. ACME has a good reputation in the industry. b. The person in charge of purchasing has a sister who works at ACME. c. ACME has a history of being accused of using shady business practices to drive down their costs. d. A report submitted by an independent third party suggests that ACME's prices are best. *6. Zaid: "This project is sure to be a failure." a. Zaid wasn't included in the planning process. b. The project is far behind schedule. c. Zaid's boss, Jen, has doubts about this project. d. Everyone in the lunch room is making jokes about the project. 7. Angelo: Marijuana should not be distributed only through government-run dispensaries. a. All of Angelo's friends smoke marijuana. b. There is evidence that broadening distribution outlets for marijuana would still result in a safe product and would serve the needs of consumers better. c. Angelo has already said on television that the government should stay out of the marijuana business. d. Angelo works at a private marijuana dispensary. Exercise 2.4 Read the following passages. Determine whether each one contains examples of the kind of group pressure that encourages people to conform (peer pressure or appeal to popularity) or the type that urges people to think that one's own group is better than others. For each example of group pressure, specify the possible negative consequences of such pressure. A couple of these are very difficult to classify. *1. Marie-Eve is straight, has an active dating life, and is strongly attracted to men. She has never considered any other path. She believes that there's nothing wrong with legally limiting marriage to unions between a man and a woman. 2. Prathamesh is trying out for his university's varsity lacrosse team. Nearly everyone on the team is religious, although various team members adhere to different religions. Prathamesh hasn't ever really been religious, and he's not even sure that he believes in God. He notices that he hasn't been invited to many of the team events. *3. An Atlantic Canadian university has invited a famous writer to be a guest speaker in the campus-wide distinguished-speaker series. She is an 53 54 Part One | Basics accomplished poet and essayist. She is also a Marxist and believes Canada should move in a more socialist direction. During her speech, she is shouted down by a small group of conservative students and faculty. 4. Yang Lei is a conservative blogger for one of Canada's most popular conservative news and commentary websites. But she yearns for bigger and better things—most especially, a regular column for a newsmagazine. She gets her dream job, though the magazine does have liberal leanings. The first few columns she writes for the magazine are a shock to her friends. Politically, her new columns are middle-of-the-road or even suspiciously left-leaning. 5. Adam is afraid of heights. At the local fair, his friends want him to go on the Ferris wheel and really want him to go on it with them, but he has so far resisted their efforts to persuade him. Running out of ideas, his friends decide to have a cute girl in their statistics class ask him to go on it with her. They all laugh when they hear Adam screaming from the top of the wheel. 6. A prominent politician in Ottawa presents a carefully reasoned argument against the use of quotas to make sure that women have equal access to government jobs. He points to studies that show that women are relatively successful at getting such jobs, and he argues that there are strong moral reasons in favour of always hiring the most qualified candidate. That evening, his office receives dozens of angry emails from women and men who say his statement was sexist and who threaten not to vote for him in the next election. The next day, he issues a press release apologizing for his comments. He states that he is a strong supporter of woman's rights and that his comments on hiring quotas were "taken out of context." *7. Advertisement: When you make the best car in the world, everyone wants it. Audi TT. A car in demand. Exercise 2.5 Read the following scenarios. Indicate whether each one contains examples of self-interested thinking or face-saving, and, for each instance, briefly outline the possible negative consequences. *1. Last year, Neera Co. operated at a loss for the first time since it was founded 60 years ago. The new CEO blamed poor market conditions for the loss. So far this year, Neera Co. has been losing even more money than last year, and its shareholders have started voicing their concerns. The CEO is planning to release a statement that blames the workers' union's unfair wage demands for driving up costs and hurting the company. 2 | The "Environment" of Critical Thinking *2. City councillor Jackson is in a position to cast the deciding vote on two proposals for the development of a new city park. Proposal 1 offers a parcel of land near Jackson's house, which gives him a beautiful view. Its drawbacks are that it would cost the city twice as much as proposal 2 and is not easily accessible to most of the public. Proposal 2 suggests a parcel of land near the centre of town. It is convenient to the public, has a more beautiful setting, and will raise property values in the area. Councillor Jackson says, without providing any evidence, that there's "too much traffic" around the second site and that the obvious best choice is proposal 1. 3. Antonio is running in the municipal election for a position on his city council. On election night, he has two speeches prepared. If he wins, he plans on stating in his speech that he is glad that the people have spoken so clearly and given him this honourable task. If he loses, he plans to express his disappointment in how poorly the election was run and how poorly the volunteers running the polling stations were trained. 4. Sheila is a bright medical scientist. For years she has been working on a series of clinical studies that could establish her favourite medical hypothesis— that high doses of vitamin E can cure skin cancer. Each study in the series has added more evidence suggesting that the hypothesis is probably true. The last study in the series is crucial. It is a much larger study than the others, and it will pretty much confirm or invalidate the usefulness of vitamin E for skin cancer. When the study is completed, she examines the data. Instead of confirming her hypothesis, the study suggests not only that her pet idea is unfounded but also that the doses of vitamin E used are actually toxic, causing substantial side effects in some patients. She concludes, though, that the study results do not disconfirm her hypothesis but are merely inconclusive. 5. Simone and Justin are in a heated debate about anthropogenic global warming (AGW)—the idea that human activity is responsible for substantial warming of the Earth over the past hundred years or so. Simone rejects this idea, believing instead that the changes observed over the last hundred years have been part of a natural global cycle. Justin rejects that view in favour of the "anthropogenic" (human-caused) point of view. Simone cites a number of facts that seem to prove her case. In addition, she alleges that AGW is false because there have been a number of other substantial changes in global temperatures in the last thousand years that clearly have nothing to do with human activity. Justin has no answer for this argument and looks exasperated. Simone is about to declare victory when Justin suddenly begins to quote the research findings of reputable climate scientists showing that the current change in climate really is uniquely sudden and severe after all. After the debate, some of Justin's friends quietly congratulate him for being clever enough to "quote" research "findings" that are actually entirely fictitious. 55 56 Part One | Basics Field Problems 1. Recall a situation in your past in which your beliefs may have been skewed by self-interest, face-saving, or group pressure. Think about (1) how one or more of these three factors affected your beliefs, (2) what the consequences (negative or positive) of the event were, and (3) what beliefs you might have acquired instead if you had used critical thinking. Take notes to help you remember the facts, and be prepared to present your story in class. 2. Recall a situation in which the beliefs of someone you know were apparently skewed by self-interest, face-saving, or group pressure to conform. Identify the three factors mentioned in the preceding question. 3. Assess a speech by a Canadian politician—federal, provincial, or municipal. Examine the speech for evidence that the politician is making use of peer pressure, appeal to popularity, or stereotyping. Explain briefly what you found. Self-Assessment Quiz 1. According to the definition of critical thinking given in the text, what factors must be present for critical thinking to take place? 2. From the standpoint of critical thinking, what is one sign that we have allowed our bias in favour of ourselves to go too far? 3. According to the text, what term is used to describe a philosophy of life, a set of fundamental ideas that helps us make sense of a wide range of important issues in life? 4. What is social relativism? 5. According to the text, what is stereotyping? 6. What degree of doubt do we attempt to surpass in the acquisition of knowledge? 7. According to the text, why is it important to look for opposing evidence when evaluating claims? Read the following scenarios. State whether each one contains examples of self- interested thinking, face-saving, or both. 8. Trish predicted that the new Saturday Night Live spin-off show would be amazing. But in fact, TV critics almost all think the show stinks, and TV audiences—influenced perhaps by critics—generally stay away from the show. Trish complains that the critics are all "biased" and that most TV viewers have lousy taste anyway. 9. Lois believes strongly that a nation-wide economic crash is imminent. She says this truth is unavoidable: she has had several friends lose jobs in the past three months. However, economists state that this is very unlikely. Key 2 | The "Environment" of Critical Thinking economic statistics are actually quite strong, including overall employment numbers. Lois doesn't say anything else about her "evidence," but she asserts, "You'll all be sorry when it happens and you see that I'm right!" 10. One day Julie and Jill hear their instructor read a list of arguments for and against reforming the way that Canada screens immigrants. Half the arguments are in favour of reform, and half are against it. Julie is on the pro side, and Jill is on the con side. Later, when they discuss the immigration arguments, they recall the facts differently. Julie remembers that most of the arguments heard in class were in favour of reform. Jill remembers only the arguments against changes and recalls very few pro arguments. Specify whether the following passages are examples of face-saving, self-serving, group pressure thinking, or a combination of these. 11. They made a huge mistake by not giving me the scholarship. They'll see! 12. Everyone believes in the power of positive thinking. That fact alone ought to persuade you to do the same. 13. Look, every student I know cheats on exams once in a while. So why not you? Why do you have to be such a goodie-goodie? 14. People should do whatever makes them happy. 15. Member of Parliament Aneesah Syed: "Anyone who doesn't believe in God shouldn't have a say in how this nation is run. I don't think that atheists should even be citizens." 16. Why won't you get an iPhone already? We all have one, and group messaging you would be so much easier if you had iMessage. 17. In Canada about 90 per cent of the population has some kind of religious belief or affiliation with some religious organization. In light of this, how can you say you're an unbeliever? If you're an unbeliever, you're un-Canadian. Read each of the following passages, and state whether it is an example of the subjectivist fallacy or social relativism. 18. This may not be your truth, but it's our truth. 19. It's true for me that killing innocent civilians is morally wrong. It may not be true for you. 20. Chinese diplomat: "My country cannot be judged by some universal standard. It must be judged by its own unique values and norms." Integrative Exercises These exercises pertain to material in Chapters 1 and 2. 1. What is an argument? 2. What is a statement or claim? (Give an example of a statement and an example of a sentence that is not a statement.) 57 58 Part One | Basics 3. Name one way in which a world view can influence your evaluation of a claim. 4. According to the text, what critical thinking principle should you keep in mind when you're trying to think clearly about a topic that is bound up with your own personal interests? For each of the following passages, indicate whether it contains an argument. For each argument, specify what the conclusion is and whether the passage contains an appeal to popularity, or peer pressure, or neither. 5. They say that money is the root of all evil. But money is only evil if you want more than your share of it. So greed is the real problem. 6. Cloning any biological entity (including humans) is not worth the risks involved. Scientists have already reported some unexpected, dangerous side effects in the cloning of plants, and Dolly, the famous cloned sheep, died young. 7. You bought a Yaris? Bahahaha! You'll be the laughingstock of the whole town if anyone sees you in that thing. 8. Someday, perhaps, the government will be willing to listen to people who elect them instead of just listening to wealthy corporations. 9. Sorry, but that's just the way I was raised. A wife should obey her husband. 10. You can't deny that the mayor is terrific. Most folks in town believe that she is doing a great job, and you can't argue with the people. 11. Your family loves you, and we all think you're wrong about Frank. That should be enough to convince you not to marry him. Read each of the following claims. Then select from the list any statements that, if true, would constitute good reasons for accepting the claim. Some statements may have no good reasons listed. 12. There should be harsher punishments for sexual harassment in the workplace. a. Countries with the harshest punishments for sexual harassment have the lowest incident rates of sexual harassment. b. Polls show that Canadians think that overall, companies don't do as much as they should to reduce rates of sexual harassment in the workplace. c. The prime minister has voiced his support for increased penalties for workplace sexual harassment, and your friends agree with him as well. d. Punishing workplace sexual harassment is the only way to ensure the integrity of our workplaces and so is the only morally correct course of action. 13. It's getting harder and harder for young Canadians to find a decent job that pays a living wage. a. I haven't found a job despite graduating over three months ago. b. Surveys show that joblessness among Canadians aged 18–25 is higher than it was last year. c. Many Canadian companies are opening up branches in foreign countries. d. My cousin has a master's degree, but she has been working at Starbucks for over a year now. 2 | The "Environment" of Critical Thinking 14. There is an afterlife. After you die, your essence lives on. a. I have to believe in life after death. The alternative is too terrible to contemplate. b. Over 80 per cent of Canadians believe in life after death. c. This society believes that there is an afterlife. d. On the radio I told two million people that there is life after death. So I have to believe in it. Otherwise, I'll look like a fool. For each of the following passages, determine whether an argument is present and whether peer pressure or an appeal to popularity is being used. Some passages may not contain arguments, and some may not contain examples of group pressure. 15. "Canada has a dog-dumping problem. Scrolling through headlines from the past year reveals stories, spanning from B.C. to New Brunswick, of dogs dumped like trash, in forests, in parks, on roadsides and in actual trash. The latest to make news: a little white dog found duct taped inside a box last week on the side of a Manitoba highway. The truth is that for every disturbing dog-dumping story deemed newsworthy, there is an even more disturbing number of abandoned and surrendered pets not making headlines, and this is a sign of a much greater problem. As a culture, Canadians lack respect for the duties of dog ownership, and throwing away animals like garbage is just par for the cruel course." (Jessica Scott-Reid, Globe and Mail, 26 November 2017) 16. Every right-thinking person knows this to be true: to defend freedom of speech means to defend the freedom to speak even those opinions with which we disagree. 17. You must reject the proposition that rising levels of gun violence in Canada's major cities proves the need for the federal government's firearm registry. First, there's no documented connection between violence and the availability of guns. Second, if you accept the need for a registry, you'll be the laughingstock of all your fellow westerners! 18. To teens, getting fake IDs to sneak into bars and pubs may seem like a good idea, but it's not. I think every teenager who tries it should be arrested. 19. You cannot seriously believe that Seattle is more beautiful than Vancouver. I don't know a single Vancouverite who believes that! Critical Thinking and Writing Exercise From Issue to Thesis For many students, the biggest challenge in writing an argumentative essay is deciding on an appropriate thesis—the claim, or conclusion, that the essay is designed to support or prove. Very often, when an essay runs off track and crashes, the derailment can be traced to a thesis that was bad from the beginning. 59 60 Part One | Basics Picking a thesis out of the air and beginning to write is usually a mistake. Any thesis statement that you craft without knowing anything about the subject is likely to be ill-formed or indefensible. It's better to begin by selecting an issue—a question that's controversial or in dispute—and then researching it to determine what arguments or viewpoints are involved. To research it, you can survey the views of people or organizations involved in the controversy. Read articles and books, talk to people, and do some research online. This process should not only inform you about various viewpoints but also tell you what arguments are used to support them. It should also help you to narrow the issue down to one that you can easily address in the space you have. Suppose you begin with the question of whether Canada has serious industrial pollution problems. After investigating this issue, you would probably see that it is much too broad to be addressed in a short paper. You should then restrict the issue to something more manageable—for example, whether recent legislation to allow coal-burning power plants to emit more sulphur dioxide will harm people's health. With the scope of the issue narrowed, you can explore arguments on both sides. You cannot examine every single argument, but you should assess the strongest ones, including those that you devise yourself. You can then use what you've already learned about arguments to select one that you think provides good support for its conclusion. The premises and conclusion of this argument can then serve as the bare-bones outline of your essay. Your argument might look like this: [Premise 1] High amounts of sulphur dioxide in the air have been linked to increases in the incidence of asthma and other respiratory illnesses. [Premise 2] Many areas of the country already have high amounts of sulphur dioxide in the air. [Premise 3] Most sulphur dioxide in the air comes from coal-burning power plants. [Conclusion] Therefore, allowing coal-burning power plants to emit more sulphur dioxide will most likely increase the incidence of respiratory illnesses. For the sake of the example, the premises of this argument are made up. But the argument of your essay must be real, with each premise that could be called into question supported by an additional argument. After all, your readers are not likely to accept the conclusion of your argument if they doubt your premises. In some cases, your paper may contain more than one argument supporting a single conclusion, or it may offer a critique of someone else's argument. In either case, investigating an issue and the arguments involved will follow the pattern just suggested. In a critique of an argument (or arguments), you offer reasons why the argument fails and you thereby support the thesis that the conclusion is false or at least unsupported. 2 | The "Environment" of Critical Thinking This process of devising a thesis statement and crafting an argument to back it up is not linear. You will probably have to experiment with several arguments before you find one that's suitable. Even after you decide on an argument, you may later discover that its premises are dubious or that they cannot be adequately supported. Then you will have to backtrack to investigate a better argument. Backtracking in this preliminary stage is relatively easy. But if you postpone this rethinking process until you are almost finished with your first draft, it will be harder—and more painful. Argument and Emotion As we saw earlier, the point of an argument is to provide rational support for a claim by supplying good reasons for accepting a conclusion. And argument, of course, is the main focus of a good argumentative essay. Nonetheless, experienced writers often enhance the persuasive power of their argumentative essays through the use of various emotional appeals. Inexperienced writers, though, sometimes get the argumentative and emotional elements confused or out of balance. To avoid such problems, try to stick to these rules of thumb: • Be fair to the opposing view. Summarize or restate the opposing arguments clearly and accurately. Avoid sarcasm, ridicule, or loaded (emotive) words in describing other viewpoints. Don't say, for example, "this socalled argument," "that ridiculous view," or "this idiotic proposal." • Be fair to your opponent. Avoid personal attacks, insults, stereotyping, and innuendo. Keep the main focus on the quality of your opponent's arguments, not on his or her character. • Avoid appeals to your own self-interest or the wishes of your preferred group. • If you have strong feelings about an issue, try to channel those feelings into creating the best arguments possible—not into emotional displays. Writing Assignments 1. Read Essay 2 ("Hurray! No One's Watching") in Appendix A, and write a summary of the essay in 75–100 words. Mention the thesis statement and each supporting premise. 2. Study the argument presented in Essay 8 ("Unrepentant Homeopaths") in Appendix A. Identify the conclusion and the premises and objections considered. Then write a 500-word rebuttal to the essay. That is, defend the claim that it is morally right to promote homeopathy. 61 62 Part One | Basics 3. Select an issue from the following list and write a 600-word essay defending a statement pertaining to the issue. Follow the procedure discussed in the text for identifying a thesis and an appropriate argument to defend it. • Are the mainstream news media biased? • Should a single corporation be allowed to buy up as many media outlets (newspapers, radio and TV stations, book publishers, etc.) as it wants? • Should the Canadian government be allowed to arrest and indefinitely imprison, without trial, any Canadian citizen who is suspected of terrorism? • Should corporate taxes be raised or lowered? Notes 1. 2. Bertrand Russell, Let the People Think (London: William Clowes, 1941), 2. W.K. Clifford, "The Ethics of Belief," in The Rationality of Belief in God, ed. George I. Mavrodes (Englewood Cliffs, NJ: Prentice-Hall, 1970), 159–60. 3. For a thorough review of various forms of relativism, see Theodore Schick and Lewis Vaughn, How to Think about Weird Things, 3rd ed. (Mountain View, CA: Mayfield, 1999), 68–92. 3 Making Sense of Arguments Chapter Objectives Argument Basics You will be able to • distinguish between deductive and inductive arguments. • understand the terms valid, invalid, and sound. • understand the terms strong, weak, and cogent. Judging Arguments You will be able to • follow the four-step procedure for determining whether an argument is deductive or inductive, good or bad. • obtain a familiarity with indicator words that suggest that an argument is deductive or inductive. Finding Missing Parts You will be able to • use the three-step procedure for uncovering implicit premises. Argument Patterns You will be able to • memorize and be able to recognize the argument patterns known as modus ponens, modus tollens, hypothetical syllogism, denying the antecedent, affirming the consequent, and disjunctive syllogism. 64 Part One | Basics • use the counterexample method for determining if a deductive argument is valid or invalid. Diagramming Arguments You will be able to • understand the definition of dependent and independent premises. • follow the three-step procedure to diagram arguments, both simple and complex ones, including those embedded in extraneous material. Assessing Long Arguments You will be able to • understand the challenges involved in assessing long arguments. • follow the procedure for diagramming long arguments. I n this chapter we resume our discussion of arguments begun in Chapter 1, dig deeper into the dynamics and structure of different types of argument, and get a lot more practice identifying and critiquing simple (and not so simple) arguments in their "natural habitat." Recall that in Chapter 1 we defined an argument as a group of statements in which some of them (the premises) are intended to support another of them (the conclusion). An essential skill is the ability to identify arguments in real-life contexts and to distinguish them from non-arguments. To recognize an argument you must be able to identify the premises and the conclusion. Indicator words such as because and since often signal the presence of premises, and words such as therefore and thus can point to a conclusion. Argument Basics deductive argument An argument intended to provide logically conclusive support for its conclusion. inductive argument An argument in which the premises are intended to provide probable, not conclusive, support for its conclusion. The point of devising an argument is to try to show to your audience (or perhaps just to yourself) that a statement or claim is worthy of acceptance. The point of evaluating an argument is to see whether this task has been successful—whether the argument shows that the statement (the conclusion) really is worthy of acceptance. When the argument shows that the statement is worthy of acceptance, we say that the argument is good. When the argument fails to show that the statement is worthy of acceptance, we say that the argument is bad. There are different ways, however, that an argument can be good or bad. This is because there are different types of arguments. Arguments come in two main forms—deductive and inductive. A deductive argument is one that is intended to provide, and is potentially capable of 3 | Making Sense of Arguments 65 Food For Thought Persuading or Reasoning? Philip Scalia/Alamy Stock Photo There is a fundamental distinction in critical thinking between persuading and reasoning. Persuading someone to agree with you is not the same thing as presenting them with a good argument, though a good argument might end up being persuasive. You can influence people's opinions by using words to appeal to their ego, gullibility, bigotry, greed, anger, prejudice, and more. You just have to use emotional language, psychological tactics, tricky wording, and outright lies. But having done so, you would not have demonstrated that any belief is true or warranted. You would not have shown that a claim is worthy of acceptance. To do so is a matter of logic and argumentation. The techniques of raw persuasion are not. Certainly, the presentation of a good argument (in the critical thinking sense) can often be psychologically compelling. And there are times when persuasion through psychological or emotional appeals is approGreat persuaders aren't always great critical thinkers. Recall a priate, even necessary. You just have moment when you might have been persuaded by a speech or opinto keep these two functions separate ion piece. Were you persuaded by sound reasoning or by psychoin your mind. logical or emotional appeals? providing, logically conclusive support for its conclusion. An inductive argument is one that is intended to provide, and is only capable of providing, probable—not conclusive—support for its conclusion. Deductive Arguments A deductive argument that provides decisive logical support is said to be valid; a deductive argument that fails to provide such support is said to be invalid. A deductively valid argument is such that if its premises are true, its conclusion must be true. That is, if the premises are true, there is no way that the conclusion can be false. In logic, valid is a technical term; it is not a synonym for true. A deductively valid argument simply has the kind of logical structure that guarantees the truth of the conclusion if the premises are true. "Logical structure" refers not to the content of an argument but to its construction, that is, the way the premises and conclusion fit together. Because of the guarantee of truth in the conclusion, valid argument A deductive argument that succeeds in providing conclusive support for its conclusion. invalid argument A deductive argument that fails to provide conclusive support for its conclusion. 66 Part One | Basics deductively valid arguments are said to be truth-preserving: in a valid deductive argument, if you start with true premises, the structure of the argument "preserves" that truth, all the way through into the conclusion. Here's a simple deductively valid argument: © skynesher/iStockphoto Sheldon is a physicist. All physicists are good at math. So Sheldon is good at math. And here's a classic: Can an argument containing a false premise, such as "Dolphins are plotting to take over the planet," be logically valid? truth-preserving A characteristic of a valid deductive argument in which the logical structure guarantees the truth of the conclusion if the premises are true. All men are mortal. Socrates is a man. Therefore, Socrates is mortal. And here is one in regular paragraph form: [Premise] All Canadian police officers carry a gun. [Premise] Alexandra is a Canadian police officer. [Conclusion] Therefore, Alexandra carries a gun. In each of these arguments, if the premises are true, the conclusion must be absolutely, positively true. You may or may not agree with the premises, but it is impossible for the premises to be true and the conclusions false. The conclusion follows logically from the premises. And the order of the premises makes no difference. Indeed, it doesn't even matter whether the premises are stated before or after the conclusion. What matters is the logical relation between them. A deductively invalid version of these arguments might look like this: Sheldon is a physicist. Sheldon is a man. So all physicists are men. If Socrates has horns, he is mortal. Socrates is mortal. Therefore, Socrates has horns. In each of these, the conclusion does not follow logically from the premises. Each is an attempt at a deductively valid argument, but the attempt fails—even if the premises were true, they would not guarantee that their conclusions are true. And again, this would be the case regardless of the order of the premises. Note that even an argument with a conclusion that is obviously true can be invalid if 3 | Making Sense of Arguments that conclusion is not supported by the premises offered. Look at this argument, for example: All whales have tails. All whales have eyes. Therefore, all whales are mammals. 67 "The most perfidious way of harming a cause consists of defending it deliberately with faulty arguments." —Friedrich Nietzsche It's obviously a silly argument, but it demonstrates something important. The conclusion here is obviously true—whales really are mammals—but the argument is invalid: the conclusion doesn't follow from the premises offered. Inductive Arguments An inductive argument that succeeds in providing probable—but not conclusive—logical support for its conclusion is said to be strong. An inductive argument that fails to provide such support is said to be weak. An inductively strong argument is such that if its premises are true, its conclusion is probably or likely to be true. The structure of an inductively strong argument cannot guarantee that the conclusion is true if the premises are true—but the conclusion can be rendered probable and worthy of acceptance. (Here again, the structure and content of an argument are separate issues.) Because the truth of the conclusion cannot be guaranteed by the truth of the premises, inductive arguments are not truth-preserving. Let's turn our first two deductively valid arguments into inductively strong arguments: Most physicists are good at math. Therefore, Sheldon (a physicist) is probably good at math. Almost all humans are mortal. Socrates is a human. Therefore, Socrates is probably mortal. Notice that in the first argument, it's entirely possible for the premise to be true and the conclusion false. After all, if only most physicists are good at math, there is no guarantee that Sheldon is good at math. Yet the premise, if true, makes the conclusion probably true. Likewise, in the second argument it is possible that even if 99.9 per cent of humans are mortal and Socrates is human, the conclusion that Socrates is mortal could be false. But the premises, if true, make it likely that the conclusion is true. Good Arguments Logical validity, or logical strength, is an essential characteristic of good arguments. But there is more to good arguments than having the proper structure. strong argument An inductive argument that succeeds in providing probable—but not conclusive—support for its conclusion. weak argument An inductive argument that fails to provide strong support for its conclusion. 68 Part One | Basics Good arguments also have true premises. A good argument is one that has the proper structure and true premises. Take a look at this argument: All pigs can fly. Michael is a pig. Therefore, Michael can fly. sound argument A deductively valid argument that has true premises. Both of the premises of this argument are false (assuming that "Michael" is a human being or some other non-pig), but the conclusion follows logically from those premises. That is, if the premises were true—if pigs really could fly and if Michael were a pig—then it would also be true that Michael would be able to fly. But as it is, it's a deductively valid argument with all the parts in the right place— even though the premises and conclusion are false. But it is not a good argument because a good argument must also have true premises and this argument doesn't. A deductively valid argument that also has true premises is said to be sound. A sound argument is a good argument that gives you good reasons for accepting its conclusion. Such an argument, in other words, gives us everything that we could hope for in a deductive argument. It is important to note, however, that even deductively valid arguments can have true or false premises and true or false conclusions. Validity is only about structure and what happens to follow logically from what. Specifically, deductively valid arguments can have false premises and a false conclusion, false premises and a true conclusion, and true premises and a true conclusion. See for yourself: False Premises, False Conclusion All businesses are corporations. All corporations are allowed to vote. Therefore, all businesses are allowed to vote. Nick Kim/Cartoon Stock False Premises, True Conclusion Gold floats in water. Silver floats in water. Therefore, silver is lighter than gold. How might focusing only on an argument's logic, without paying attention to the truth of its premises, be dangerous? True Premises, True Conclusion Abshir is a human. All humans are mammals. Therefore, Abshir is a mammal. A valid argument, though, cannot have true premises and a false conclusion—that's impossible. A good inductive argument must also have true premises. This example illustrates why: 3 | Making Sense of Arguments 69 The first humans were roaming the earth just as the dinosaurs were dying out. So it's likely that we will find human fossils mixed in with dinosaur fossils. This is an inductively strong argument (because its premise, if true, would make its conclusion quite likely), but it's not a good argument because its premise is false—the first humans appeared on earth about 65 million years after the last dinosaurs died out! When inductively strong arguments also have true premises, they are said to be cogent. Good inductive arguments are cogent; bad inductive arguments are not cogent. The argument above, about fossils, is inductively strong but not cogent. The word cogent represents the highest form of praise available for an inductive argument: a cogent inductive argument is one that we can rely upon. Here's an example of a cogent inductive argument: cogent argument A strong inductive argument with all true premises. Humans appeared on earth millions of years after the last dinosaurs died out. So it's very unlikely that we will find human fossils mixed in with dinosaur fossils. You may have noticed another important difference between deductive and inductive arguments. The kind of support that a deductive argument can give a conclusion is absolute. Either the conclusion is shown to be true, or it is not. There is no sliding scale of truth or falsity for deductive arguments. The support that an inductive argument can provide a conclusion, however, can range from very weak to extremely strong. An inductive argument, that is, might provide a little support, a moderate amount of support, or a lot of support for its conclusion. Review Notes Deductive and Inductive Arguments A deductive argument • is intended to provide conclusive support for its conclusion; • is said to be valid if it succeeds in providing conclusive support for its premise. (A valid argument is such that if its premises are true, its conclusion must be true.); and • is said to be sound if it is valid and has true premises. An inductive argument • is intended to provide probable support for its conclusion; • is said to be strong if it succeeds in providing probable support for its conclusion. (A strong argument is such that if its premises are true, its conclusion is probably true.); and • is said to be cogent if it is a strong argument and has true premises. 70 Part One | Basics Both deductive and inductive arguments can be manipulated in various ways to yield new insights. For example, let's say that you have formulated a valid deductive argument and you know that the conclusion is false. From these facts you can infer (based on the definition of a valid deductive argument) that at least one of the premises must be false. Using this approach, you can demonstrate that a premise is false because in at least one valid argument that premise leads to a false conclusion. Or let's say that you've constructed a valid argument and you know that your premises are true. Then you can infer that the conclusion must be true— even if the conclusion is contrary to your expectations. Or maybe you put forth a strong inductive argument and you know that the premises are questionable. Then you know that the conclusion also can't be trusted—it might end up being true, but you can't assume so based on the weak premises of this argument. Exercise 3.1 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. 1. What is an inductive argument? 2. What is a deductive argument? 3. Are deductive arguments truth-preserving? Why or why not? *4. What type of arguments do the terms valid and invalid apply to? 5. What kind of support does an inductive argument provide for its conclusion when the argument is strong? 6. Can an inductive argument guarantee the truth of the conclusion if the premises are true? Why or why not? 7. What is the difference between an inductively strong argument and a deductively valid one? *8. What is the term for valid arguments that have true premises? 9. What is the term for strong arguments that have true premises? 10. Can a valid deductive argument have false premises and a true conclusion? Can it have false premises and a false conclusion? 11. What logical conclusion can you draw about an argument that is deductively valid but has a false conclusion? *12. Is it possible for a valid argument to have all true premises and a false conclusion? 13. In what way are conclusions of deductive arguments absolute? Judging Arguments When it comes to deductive and inductive arguments, the most important skills you can learn are being able to identify both kinds of arguments and determining whether individual arguments you come across are good or bad. Much of the rest 3 | Making Sense of Arguments 71 of this text is devoted to helping you get good at these skills. This chapter will serve as your first lesson and give you a chance to practise what you learn. So the obvious questions here are the following: when you come face to face with an argument to evaluate, (1) how can you tell whether it's deductive or inductive and (2) how can you determine whether it gives you good reasons for accepting the conclusion (whether it's sound or cogent)? The following is a suggested four-step procedure for answering these questions, a procedure that will be elaborated on here and in later chapters. Step 1. Find the conclusion of the argument, and then identify its premises. Use the techniques you learned in Chapter 1. You'll have plenty of chances to sharpen this skill in later chapters. Step 2. Ask, "Is it the case that if the premises are true the conclusion must be true?" If the answer to that question is yes, you should treat the argument as deductive, for it is very likely meant to offer conclusive support for its conclusion. The argument, then, is deductively valid, and you should check to see if it's sound by checking whether all of the premises are true. If the answer is no, proceed to the next step. Step 3. Ask, "Is it the case that if the premises were true, its conclusion would probably be true?" If the answer is yes, treat the argument as inductive, for it is very likely meant to offer probable support for its conclusion. The argument, then, is inductively strong, and you should check to see if it's cogent. If the answer is no, proceed to the next step. Step 4. Ask, "Is the argument intended to offer conclusive or probable support for its conclusion but fails to do so?" If you reach this step, you will have already eliminated two possibilities: a valid argument and a strong one. The remaining options are an invalid argument or a weak one. So here you must discover what type of (failed) argument is intended. There are two guidelines that can help you do that. DILBERT © 2003 Scott Adams. Used by permission of UNIVERSAL UCLICK. All rights reserved. GUIDELINE 1: Generally, if an argument looks deductive or inductive because of its form, assume that it is intended to be so. How should you systematically test your reasoning and the reasoning of others? 72 Part One | Basics Bad arguments may sometimes look like good arguments because the arrangement of their premises and conclusion—their form—is similar to that found in reliable arguments. (You saw some of these reliable argument forms in the argument examples presented earlier in this chapter.) Such argument forms are an indication of what kind of argument is intended, and that fact gives you some guidance on determining argument type. GUIDELINE 2: Generally, if an argument looks deductive or inductive because of the types of indicator words used (and if its form yields no other clues), then assume that it is intended to be so. "He who strikes the first blow admits he's lost the argument." —Chinese proverb Arguments are often accompanied by words or phrases that identify them as deductive or inductive. Terms that tend to signal a deductive argument include "It necessarily follows that," "it logically follows that," "absolutely," "necessarily," and "certainly." Words signalling an inductive argument include "likely," "probably," "chances are," "odds are," and "it is plausible that." Such indicator words, though, are not foolproof clues to the type of argument because they are sometimes used in misleading ways. For example, someone might end an inductively strong argument with a conclusion prefaced with “it necessarily follows that,” suggesting (incorrectly) that the argument is deductively valid. But argument-type indicators may still be useful, especially when the argument form provides no clues (i.e., when Guideline 1 doesn’t apply). In step 4, once you discover which kind of argument is intended, you will know that it is either invalid or weak (because in steps 2 and 3 we eliminated the possibility of a valid or strong argument).1 Let’s try out the four-step procedure on a few arguments. Consider this one: [Premise] Unless we do something about the massive Ebola epidemic in Africa, the whole continent will be decimated within six months. [Premise] Unfortunately, we won’t do anything about the Ebola epidemic in Africa. [Conclusion] It necessarily follows that the population of Africa will be decimated within six months. Step 1 is already done for us; the premises and conclusion are clearly labelled. In step 2 we must ask, “Is it the case that if the premises are true, the conclusion must be true?” The answer is yes, if it’s true that the Ebola epidemic in Africa will decimate the population in six months unless “we do something” and it’s true that “we won’t do anything,” then the conclusion that the population of Africa will be decimated in six months must be true. So this argument is deductively valid. To determine if it’s sound, we would need to check to see if the premises are true. In this case, the first premise is false because, under current conditions, it would take longer than six months for the epidemic to decimate the population of the whole continent. The other premise (“we won’t do anything”) is at least dubious, since we can’t predict the future. So what we have here is a deductively valid argument that’s unsound—a bad argument. 3 | Making Sense of Arguments 73 Now let’s analyze this one: [Premise] The Quebec-based French-language group “l’imperatif français” works diligently to make sure businesses in Quebec use French in their daily operations. [Premise] The Quebec government has affirmed its commitment to preserving the French language. [Premise] And most Canadians are in favour of official bilingualism. [Conclusion] Let’s face it, the French language is guaranteed to survive in Quebec! Again, step 1 is already done for us. At step 2 we can see that even if the three premises of this argument are all true, the conclusion can still be false. After all, even if everything described in the premises is true, the French language could still die out in Quebec (perhaps because new immigrants speak English or other languages or because of the influence of American TV, movies, and magazines). So the argument can’t be deductively valid. But if we go through step 3, we can see that if all the premises are true, the conclusion is likely to be true, making the argument inductively strong. If the premises are true, the argument would be cogent. See what you think of this one: [Premise] If you act like Bart Simpson, you will be respected by all your classmates. [Premise] But you don’t act like Bart Simpson at all. [Conclusion] It follows that you will not be respected by all of your classmates. This argument flunks the tests in steps 2 and 3: it is not deductively valid, and it is not inductively strong. But it does have features that suggest it is an attempt at a deductive argument. First, it displays a pattern of reasoning that can, at first glance, seem deductive. Actually, it uses an argument pattern that is always deductively invalid (called “denying the antecedent,” an argument form we will look at shortly). This alone should be evidence enough that the argument is indeed deductive but invalid. But it also contains a phrase (“it follows that”) that suggests an attempt at a deductive form. Food For Thought When Reasoning Crashes . . . Leave the Scene of the Accident Sometimes an argument goes off into a ditch, and you don’t know why. Here’s an example of a wrecked argument from the great American satirical writer Ambrose Bierce (1842–1914?). Can you figure out exactly what the problem is with this silly argument? One man can dig a posthole in sixty seconds. Therefore, sixty men can dig a posthole in one second. 74 Part One | Basics You’ll get a lot more exposure to argument forms and indicator words in the rest of this chapter (and the rest of this text). Ultimately, practice in distinguishing different types of arguments and their relative worth is the only way to gain competence (and confidence!) in making these judgments. So far in this chapter, we’ve spent most of our time assessing the logical structure of arguments—that is, whether they are valid or invalid, or strong or weak. We haven’t focused as much attention on evaluating the truth of premises because that’s a big issue that’s best considered separately—which is what we do in Part 2 of this book. Exercise 3.2 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. For each of the following arguments, follow the four-step procedure to determine whether it is deductive or inductive, valid or invalid, and strong or weak. State the results of applying each step. Example 1 Dexter did not commit the murder. After all, someone who had committed the murder would have dirt on his shoes and blood on his hands. Dexter’s shoes and hands are clean. Step 1: Conclusion: Dexter did not commit the murder. Premises: Someone who had committed the murder would have dirt on his shoes and blood on his hands. Dexter’s shoes and hands are clean. Step 2: Deductively valid. Step 3: Does not apply. Step 4: Does not apply. Example 2 Most people who smoke pot are irresponsible and forgetful. Looks like you smoke pot all the time! Therefore, you’re irresponsible and forgetful. Step 1: Conclusion: Therefore, you’re irresponsible and forgetful. Premises: Most people who smoke pot are irresponsible and forgetful. Looks like you smoke pot all the time. Step 2: Not deductively valid. Step 3: Inductively strong. Step 4: Does not apply. *1. Ethel graduated from McGill University. If she graduated from McGill, she probably has a superior intellect. So clearly she has a superior intellect. 3 | Making Sense of Arguments 2. You’ve been dating Barry for months now. And you would have to have poor judgment to be dating Barry. So I think you clearly have poor judgment. 3. You’re a business major, and all business majors are obsessed with money, so you must be obsessed with money! 4. “Good sense is of all things in the world the most equally distributed, for everybody thinks himself so abundantly provided with it, that even those most difficult to please in all other matters do not commonly desire more of it than they already possess.” (René Descartes, A Discourse on Method) 5. People with racist tendencies also have low self-esteem. People who have benefited from racist systems—which is comparable to having racist tendencies— also probably have low self-esteem. *6. Every musician has had special training, and everyone with special training has a university degree. Thus, every musician has a university degree. 7. All dogs are loyal. All dogs are good guard animals. It necessarily follows that all loyal animals are good guard animals. 8. If Greenpeace is against the Keystone XL pipeline, then the pipeline must be a terrible risk to the environment. Greenpeace is against the pipeline. Therefore, it must be a terrible risk to the environment. *9. Some actors sing, and some play a musical instrument. So some actors who sing also play a musical instrument. 10. Anyone who is not a bigot will agree that Chris is a good fellow. Some people in this neighbourhood think that he’s anything but a good fellow. Some people in this neighbourhood are bigots. 11. Public protest has never accomplished anything. We shouldn’t waste our time participating in the protest march. 12. A vase was found broken on the floor, some money had been taken out of the safe, and there were strange scratches on the wall. I think that someone must have burglarized the place. 13. All the evidence in this trial suggests that Robert Pickton is guilty of murder. Let’s face it: he’s definitely guilty. 14. If everything were all right, there would be no blood on the floor. Of course, there is plenty of blood on the floor. Therefore, everything is not all right. *15. If minds are identical to brains—that is, if one’s mind is nothing but a brain— androids could never have minds because they wouldn’t have brains. Clearly, a mind is nothing but a brain, so it’s impossible for androids to have minds. 16. “From infancy, almost, the average girl is told that marriage is her ultimate goal; therefore her training and education must be directed towards that end.” (Emma Goldman, “Marriage and Love”) 17. If store windows are being broken all over town, the hockey riot has started. So the riot has begun. Dozens of windows have already been broken. 18. If you have a fever, headache, and unexplained bruising, then you have Ebola. And you do have a fever, headache, and unexplained bruising. So you most certainly have Ebola! 75 76 Part One | Basics Exercise 3.3 For each of the following arguments, indicate whether it is valid or invalid, strong or weak. 1. André says that the Raptors new lineup is really good. So it must be really good! 2. Giving people money they have not earned through labour is not helping anyone. And welfare is by definition a handout to people who have not worked for it. It follows then that welfare does not help anyone. *3. If the Globe and Mail reports that the war in Afghanistan is over, then the war in Afghanistan is over. The Globe and Mail has reported exactly that. The war must be over. 4. In any triangle, if l = 5 and w = 4, then a = 10. And in this triangle, l = 5 and w = 4; therefore, for this triangle a = 10. 5. Any sitcom that tries to imitate The Big Bang Theory probably sucks. And that new sitcom is totally trying to imitate The Big Bang Theory. It’s gotta suck. 6. “Poetry is finer and more philosophical than history; for poetry expresses the universal and history only the particular.” (Aristotle, Poetics) 7. Either you’re lying or you’re not telling the whole story. You’re obviously not lying, so you’re just telling part of the story. *8. Either your thinking is logical or it is emotional. It’s obviously not logical. It’s emotional. 9. Vaccinations save lives. It is unwise to skip your baby’s scheduled vaccinations. 10. A recent Gallup poll says that 69 per cent of Canadians believe in the existence of heaven but only 43 per cent say they believe in hell. People are just too willing to engage in wishful thinking. 11. Drug addicts often support their habits by shoplifting, and George has been caught shoplifting three times. He’s an addict for sure. 12. “We say that a person behaves in a given way because he possesses a philosophy, but we infer the philosophy from the behavior and therefore cannot use it in any satisfactory way as an explanation, at least until it is in turn explained.” (B.F. Skinner, Beyond Freedom and Dignity) 13. You failed your driver’s test twice. You’ve had three traffic tickets in the last two years. And your own brother won’t let you drive him to hockey practice. It’s pretty clear you’re not a very good driver. *14. Bachelors are unmarried. George is a bachelor. He is unmarried. 15. Anything that makes people violent should be banned. Tequila makes people violent. We ought to ban the sale of tequila in campus pubs. 16. If there is a tax cut this year, the deficit will rise. There has already been a tax cut. The deficit is sure to rise. 17. If the universe had a beginning, then it was caused to begin. We know that the universe did have a beginning in the form of the big bang. So it was 3 | Making Sense of Arguments caused to come into existence. If it was caused to come into existence, that cause must have been God. God caused the universe to come into existence. *18. If the United States is willing to wage war in the Middle East, it can only be because it wants the oil supplies in the region. Obviously, the United States is willing to go to war there. The United States wants that oil. 19. “Someone must have been telling lies about Joseph K., for without having done anything wrong he was arrested one fine morning.” (Franz Kafka, The Trial) 20. If you’re a member of a visible minority, then you understand racism. But you’re white. You’re just never going to understand what I’m going through. 21. If the landlady is at the door, it’s probably because she’s looking for this month’s rent. There she is. She must want the rent. 22. Anyone willing to take the lives of innocent people for a cause is a terrorist. Many Christians, Jews, and Muslims have taken innocent lives in the name of their religious cause. Many Christians, Jews, and Muslims have been terrorists. *23. I like geometry. My geometry teacher likes me. Therefore, I will pass my geometry course with flying colours. Finding Missing Parts Sometimes arguments, especially informal ones, may seem to have a few pieces missing. Premises (and sometimes even conclusions) are often left unstated. These implicit premises, or assumptions, are essential to the argument. Of course, certain assumptions are frequently left unsaid for good reason: they are obvious and understood by all parties to the argument, and boredom would set in fast if you actually tried to mention them all. If you wish to prove that “Socrates is mortal,” you normally wouldn’t need to explain what mortal means and that the name “Socrates” refers to an ancient philosopher and not to your dog. But many arguments do have unstated premises that are necessary to the chain of reasoning and so must be made explicit to fully evaluate the arguments. For instance: Handguns are rare in Canada, but the availability of shotguns and rifles poses a risk of death and injury. Therefore shotguns and rifles should be banned, too! Notice that there is a kind of disconnect between the premise and the conclusion. The conclusion is about banning something, but the premises—the reasons given—don’t say anything about banning anything. The conclusion follows from the premise only if we assume an additional premise, perhaps something like this: 77 78 Part One | Basics “Anything that poses any risk of death or injury should be banned.” With this additional premise, the argument becomes: Handguns are rare in Canada, but the availability of shotguns and rifles poses a risk to public safety. Anything that poses any risk of death or injury should be banned. Therefore, shotguns and rifles should be banned, too! Now that all the premises are spelled out, you can evaluate the full argument just as you would any other. Not only that, but you can see that the unstated premise is questionable, which is the case with many implicit premises. Not everyone would agree that absolutely anything raising the risk of death or injury should be banned, for if that were the case we would have to outlaw cars, airplanes, most prescription drugs, most occupations, and who knows how many kitchen appliances! Many unstated premises are like this one—they’re controversial and hence unstated. But they’re also important to evaluate and therefore should not be left unexamined. Here’s another argument with an unstated premise: Anyone who craves political power cannot be trusted to serve the public interest. So I say Premier Sakinofsky can’t be trusted to serve the public interest. As stated, this argument seems like a rush to judgment because the first premise concerns anyone who craves power and suddenly Premier Sakinofsky is denounced as untrustworthy. Something’s missing. What we need is another premise connecting the first premise to the conclusion: “Premier Sakinofsky craves political power.” Now let’s plug the implicit premise into the argument: Anyone who craves political power cannot be trusted to serve the public interest. Premier Sakinofsky craves political power. So he can’t be trusted to serve the public interest. “The difficult part in an argument is not to defend one’s opinion, but rather to know it.” —André Maurois So exactly when should we try to ferret out an unstated premise? The obvious answer is that we should do so when there appears to be something essential missing—an implied, logical link between premises and conclusion that is not a common-sense, generally accepted assumption. Such implicit premises should never be taken for granted because, among other things, they are often deliberately hidden or downplayed to make the argument seem stronger. Be aware, though, that many times the problem with an argument is not unstated premises but invalid or weak structure. Consider this: If that potion contains arsenic, he will die. But it does not contain arsenic, so he will not die. This argument is invalid; the conclusion does not follow from the premises. (After all, arsenic isn’t the only poison that could be in that potion! So even if the 3 | Making Sense of Arguments 79 premises are true, the conclusion need not be.) Like most invalid arguments, it can’t be salvaged without altering it beyond what is clearly implied. It’s just a bad argument. The same goes for weak arguments. They usually can’t be fixed without adding or changing premises gratuitously. Remember, the point of articulating unstated premises is to make explicit what is already implicit. Your job as a critical thinker is not to make bad arguments good; that task belongs to the one who puts forward the argument in the first place. To make sure that your investigation of implicit premises is thorough and reasonable, work through the following three-step process2: Step 1. Search for a credible premise that would make the argument valid, one that would furnish the needed link between premise (or premises) and conclusion. Choose the supplied premise that a. is most plausible and The first requirement (a) means that you should look for premises that are either true or, at least, not obviously false. The second requirement (b) means that premises should fit—that is, at least not conflict—with what seems to be the author’s point or purpose (which, of course, is often difficult to figure out). These two requirements embody what is sometimes known as “the Principle of Charity in Interpretation” or just “the Principle of Charity.” The Principle of Charity says that whenever we find someone’s meaning unclear, we should attempt to interpret it in a way that makes sense. And what “makes sense” will often depend on context. Imagine if someone says to you, “this steak is not good.” Just what does “good” mean here? “Good” can mean lots of things. If you’re at a restaurant, and the person sitting across from you says, “this steak is not good,” she probably means that the steak is tough or not very tasty. But if you’re in your kitchen and your roommate takes a raw steak out of the fridge, sniffs it, and says, “This steak is not good,” it’s quite likely that she means that steak is spoiled. If you looked at your roommate and asked her just how bad the steak tasted, you would be guilty of interpreting her uncharitably: the context clearly indicates that she’s not talking about the steak tasting good but about whether it is spoiled. There’s nothing wrong with arguing Interpreting charitably is the fair thing to do, and it’s the occasionally— in the sense of “having a thing that’s most likely to aid in clear communication. And debate”—but might you fare better by prewhen it comes to criticizing someone else’s argument, you want senting actual arguments and avoiding fallato be especially fair in stating what you think their argument is. cious ones? Betsy Streeter/www.CartoonStock.com b. fits best with the author’s intent. 80 Part One | Basics straw man The fallacy of distorting, weakening, or oversimplifying someone’s position so it can be more easily attacked or refuted. Criticizing a version of their argument into which you’ve inserted a silly or irrelevant premise isn’t very productive, and it isn’t very fair. In fact, that amounts to a well-known fallacy known as the straw man fallacy, which we’ll discuss in more detail in Chapter 5. If the premise you supply is plausible and fitting (with the author’s intent), use it to fill out the argument. If the premise you supplied is either not plausible or not fitting, go to step 2. Step 2. Search for a credible premise that would make the argument as strong as possible. Choose the supplied premise that fulfills stipulations (a) and (b). If the premise you supply is plausible and fitting, use it to fill out the argument. If it is either not plausible or not fitting, consider the argument beyond repair and reject it. Step 3. Evaluate the reconstituted argument. If you’re able to identify a credible, implicit premise that makes the argument either valid or strong, assess this revised version of the argument, paying particular attention to the plausibility of the other premise or premises. Now let’s apply the procedure above to a few arguments: If the Bank of Canada lowers interest rates one more time, there will be a deep recession. So I’m telling you there’s going to be a deep recession. The first step is to see if there’s a credible premise that would make the argument valid. We can see right away that one premise will do the trick: “The Bank of Canada is about to lower interest rates again.” Adding it to the argument will supply the link needed between the existing premise and the conclusion. We also can see that our new premise is plausible (the Bank of Canada has in fact lowered interest rates many times in the past) and seems to fit with the point of the argument (to prove that there will be a recession). Our resulting argument, though, is probably not a good one because the premise about the effect of the Bank of Canada’s lowering interest rates is questionable. Now examine this one: Security officer Blart lied on her employment application about whether she had a criminal record. Security officer Blart will do a bad job of screening passengers for weapons. The sentence “Security officer Blart will do a bad job of screening passengers for weapons” is the conclusion here. To try to make this argument valid, we would need a premise like “Any security officer at Pearson International Airport who has lied on his or her employment application about having a criminal record will do a bad job of screening passengers for weapons.” This premise fits the point of the argument, but it isn’t plausible. Surely it can’t be the case that any security officer who has lied will do a bad job of screening. A more plausible premise is “Most security officers at Vancouver International Airport who have lied on their employment applications about having a criminal record will do a bad job of screening 3 | Making Sense of Arguments passengers for weapons.” This premise will do, and this is now a good argument— assuming that the other premise is true. What about this one?: The use of marijuana should be legal because it’s an act that brings pleasure to people’s lives. To make this argument valid, we need a premise that connects the idea of something being legal with the idea of bringing pleasure. We would need to add this premise (or one like it): “Any act that brings pleasure to people’s lives should be legal.” But this premise is hard to accept since many heinous acts—such as murder and theft—may bring pleasure to some people, yet few of us would think those acts should be legal. To try to make the argument strong, we might add this premise instead: “Some acts should be legal simply because they bring pleasure to people’s lives.” This premise is actually controversial, but it at least is not obviously false. It also fits with the point of the argument. If we decide that the premise is neither plausible nor fitting, we would declare the argument beyond repair. Identifying and filling in missing parts is an important skill. And it’s a challenging one, so it’s important to spend some time practising it. Finding missing parts is challenging in part because it requires interpreting what is seen—the parts of the argument that are right in front of you—in order to form a reasonable hypothesis about what is not seen. Adding to the challenge is that arguers are sometimes unclear and may not even be sure themselves of what they are trying to say. But if we value critical thinking, the challenge of figuring it out is worth the effort. Exercise 3.4 For exercises marked with an asterisk (*), there are answers in Appendix B, Answers to Select Exercises. I. For each of the following arguments, state the implicit premises that will make the argument valid. Example The engine is sputtering. It must be out of gas. Implicit premise: Whenever the engine sputters, it’s out of gas. *1. Any member of Parliament who is caught misusing campaign funds should resign his or her seat. The honourable member from A lgoma-Manitoulin-K apuskasing should resign. 2. Kelly is a very strong student, so she is almost certain to get an A in critical thinking. 81 82 Part One | Basics 3. If you get a good grade on your essay, it’s because I gave you excellent feedback on your first draft. I must have given excellent feedback on your first draft. 4. A major terrorist attack will happen in this country. The RCMP doesn’t have a very serious focus on stopping terrorism. *5. The author of this new book on international peace-keeping is either biased or incompetent as a journalist. So she’s biased. 6. Mavis must know the Koran well. She goes to mosque every day. 7. The government of Saudi Arabia is bound to fall! After all, the Taliban regime in Afghanistan fell because it was deeply sexist. 8. The Canadian government should limit its military activities to the western hemisphere because it doesn’t have the resources to cover the whole world. 9. Salmon has lots of vitamin D. So it must be healthy for you. *10. Taslima did not criticize US military action in the Gulf War or in the war in Afghanistan. She must be pro-American. II. For each of the following arguments, change or add a premise that will make the argument strong. 1. That dude with the beard was in the coffee shop when my laptop was stolen while I was in the bathroom. He was staring at me 20 minutes earlier. So he’s probably the one who stole it. 2. Morgan has a habit of keeping junk that she really should throw out, so she is likely going to end up on one of those reality shows about “hoarders.” *3. Six out of 10 of my teenage friends love rap music. So 60 per cent of all teens love rap music. 4. Seventy-one per cent of the faculty and staff at Spadina College are New Democrats. So most of the students are probably New Democrats. 5. Professor McElrea has never even written a book on the topic he teaches. He’s probably not a very good professor. *6. If Assad’s fingerprints are on the vase, then he’s probably the one who broke it. He’s probably the one who broke it. 7. The owner of the team is almost certainly going to spend big on a star player. If he really wants to make the finals next year, he will do it by spending money on a star player. 8. Ninety per cent of students at the University of Northern Saskatchewan graduate with a BA degree. Li Fong will probably graduate from the University of Northern Saskatchewan with a BA degree. *9. The murder rates in the Atlantic provinces are very low. The murder rates in most large cities in the western provinces are very low. So the murder rate in Toronto must be very low. 10. Paul is a typical Canadian. He probably eats way too many doughnuts. 3 | Making Sense of Arguments 83 Argument Patterns Earlier we discussed the importance of being familiar with patterns, or forms, of argument—that is, the structures on which the content of an argument is laid. The point was that knowing some common argument forms makes it easier to determine whether an argument is deductive or inductive. But being familiar with argument forms is also helpful in many other aspects of argument evaluation. Let’s take a closer look at some of these forms. Food For Thought Arguments on the Net The Internet is fertile ground for all manner of arguments—good and bad, boring and silly. Here’s one that has gone around the world a few times online: Adolf Hitler was evil. Adolf Hitler was a vegetarian. Therefore, vegetarianism is evil. What’s wrong with this argument? If you don’t know, the following section on argument patterns will help you. An important clue that something is fishy here is that any argument of this form can be used to try to “frame” practically anybody. Consider: Dominic lives in Montreal. Dominic is tall. Therefore, everyone who lives in Montreal is tall. The Internet is also a terrific place to find bad political arguments. Consider this one: Donald Trump thinks limiting immigration is a good idea. I don’t like Donald Trump. So limiting immigration must be a bad idea! What’s wrong with this one? If it’s not obvious, try this argument that follows the same pattern: Donald Trump thinks 2 + 2 = 4. I don’t like Donald Trump. So 2 + 2 must not equal 4! The point, of course, is this: the simple fact that your least (or most!) favourite person supports a claim is not a good reason either to believe it or disbelieve it. But it’s also useful to remember that even though the argument above about immigration is a bad argument, its conclusion might still be true, and we may well be able to provide strong support for that conclusion—with a different argument! 84 Part One | Basics Affirming the Antecedent Since argument forms are structures distinct from the content of an argument, we can easily signify different forms by using letters to represent statements in the arguments. Each letter represents a different statement in much the same way that letters are used to represent values in a mathematical equation. Consider this argument: If the job is worth doing, then it’s worth doing well. The job is worth doing. Therefore, it’s worth doing well. We can represent this argument like this: conditional statement An “if–then” statement; it consists of the antecedent (the part introduced by the word if) and the consequent (the part introduced by the word then). antecedent The first part of a conditional statement (If p, then q), the component that begins with the word if. consequent The part of a conditional statement (If p, then q) introduced by the word then. affirming the antecedent/ modus ponens A valid argument form: If p, then q. p. Therefore, q. denying the consequent/ modus tollens A valid argument form: If p, then q. Not q. Therefore, not p. If p, then q. p. Therefore, q. Notice that the first line in the argument is a compound statement. That means it’s composed of at least two constituent statements—“the job is worth doing” and “it’s worth doing well”— which are represented in this case by p and q. So we have two statements in this argument that are arranged into an argument form, one that is both very common and always valid. We can plug any statements we want into this form, and we will still get a valid argument. The premises may be true or false, but the form will be valid. Some of the more common argument patterns that you encounter are like this pattern—they’re deductive and conditional. They are conditional in that they contain at least one conditional, or “if–then,” premise. We describe such premises as conditional because they state the conditions under which a certain state of affairs will obtain. The first statement in a conditional premise (the if part) is known as the antecedent. The second statement (the then part) is known as the consequent. The conditional pattern shown here is called affirming the antecedent or, to use the Latin term, modus ponens. Any argument in the modus ponens form is valid—if the premises are true, the conclusion absolutely must be true. In the argument form shown here, this means that if “If p, then q” and “p” are both true, the conclusion has to be true also. (Try your own example, filling in any true statements you want for “If p, then q” and “p.” If your premises are true, then your conclusion will also be true.) These facts, then, provide a way to quickly size up any conditional argument. If an argument is in the form of modus ponens, it’s valid, regardless of the content of the statements. That’s a very handy thing to know. Denying the Consequent Another common conditional argument form is called denying the consequent or modus tollens: 3 | Making Sense of Arguments 85 If Austin is happy, then Barb is happy. Barb is not happy. Therefore, Austin is not happy. The form of modus tollens is: If p, then q. Not q. Therefore, not p. Like modus ponens, modus tollens is always valid. If the premises are true, the conclusion must be true. Make up your own example to see for yourself! So any argument that’s in the modus tollens pattern is valid. Hypothetical Syllogisms A third common conditional argument form is called hypothetical syllogism. Hypothetical is just another term for conditional. A syllogism is an argument (usually deductive) made up of three statements—two premises and a conclusion. (Modus ponens and modus tollens are particular kinds of syllogisms. We’ll discuss “categorical” syllogisms—deductive syllogisms that show the logical relationships between three categories of things—in Chapter 6, and we’ll discuss inductive “statistical” syllogisms in Chapter 8.) In a hypothetical syllogism, all three statements are conditional, and the argument is always valid: If you leave the door open, the cat will get out. If the cat gets out, it will get hit by a car. Therefore, if you leave the door open, the cat will get hit by a car. Here’s the symbolized version: If p, then q. If q, then r. Therefore, if p, then r. People often use hypothetical syllogisms to reason about causal chains of events. They try to show that one event will lead unavoidably to a sequence of events that will finally conclude in a single event that seems far removed from the first. This linkage has prompted some to label hypothetical syllogisms “chain arguments.” Here’s another example of a hypothetical syllogism: If the Habs lose this game, they’re out of the playoffs. If they’re out of the playoffs, there will be riots in Montreal. Therefore, if the Habs lose this game, there will be riots in Montreal. hypothetical syllogism A valid argument made up of three hypothetical, or conditional, statements: If p, then q. If q, then r. Therefore, if p, then r. syllogism A deductive argument made up of three statements—two premises and a conclusion. See affirming the antecedent and denying the consequent. 86 Part One | Basics Because the structure of this argument is the same as the structure of the previous argument (that is, they’re both hypothetical syllogisms), the symbolized version is exactly the same: If p, then q. If q, then r. Therefore, if p, then r. Denying the Antecedent denying the antecedent An invalid argument form: There are also two common conditional argument forms that are not valid, though they superficially resemble valid forms. One is called denying the antecedent. For example: If p, then q. Not p. Therefore, not q. If Einstein invented the steam engine, then he’s a great scientist. Einstein did not invent the steam engine. Therefore, he is not a great scientist. Denying the antecedent is represented like this: If p, then q. Not p. Therefore, not q. “Mistakes are made on two counts: an argument is either based on error or incorrectly developed.” —Thomas Aquinas You can see the problem with this form in the preceding argument. Even if the antecedent, p, is false (if Einstein did not invent the steam engine), that doesn’t show that he’s not a great scientist because he could be a great scientist on account of some other great achievement. Thus, denying the antecedent is clearly an invalid pattern because it’s possible for the premises to be true and the conclusion false. Review Notes Valid Conditional Argument Forms Affirming the Antecedent (Modus Ponens) Example If p, then q. If Spot barks, a burglar is in the house. p. Spot is barking. Therefore, q. Therefore, a burglar is in the house Denying the Consequent (Modus Tollens) Example If p, then q. If it’s raining, the park is closed. Not q. The park is not closed. Therefore, not p. Therefore, it’s not raining. 3 | Making Sense of Arguments 87 Hypothetical Syllogism Example If p, then q. If Tanvir steals the money, he will go to jail. If q, then r. If Tanvir goes to jail, his family will suffer. Therefore, if p, then r. Therefore, if Tanvir steals the money, his family will suffer. Here’s another example of this form: If Alexander the Great jumped off the CN Tower without a parachute, then Alexander the Great would be dead. Alexander the Great did not jump off the CN Tower without a parachute. Therefore, Alexander the Great is not dead. Even if Alexander the Great did not jump off the CN Tower without a parachute, that in itself does not show that he is not dead. After all, there are lots of ways to die. And in fact, we know that he died (of illness) more than 2300 years ago. In other words, it’s possible for both premises in this argument to be true while the conclusion is nonetheless false. So the argument is invalid. Affirming the Consequent There’s another common invalid form you should know about: affirming the consequent. Here’s an instance of this form: If Brandon is the capital of Manitoba, then Brandon is in Manitoba. Brandon is in Manitoba. Therefore, Brandon is the capital of Manitoba. affirming the consequent An invalid argument form: If p, then q. q. Therefore, p. We represent this form like this: If p, then q. q. Therefore, p. Obviously, in this form it’s possible for the premises to be true while the conclusion is false, as this example shows. This pattern, therefore, is invalid. Disjunctive Syllogism The final pattern we will look at is a common non-conditional argument form called disjunctive syllogism. It’s valid and extremely simple: Either Ralph walked the dog, or he stayed home. He didn’t walk the dog. Therefore, he stayed home. disjunctive syllogism A valid argument form: Either p or q. Not p. Therefore, q. In the second premise of the syllogism, either disjunct (either of the parts separated by “or”) can be denied. 88 Part One | Basics It’s called a disjunctive syllogism because it starts with a disjunction—a statement that says that one or another of two things is true. Each of those things (in this case “Ralph walked the dog” and “he stayed home”) is called a disjunct. The symbolized form of the argument above is thus: Either p or q. Not p. Therefore, q. Keep in mind that in a disjunctive syllogism, either disjunct can be denied, not just the first one. Here’s an example in which the second of the two disjuncts is denied: Either Rick Mercer was joking or he is out of touch with current events. But I know he’s not out of touch with current events! So he must have been joking. These six deductive argument forms (four valid ones and two invalid ones) can help you to streamline the process of argument evaluation. If you want to find out quickly if a deductive argument is valid, you can compare it to these patterns to do that. (But remember, a good deductive argument has both a valid form and true premises.) You need only to see if the argument fits one of the forms. If it fits a valid form, it’s valid. If it fits an invalid form, it’s invalid. If it doesn’t fit any of the forms, then you need to find another way to evaluate the argument. The easiest Review Notes Invalid Conditional Argument Forms Denying the Antecedent Example If p, then q. Not p. Therefore, not q. If the cat is on the mat, she is asleep. She is not on the mat. Therefore, she is not asleep. Affirming the Consequent Example If p, then q. q. Therefore, p. If the cat is on the mat, she is asleep. She is asleep. Therefore, she is on the mat. Disjunctive Syllogism (Valid) Symbolized Version Example Either p or q. Not p. Therefore, q. Either we light the fire or we will freeze. We cannot light the fire. Therefore, we will freeze. 3 | Making Sense of Arguments way to use this form-comparison technique is to memorize all six forms so that you can recognize them whenever they arise. Sometimes you can see right away that an argument has a valid or invalid form. At other times, you may need a little help figuring this out, or you may want to use a more explicit test of validity. In either case, the counterexample method can help. With this technique you check for validity by simply devising a parallel argument that has the same form as the argument you’re evaluating (the test argument) but has obviously true premises and a false conclusion. Recall that any argument having true premises and a false conclusion cannot be valid. So if you can invent such an argument that also has the same pattern as the test argument, you’ve proved that the test argument is invalid. For example, let’s say that you are confronted with this argument: If old-fashioned values are lost, then young people will abandon marriage. Young people have abandoned marriage. Therefore, old-fashioned values have been lost! And to check this test argument, you come up with this parallel argument, which has exactly the same form: If George is a dog, then he is warm-blooded. George is warm-blooded. Therefore, he is a dog. This argument has the same pattern as the previous one—but the premises can easily be true and the conclusion false (assuming, for example, that George is your brother!). So the test argument too has to be invalid. You may have already guessed that it is an instance of affirming the consequent. The counterexample method, though, works not just for the deductive forms we’ve discussed but for all deductive forms. (We will discuss other deductive forms in upcoming chapters.) Exercise 3.5 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. For each of the following arguments, determine whether it is valid or invalid, and indicate the argument pattern. *1. If the Vikings had sailed up the St Lawrence, there would be archeological evidence of that. But there is no such evidence. So the Vikings did not sail up the St Lawrence. 89 90 Part One | Basics 2. If it doesn’t have the Fairtrade Foundation’s mark on it, then it’s not fairtrade coffee. This coffee doesn’t have the Fairtrade Foundation’s mark on it. So it’s not fair-trade coffee. 3. Either Amar has been taking steroids or he’s got a terrific trainer. He hasn’t been taking steroids. So he must have a terrific trainer. 4. If my iPod hasn’t been plugged in overnight, the battery must be dead. The battery isn’t dead. Therefore, my iPod must have been plugged in overnight. 5. If I take the express bus, I’ll get to campus a half-hour before class starts. But I didn’t take the express bus. I won’t get to campus a half-hour before class starts. *6. If CBC News omits important news stories, then it is irresponsible. It is not irresponsible. So CBC News does not omit important news stories. 7. If ESP (extrasensory perception) were real, psychic predictions would be completely reliable. Psychic predictions are completely reliable. Therefore, ESP is real. 8. If my iPhone has been plugged in, the battery must be ok. My iPhone has not been plugged in. Therefore, the battery must be dead. *9. If ESP (extrasensory perception) were real, psychic predictions would be completely reliable. ESP is real. Therefore, psychic predictions are completely reliable. 10. If Tammy has a PhD, she will be hired. Tammy was not hired. Therefore, Tammy does not have a PhD. 11. If interest rates go up, bond prices must go down. Bond prices went down. Therefore, interest rates went up. 12. If our dog Dorothy goes out in the rain, she will get wet. If Dorothy gets wet, she will smell bad. Therefore, if Dorothy goes out in the rain, she will smell bad. Exercise 3.6 For each of the following premises, add another premise and a conclusion to make it valid in two different ways—modus ponens and modus tollens. 3 | Making Sense of Arguments 1. If p, then q. *2. If Lino is telling the truth, he will admit to all charges. 3. If China adopts North American patterns of consumption, then the environment is doomed. 4. If the new vaccine prevents the spread of Ebola, the researchers who developed the vaccine should get the Nobel Prize. *5. If religious conflict in Nigeria continues, thousands more will die. 6. If people love Tim Hortons coffee, there will be long line-ups at every Tim Hortons every morning. 7. We should go to the restaurant without them if Martin and Juliana don’t show up soon. 8. If our politicians realize that they serve the people, and not the other way around, our laws would be much more reflective of our society’s values and beliefs. *9. If solar power can supply six megawatts of power in Vancouver (which is certainly not the sunniest place in the world), then solar power can transform the energy systems in sunnier places like Edmonton and Calgary. 10. If you really want to have fun on your birthday, you should spend it in New York. Exercise 3.7 Use the counterexample method to create a parallel argument for each of the invalid arguments in Exercise 3.5. Write out each parallel argument, and represent its form with letters as discussed earlier. Answers are provided for 4, 5, 7, 8, and 11. Example Test Argument If the government is corrupt, the media will be critical of them. The media have been very critical of the government. Therefore, the government is corrupt. Parallel Argument If Beyoncé could fly, she sure would be famous. She is famous. Therefore, Beyoncé can fly. If a, then b. b. Therefore, a. 91 92 Part One | Basics Diagramming Arguments Most of the arguments we’ve looked at so far have been relatively simple. When arguments are more complex (and in real life they usually are!), you may find it increasingly difficult to sort out premises from conclusions and parts of an argument from non-argumentative background noise. If you can visualize the structure of an argument, though, the job gets much easier. That’s where argument diagramming comes in. Let’s begin by diagramming the following very simple argument before moving on to more complicated ones. Justin Trudeau has great ideas for preserving the natural environment. That’s for sure! Therefore, Trudeau being elected is good for Canada. We must first underline any premise or conclusion indicator words (e.g., “therefore,” “since,” and “because”): Justin Trudeau has great ideas for preserving the natural environment. That’s for sure! Therefore, Trudeau being elected is good for Canada. Next we number all the statements (and only the statements, not questions, etc.) in the passage, in sequential order. (1) Justin Trudeau has great ideas for preserving the natural environment. (2) That’s for sure! (3) Therefore, Trudeau being elected is good for Canada. And then we cross out all extraneous statements—those that are neither premises nor conclusions, those that are redundant, and those that are nothing more than background information or other logically irrelevant material. (1) Justin Trudeau has great ideas for preserving the natural environment. (2) That’s for sure! (3) Therefore, Trudeau being elected is good for Canada. We’ve crossed out claim (2) because it is redundant—it just adds emphasis to what is said in claim (1). Finally, we draw the diagram. Put the numbers associated with the premises inside squares, and place those squares above the number for the conclusion, which is itself put inside a circle. (In our diagramming method, squares will always represent premises, and circles will always represent conclusions.) Then draw arrows from the premises to the conclusion they support. Each arrow represents a logical relationship between premise and conclusion, a relationship that we might normally indicate with the word “therefore” or with the words “is a reason or premise for.” 3 | Making Sense of Arguments 1 3 This diagram is very simple because the argument it represents is very simple. It has just one premise and one conclusion. And it has just one arrow, showing that premise (1) is being used here in support of conclusion (3). Now we’re ready to try a slightly more complicated example. What do I think of shopping at H&M? I’ll tell you! They’ve got great prices, and they’ve got a good selection of men’s clothes. So H&M is a great place to shop! The first thing we do is underline any premise or conclusion indicator words (e.g., “therefore,” “since,” and “because”): What do I think of shopping at H&M? I’ll tell you! They’ve got great prices, and they’ve got a good selection of men’s clothes. So H&M is a great place to shop! Next we number all the statements (and only the statements) in the passage in sequential order. What do I think of shopping at H&M? (1) I’ll tell you! (2) They’ve got great prices, and (3) they’ve got a good selection of men’s clothes. (4) So H&M is a great place to shop! We haven’t numbered that first sentence because it’s a question, not a statement—it’s merely there to introduce the topic. And then we cross out all extraneous statements—those that are neither premises nor conclusions, those that are redundant, and so on. What do I think of shopping at H&M? (1) I’ll tell you! (2) They’ve got great prices, and (3) they’ve got a good selection of men’s clothes. (4) So H&M is a great place to shop! We’ve crossed out the first two sentences because they’re not essential to the structure of this argument. The first sentence isn’t a statement at all. And the second one, though it is a statement, doesn’t really have any content: it just announces that an argument is on its way. Finally, we draw the diagram. Place the numbers of the premises inside squares, and put the number for the conclusion inside a circle. Put the premises 93 94 Part One | Basics above the conclusion on your page. Then draw arrows from the premises to the conclusion they support. 2 3 4 Here we see that our diagram—our argument—is one step more complicated than our previous example. This one has two premises, each lending some support to the conclusion. The logical “flow” from the two premises to the conclusion is represented by the two arrows. Next, let’s try something more complicated still. There is no question in my mind. I therefore maintain that Dexter is the murderer. Because if he did it, he would probably have bloodstains on the sleeve of his shirt. The bloodstains are tiny, but they are there. Any observant person could see them. Also, the murder weapon was within his reach for quite a while before the crime was committed. And since of all the people in the house at the time, he alone does not have an airtight alibi, he must be the killer. Again, the first thing we do is underline any premise or conclusion indicator words (e.g., “therefore,” “since,” and “because”): There is no question in my mind. I therefore maintain that Dexter is the murderer. Because if he did it, he would probably have bloodstains on the sleeve of his shirt. The bloodstains are tiny, but they are there. Any observant person could see them. Also, the murder weapon was within his reach for quite a while before the crime was committed. And since of all the people in the house at the time, he alone does not have an airtight alibi, he must be the killer. Next, we number all the statements (and only the statements) in the passage in sequential order. (For the purposes of diagramming, an if–then statement is considered one statement, and multiple statements in a single compound sentence are to be counted as separate statements. Such statements are usually joined by “and,” “or,” or “but.”) (1) There is no question in my mind. (2) I therefore maintain that Dexter is the murderer. (3) Because if he did it, he would probably have bloodstains on the sleeve of his shirt. (4) The bloodstains are tiny, but they are there. (5) Any observant person could see them. (6) Also, the 3 | Making Sense of Arguments 95 murder weapon was within his reach for quite a while before the crime was committed. (7) And since of all the people in the house at the time, he alone does not have an airtight alibi, (8) he must be the killer. And then we cross out all extraneous statements, noise, redundancies, and anything else that is neither a premise nor a conclusion. (1) There is no question in my mind. (2) I therefore maintain that Dexter is the murderer. (3) Because if he did it, he would probably have bloodstains on the sleeve of his shirt. (4) The bloodstains are tiny, but they are there. (5) Any observant person could see them. (6) Also, the murder weapon was within his reach for quite a while before the crime was committed. (7) And since of all the people in the house at the time, he alone does not have an airtight alibi, he must be the killer. Finally, we draw the diagram. Again, place the numbers of the premises inside squares and above the number for the conclusion, which is itself placed inside a circle. Squares will represent premises, and circles will represent conclusions. Draw arrows from the premises to the conclusion they support. 3 4 6 7 2 In this diagram, you can see that premises 3 and 4 are handled differently from premises 6 and 7. The reason is that some premises are independent and some are dependent. An independent premise offers support to a conclusion without the help of any other premises. If other premises are omitted or undermined in an argument, the support supplied by an independent premise does not change. We represent this fact in the diagram by drawing separate arrows to the conclusion from premises 6 and 7, both of which give it independent support. If we delete one of these premises, the support that the other one gives does not change. Premises 3 and 4 are dependent premises. They do depend on each other to jointly provide support to a conclusion. If either premise 3 or 4 is removed, the support that the remaining premise supplies is undermined or completely cancelled out. By itself, premise 3 (“Because if he did it, he would probably have bloodstains on the sleeve of his shirt”) offers no support whatsoever to the conclusion (“Dexter is the murderer”). And by itself, premise 4 (“The bloodstains are tiny, but they are there”) doesn’t lend any support to the conclusion. But together, premises 3 and 4 offer a good reason to accept the conclusion. We represent dependent premises by independent premise A premise that does not depend on other premises to provide support to a conclusion. If an independent premise is removed, the support that other premises supply to the conclusion is not affected. dependent premise A premise that depends on at least one other premise to provide joint support to a conclusion. If a dependent premise is removed, the support that its linked dependent premises supply to the conclusion is undermined or completely cancelled out. 96 Part One | Basics underlining them together, as in our diagram. Since dependent premises together act as a single premise, or reason, we draw a single arrow from the combined premises (from the line between 3 and 4, each of which is inside its own square) to the conclusion. With the diagram complete, we can see clearly that two independent premises and one set of dependent premises provide support for the conclusion (statement 2). Now, consider this argument: (1) The famous trial lawyer Clarence Darrow (1857–1938) made a name for himself by using the “determinism defence” to get his clients acquitted of serious crimes. (2) The crux of this approach is the idea that humans are not really responsible for anything they do because they cannot choose freely— they are “determined,” predestined, if you will, by nature (or God) to be the way they are. (3) So in a sense, Darrow says, humans are like wind-up toys with no control over any action or decision. (4) They have no free will. (5) Remember that Darrow was a renowned agnostic who was skeptical of all religious claims. (6) But Darrow is wrong about human free will for two reasons. (7) First, in our moral life, our own common-sense experience suggests that sometimes people are free to make moral decisions. (8) We should not abandon what our common-sense experience tells us without good reason—and (9) Darrow has given us no good reason. (10) Second, Darrow’s determinism is not confirmed by science, as he claims—but actually conflicts with science. (11) Modern science says that there are many things (at the subatomic level of matter) that are not determined at all: (12) they just happen. Bettman/Getty Images Indicator words are scarce in this argument, unless you count the words first and second as signifying premises, but they’re not reliable indicators. After we number the statements consecutively and cross out extraneous statements, the argument looks like this: Clarence Darrow was skilled at argumentation, which he used to good effect in his most famous case, the so-called Scopes Monkey Trial of 1925, in which he defended a man (John Scopes) charged with teaching evolution in a public school. Give examples of other fields, beside law, in which good reasoning is essential. (1) The famous trial lawyer Clarence Darrow (1857–1938) made a name for himself by using the “determinism defence” to get his clients acquitted of serious crimes. (2) The crux of this approach is the idea that humans are not really responsible for anything they do because they cannot choose freely—they are “determined,” predestined, if you will, by nature (or God) to be the way they are. (3) So in a sense, Darrow says, humans are like wind-up toys with no control over any action or decision. (4) They have no free will. (5) Remember that Darrow was a renowned agnostic 3 | Making Sense of Arguments who was skeptical of all religious claims. (6) But Darrow is wrong about human free will for two reasons. (7) First, in our moral life, our own common-sense experience suggests that sometimes people are free to make moral decisions. (8) We should not abandon what our common- sense experience tells us without good reason—and (9) Darrow has given us no good reason. (10) Second, Darrow’s determinism is not confirmed by science, as he claims—but actually conflicts with science. (11) Modern science says that there are many things (at the subatomic level of matter) that are not determined at all: (12) they just happen. To simplify things, we can eliminate several statements right away. S tatements 1 through 4 are just background information on Darrow’s views. Statement 5 is irrelevant to the argument; his agnosticism has no logical connection to the premises or conclusion. Statement 12 is a rewording of statement 11. After this elimination process, only the following premises and conclusion (statement 6) remain: (6) But Darrow is wrong about human free will for two reasons. (7) First, in our moral life, our common-sense experience suggests that sometimes people are free to make moral decisions. (8) We should not abandon what our common-sense experience tells us without good reason. (9) Darrow has given us no good reason. (10) Second, Darrow’s determinism is not confirmed by science, as he claims—but actually conflicts with science. (11) Modern science says that there are many things (mostly at the subatomic level of matter) that are not determined at all. The question is, how are these premises related to the conclusion? Well, premises 7, 8, and 9 are dependent premises supporting the conclusion. Taken separately, these premises are weak, but together they constitute a plausible reason for accepting statement 6. Premise 10 directly supports the conclusion, and it in turn is supported by premise 11. These logical relationships can be diagrammed like this: 11 7 10 6 8 9 97 98 Part One | Basics Review Notes Diagramming Arguments: Step by Step 1. Underline all premise or conclusion indicator words such as “since,” “therefore,” and “because.” Then number the statements. 2. Cross out all extraneous material—redundancies, irrelevant sentences, questions, exclamations. 3. Draw the diagram using numbered squares to represent premises and numbered circles to represent conclusions. Connect premises and conclusions with arrows showing logical connections. Include both dependent and independent premises, and draw a line under dependent premises to connect them. Notice how statement 10 is diagrammed. It is a premise leading to the conclusion (6), so it needs to be inside a square. But it is also a conclusion (supported by premise 11), so it also needs to be inside a circle. The circle–square combination indicates that the statement is a sub-conclusion, a statement that serves as both a premise and a conclusion. Now read this passage: As the Islamic clerics cling to power in Iran, students there are agitating for greater freedom and less suppression of views that the clerics dislike. Even though ultimate power in Iran rests with the mullahs, it is not at all certain where the nation is headed. Here’s a radical suggestion: the Islamic republic in Iran will fall within the next five years. This is because the majority of Iranians are in favour of democratic reforms, and no regime can stand for very long when citizens are demanding access to the political process. Also, Iran today is a mirror image of the Soviet Union before it broke apart—there’s widespread dissatisfaction and dissent at a time when the regime seems to be trying to hold the people’s loyalty. Every nation that has taken such a path has imploded within five years. Finally, the old Iranian trick of gaining support for the government by fomenting hatred of America will not work anymore because Iran is now trying to be friends with the United States. When we number the statements and underline the indicators, we get this: (1) As the Islamic clerics cling to power in Iran, students there are agitating for greater freedom and less suppression of views that the clerics dislike. (2) Even though ultimate power in Iran rests with the mullahs, it is not at all certain where the nation is headed. Here’s a radical suggestion: (3) the Islamic republic in Iran will fall within the next five years. (4) This is because the majority of Iranians are in favour of democratic reforms, (5) and no regime can stand for very long when citizens are demanding access to the political process. (6) Also, Iran today is a mirror image of the Soviet Union before 3 | Making Sense of Arguments it broke apart—there’s widespread dissatisfaction and dissent at a time when the regime seems to be trying to hold the people’s loyalty. (7) Every nation that has taken such a path has imploded within five years. (8) Finally, the old Iranian trick of gaining support for the government by fomenting hatred of America will not work anymore (9) because Iran is now trying to be friends with the United States. And here’s the passage with the extraneous material crossed out: (1) As the Islamic clerics cling to power in Iran, students there are agitating for greater freedom and less suppression of views that the clerics dislike. (2) Even though ultimate power in Iran rests with the mullahs, it is not at all certain where the nation is headed. Here’s a radical suggestion: (3) the Islamic republic in Iran will fall within the next five years. (4) This is because the majority of Iranians are in favour of democratic reforms, (5) and no regime can stand for very long when citizens are demanding access to the political process. (6) Also, Iran today is a mirror image of the Soviet Union before it broke apart—there’s widespread dissatisfaction and dissent at a time when the regime seems to be trying to hold the people’s loyalty. (7) Every nation that has taken such a path has imploded within five years. (8) Finally, the old Iranian trick of gaining support for the government by fomenting hatred of America will not work anymore (9) because Iran is now trying to be friends with the United States. The conclusion is statement 3, and the premises are statements 4 through 9. The first two statements are extraneous. Statements 4 and 5 are dependent premises, and so are statements 6 and 7. Statements 8 and 9 constitute an argument that gives support to the conclusion of the passage. Statement 8 is the conclusion; statement 9, the premise. The diagram of this argument is as follows: 9 8 6 7 4 5 3 By the time you work through the diagramming exercises in this chapter, you will probably be fairly proficient in diagramming arguments of all kinds. 99 100 Part One | Basics Just as important, you will have a better appreciation of how arguments are built, how they are dissected, and how you can judge their value in a penetrating, systematic way. Exercise 3.8 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. For each of the following diagrams, devise an argument whose premises and conclusion can be accurately depicted in the diagram. Write out the argument, number each statement, and insert the numbers into the diagram at the right places. *1. 2. 3. 3 | Making Sense of Arguments *4. 5. 6. 7. 101 102 Part One | Basics Exercise 3.9 Diagram the following arguments using the procedure discussed in the text. 1. Mayor LeClerc must be corrupt. Because his behaviour suggests that he’s either corrupt or incompetent. He’s not incompetent, though, because he seems to be very good at getting self-serving bylaws passed by city council. 2. Violent crime rates are at an all-time low, and prisons are reporting that inmates are much better behaved. Our government’s new criminal laws seem to be doing their job. 3. I think that university is overrated. Their professors aren’t very accomplished, and their students are a bunch of rich brats. They also try way too hard to get into the news by bragging about every minor success. 4. If an individual in a coma is no longer a person, then giving him a drug to kill him is not murder. Such an individual is in fact not a person. Therefore, giving him the drug is not murder. 5. I think city council should pass a bylaw prohibiting smoking in all restaurants and bars. It won’t be a popular move, but it’s clearly the best thing from a public health point of view. By passing such a bylaw, city council would be setting a good example and reminding everyone what a serious risk smoking poses. *6. If Marla buys the house in the suburbs, she will be happier and healthier. She is buying the house in the suburbs. So she will be happier and healthier. 7. If you don’t set your alarm, you won’t wake up in time. If you don’t wake up in time, you’ll miss the bus. If you miss the bus, you won’t be able to write your final exam. If you miss one more final exam, you’ll get kicked out of school. So if you don’t set your alarm, you’ll get kicked out of school. 8. “Grow accustomed to the belief that death is nothing to us, since every good and evil lie in sensation. However, death is the deprivation of sensation. Therefore . . . death is nothing to us.” (Epicurus) 9. “A cause-and-effect relationship is drawn [by those opposed to pornography] between men viewing pornography and men attacking women, especially in the form of rape. But studies and experts disagree as to whether any relationship exists between pornography and violence, between images and behavior. Even the pro-censorship Meese Commission Report admitted that the data connecting pornography to violence was unreliable.” (Free Inquiry, Fall 1997) *10. The existence of planets outside our solar system is a myth. There is no reliable empirical evidence at all showing that planets exist outside our solar system. 11. If Li Yang gets a high score on her test, she will have a perfect grade point average. If she gets a low score, she will drop out of school. She will get a high score on the test, so she will have a perfect grade point average. 3 | Making Sense of Arguments 12. Cindy is a 15-year-old. No 15-year-old has ever gained a PhD in nuclear physics. Therefore, Cindy does not have a PhD in nuclear physics. 13. Most nurses are very knowledgeable, and Richard is a nurse. Therefore, R ichard is probably very knowledgeable. Richard probably studies very hard because most people who are very knowledgeable have studied very hard. 14. Gloria has to choose between chocolate and vanilla. But she hates vanilla. So she’ll have chocolate. 15. It’s very easy to tell whether bread is freshly baked or not. The aroma is unmistakable, and the inside will be soft and moist. Baker’s Bakery says that their bread is freshly baked in their store every day, but they must be lying. There is no aroma, and the bread is hard and dry. I also saw a delivery guy from the local grocery store carrying bread into the bakery. 16. “It is clear that archaeologists have not yet come to terms with dowsing [the practice of searching for underground water or treasure by paranormal means]. Where it has been the subject of tests, the tests have been so poorly designed and executed that any conclusion whatsoever could have been drawn from them. The fact that such tests are usually carried out only by researchers with a prior positive view of dowsing means that the conclusions will likely also be positive. The normal processes of peer review and scholarly discussion have also failed to uncover the lack of properly controlled test conditions in such studies as those of Bailey et al. and Locock, causing a generation of students and general readers in the United Kingdom, at least, to remain under the impression that the reality of archaeological dowsing had been all but confirmed by science.” (Skeptical Inquirer, March/April 1999) *17. There are at least two main views regarding the morality of war. Pacifism is the view that no war is ever justified because it involves the taking of human life. Just-war theory is the view that some wars are justified for various reasons—mostly because they help prevent great evils (such as massacres, “ethnic cleansing,” or world domination by a madman like Hitler) or because they are a means of self-defence. I think our own moral sense tells us that occasionally (as in the case of World War II, for example), violence is morally justified. It would be hard for anyone to deny that a war to prevent something like the Holocaust is morally right. 18. Some say that those without strong religious beliefs—non-believers in one form or another—cannot be moral. But millions upon millions of people have been non-believers or non-theists and yet have produced some of the most noble and most morally principled civilizations in history. Consider the Buddhists of Asia and the Confucianists of China. Consider also the great secular philosophers from the ancient Greeks to the likes of Bertrand Russell and John Searle of the twentieth century. 19. Glimglom is either a Jabberwoky or a Bugaboo or a Sceadugenga. But he’s not a Jabberwoky because he doesn’t have jaws that bite. And he’s not a Bugaboo because he’s not covered in goo. So he must be a Sceadugenga! 103 104 Part One | Basics *20. The picnic will probably be spoiled because there is a 90 per cent probability of rain. 21. I’m pretty sure that café on Yonge Street we went to that one time will go out of business soon. Their coffee was nothing special, and their cakes tasted like they were baked a week ago. Some food critics have also criticized the café’s poor service on several reputable review websites. 22. We should not reform Canada’s Senate, because our current system of appointing senators works just fine and all senators do lots of good work by holding committee hearings that shed light on important issues. Assessing Long Arguments The general principles of diagramming can help you when you have to evaluate arguments that are much longer and more complicated than most of those in this chapter. Some arguments are embedded in extended passages, persuasive essays, long reports, and even whole books. In such cases, the kind of detailed argument diagramming we use to analyze short passages won’t help you much. In very lengthy works, our three-step diagramming procedure would be tedious and time-consuming—if not maddening. But the general approach used in the procedure is relevant to longer arguments. When you have to evaluate a very long passage, you are almost always faced with three obstacles: 1. Only a small part of the writing may contain statements that serve as the premises and conclusion. (The rest is background information, reiterations of ideas, descriptions, examples, illustrations, asides, irrelevancies, and more.) 2. The premises or conclusion may be implicit. 3. Many longer works purporting to be filled with arguments contain very few arguments or none at all. (It’s common for many books—even bestsellers—to pretend to make a case for something but to be without any genuine arguments.) Fortunately, you can usually overcome these impediments if you’re willing to put in some extra effort. The following is a four-step procedure that can help: Step 1. Study the text until you thoroughly understand it. You can’t find the conclusion or premises until you know what you’re looking for—and that requires having a clear idea of what the author is driving at. Don’t try to find the conclusion or premises until you “get it.” This understanding entails having an overview of a great deal of text, a bird’s-eye view of the whole work. Step 2. Find the conclusion. When you evaluate extended arguments, your first task, as in shorter writings, is to find the conclusion. There may be several 3 | Making Sense of Arguments main conclusions or one primary conclusion with several sub-conclusions (as depicted in some of the previous argument diagrams). Or the conclusion may be nowhere explicitly stated but embodied in metaphorical language or implied by large amounts of prose. In any case, your job is to come up with a single conclusion statement for each conclusion—even if you have to paraphrase large sections of text to do it. Step 3. Identify the premises. Like the hunt for a conclusion, unearthing the premises may involve condensing large sections of text into a manageable form— namely, single premise statements. To do this you need to disregard extraneous material and keep your eye on the “big picture.” Just as in shorter arguments, premises in longer pieces may be implicit. At this stage, you shouldn’t try to incorporate the details of evidence into the premises, though you must take them into account to fully understand the argument. Step 4. Diagram the argument. After you identify the premises and conclusion, diagram them just as you would a much shorter argument. Let’s see how this procedure works on the following selection: The Case for Discrimination Edgardo Cureg was about to catch a Continental Airlines flight home on New Year’s Eve when he ran into a former professor of his. Cureg lent the professor his cellphone and, once on board, went to the professor's seat to retrieve it. Another passenger saw the two "brown-skinned men" (Cureg is of Filipino descent, the professor Sri Lankan) conferring and became alarmed that they, and another man, were "behaving suspiciously." The three men were taken off the plane and forced to get later flights. The incident is now the subject of a lawsuit by the ACLU [American Civil Liberties Union]. Several features of Cureg's story are worth noting. First, he was treated unfairly in that he was embarrassed and inconvenienced because he was wrongly suspected of being a terrorist. Second, he was not treated unfairly, because he was not wrongly suspected. A fellow passenger, taking account of his apparent ethnicity, his sex and age, and his behavior, could reasonably come to the conclusion that he was suspicious. Third, passengers' anxieties, and their inclination to take security matters into their own hands, increase when they have good reason to worry that the authorities are not taking all reasonable steps to look into suspicious characters themselves. . . . Racial profiling of passengers at check-in is not a panacea. John Walker Lindh could have a ticket; a weapon could be planted on an unwitting 73-year-old nun. But profiling is a way of allocating sufficiently the resources devoted to security. A security system has to, yes, discriminate—among levels of threat. (National Review, 1 July 2002. © 2002 National Review, Inc. Reprinted by permission.) 105 106 Part One | Basics Food For Thought No Arguments, Just Fluff Once you get really good at spotting arguments in a variety of passages, you may be shocked to see that a massive amount of persuasive writing contains no arguments at all. Apparently, many people—including some very good writers—think that if they clearly express their opinions, they have given an argument. You could look at this state of affairs as evidence that people are irrational—or you could view it as a timesaver, since there's no need to waste your time on a bunch of unsupported opinions. Unsupported opinions are everywhere, but they seem to permeate political writing, letters to the editor, and anything that's labelled "spiritual." Sometimes opinions are so weakly supported that they're almost indistinguishable from completely unsupported ones. Here's a taste: My family and friends have season tickets for the Buffalo Bandits. The disrespect that is shown to America by this team is appalling, particularly in this time of war. As both the Canadian and American national anthems are sung before each game, members of the team are hopping around, tugging at their uniforms, talking and carrying on amongst themselves. The players can't even wait for the national anthem to finish before they run off to their respective field positions. Whether one is for or against the war is irrelevant. Have some respect for America and what it stands for. (Letter to the editor, Buffalo News website) There's no argument there, just indignation. So after a decade of progress, we have our smog problem back (as if it ever left). Another problem overlooked? Couldn't be because of all the giant behemoths (SUVs) on the road, could it? Nah. Or letting all the trucks from south of the border into our country without safety and smog inspections, could it? Nah. It couldn't be because the government needs to have control of all it surveys? Nah. It must be something simpler, you think? Nah. (Letter to the editor, Daily News [Los Angeles] website) There's no argument there either. How little is said or taught of the soul-life and its complete identification with the human being! To most men the soul is something apart from themselves that is only to be talked of and trusted in on special occasions: There is no real companionship, no intimate affiliation, between men's minds and souls in their everyday existence. Now there is in every man a divine power, and when that divinity, which is real self, is acknowledged and understood by the mind, it takes a very active part in man's life—indeed, it could fill at the very least one-half of his thought-life. (Theosophy website, www.theosophy-nw.org/theosnw/ path/oc-kt.htm) Nope. 3 | Making Sense of Arguments In this example, the author has given us a break by alluding to the conclusion in the title: discrimination by racial profiling is a justified security measure. Notice that this conclusion is not explicitly stated in the text but is implied by various remarks, including "A security system has to, yes, discriminate." Given this conclusion, we can see that the entire first paragraph is background information— specifically, an example of racial profiling. The first premise is implicit. We glean it from the comments in the second paragraph: racial profiling is a reasonable response in light of our legitimate concerns about security. The second premise is explicit: profiling is a way of allocating the resources devoted to security. Laid out in neat order, this argument looks like this: (1) Racial profiling is a reasonable response in light of our legitimate concerns about security. (2) Profiling is a way of allocating sufficiently the resources devoted to security. (3) Therefore, discrimination by racial profiling is a justified security measure. The diagram of this argument looks like this: 1 2 3 A fact that can further complicate the argument structure of a long passage is that complex arguments can sometimes be made up of simpler arguments (sub-arguments). For example, the conclusion of a simple argument can serve as a premise in another simple argument, with the resulting chain of arguments constituting a larger complex argument. Such a chain can be long. The complex argument can also be a mix of both deductive and inductive arguments. Fortunately, all you need to successfully analyze these complex arguments is mastery of the elementary skills discussed earlier. (Recall that we used both a circle and a square to indicate that a particular statement is acting as both a premise of one sub-argument and the conclusion of another sub-argument.) The best way to learn how to assess long passages is to practise, which you can do in the following exercises. Be forewarned, however, that this skill depends heavily on your ability to understand the passage in question. If you can grasp the author's purpose, you can more easily paraphrase the premises and conclusion and uncover implicit statements. You will also be better at differentiating the extraneous stuff from the real meat of the argument. In the "Critical Thinking and Writing Exercise" for this chapter, we continue this discussion of evaluating long arguments. 107 "Our minds anywhere, when left to themselves, are always thus busily drawing conclusions from false premises." —Henry David Thoreau 108 Part One | Basics Exercise 3.10 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. For each of the following passages, (1) list the conclusion and premises, and (2) diagram the argument. *1. "It could be that collagen supplements provide meaningful clinical benefit to arthritis and joint pain, but there's certainly no persuasive evidence yet to suggest that's the case. Based on what collagen is, how it's absorbed, and how we know collagen is actually synthesized in the body, it's highly implausible that a small supplement of amino acids consumed daily will have any meaningful therapeutic effects. While it appears to be safe to consume, Genacol, like other collagen supplements, appears to be little more than an expensive protein supplement. If you're seeking extra collagen, my suggestion is to skip the supplements, and go for a well-marbled steak. Enjoy it, but don't expect the steak, or a collagen supplement, to relieve your joint pain. (Science-Based Pharmacy, 11 November 2011) 2. "[B]e smart about the shrimp you eat. Thankfully in Canada this is easier than in many places. Most of Canada's shrimp fisheries are considered to be ecologically sustainable with minimal bycatch, although some use otter trawls which can severely damage sea floor habitats. Canada is home to one of the most sustainable prawn fisheries in the world—the B.C. spot prawn fishery. This fishery uses traps that do not result in as much bycatch or habitat damage. We also have programs like Oceans Wise that will tell you if the shrimp you want to buy for the barbecue or order in a restaurant won't harm the oceans they come from. Shrimp should be something special we eat in celebration of special events like World Oceans Day! Fortunately the timing coincides with the B.C. spot prawn season. Yes, you will pay more for the shrimp you eat but the oceans will pay less for your choices. Your longterm gain will be appreciating and eating other marine life for much longer." (Sarah Foster, InformedOpinions.org, 5 June 2014) 3. We should move to a bigger house. After all, this house already feels full—all the bedrooms are being used. And we've decided to adopt a third child. And besides, a bigger house would mean having room for a playroom for the kids, and I think play space is really important. And we can afford it! There are good neighbourhoods that aren't too expensive, with bigger houses that just need a little fixing up. 4. "The first thing that must occur to anyone studying moral subjectivism [the view that the rightness or wrongness of an action depends on the beliefs of an individual or group] seriously is that the view allows the possibility that an action can be both right and not right, or wrong and not wrong, etc. This 3 | Making Sense of Arguments possibility exists because, as we have seen, the subjectivist claims that the moral character of an action is determined by individual subjective states; and these states can vary from person to person, even when directed toward the same action on the same occasion. Hence one and the same action can evidently be determined to have—simultaneously—radically different moral characters. . . . [If] subjectivism . . . does generate such contradictory conclusions, the position is certainly untenable." (Phillip Montague, Reason and Responsibility) 5. I just heard about another lawsuit accusing the Vatican of hiding instances of sexual abuse by priests in Canada and the United States. Sexual abuse is never OK, but I think such cases should be dismissed by courts in light of the community stature and function of priests and the benefits that accrue to society in the aftermath of the decision. Let's consider community stature first. The community stature of priests must always be taken into account in these abuse cases. A priest is not just anybody; he performs a special role in society—namely, to provide spiritual guidance and to remind people that there is both a moral order and a divine order in the world. The priest's role is special because it helps to underpin and secure society itself. Anything that could undermine this role must be neutralized as soon as possible. Among those things that can weaken the priestly role are publicity, public debate, and legal actions. Abuse cases are better handled in private by those who are keenly aware of the importance of a positive public image of priests. And what of the benefits of curtailing the legal proceedings? The benefits to society of dismissing the legal case outweigh all the alleged advantages of continuing with public hearings. The primary benefit is the continued nurturing of the community's faith, without which the community would cease to function effectively. Summary Arguments come in two forms: deductive and inductive. A deductive argument is intended to provide logically conclusive support for a conclusion; an inductive one is intended to provide probable support for a conclusion. Deductive arguments can be valid or invalid, whereas inductive arguments are strong or weak. A valid argument with true premises is said to be sound. A strong argument with true premises is said to be cogent. Evaluating an argument is the most important skill of critical thinking. It involves finding the conclusion and premises, checking to see if the argument is deductive or inductive, determining its validity or strength, and discovering if the premises are true or false. Sometimes you also have to ferret out implicit, or unstated, premises. 109 110 Part One | Basics Arguments can come in certain common patterns, or forms. Two valid forms that you will often run into are modus ponens (affirming the antecedent) and modus tollens (denying the consequent). Two common invalid forms are denying the antecedent and affirming the consequent. Analyzing the structure of arguments is easier if you diagram them. Argument diagrams can help you to visualize the function of premises and conclusions and the relationships among complex arguments with several sub-arguments. Assessing very long arguments can be challenging because they may contain lots of verbiage but few or no arguments and many premises can be implicit. Evaluating long arguments, though, requires the same basic steps as assessing short ones: (1) ensure that you understand the argument, (2) find the conclusion, (3) find the premises, and (4) diagram the argument to clarify logical relationships. Field Problems 1. Find a short passage online claiming to present an argument for a particular view but that actually contains no real arguments at all. A good way to begin is by doing the following Google search: Google the phrase "I strongly believe" or something similar (in quotation marks), along with a word representing a favourite topic of your choosing—politics, religion, sports, animal rights, whatever. Such a search will almost certainly lead you to some strong statement of opinion presented without sufficient argumentation. Then rewrite the passage and include an argument for the original view. 2. Visit a website intended to support a particular view on a social or political issue that interests you. Using the information on the website, write a 300-word passage containing an argument for a view that the website might endorse. 3. The next time you're watching television with commercials or an ad before a YouTube video, find the argument in one ad (why you should buy this car or download that app, etc.). Write out its premises and conclusion. Are any of its premises hidden? Find another ad that contains no clear argument at all. If it contains no argument, does it still try to convince you of something? How? Self-Assessment Quiz 1. What is a deductive argument? An inductive argument? 2. What distinguishes a valid argument from an invalid one? 3. What is an inductive argument? What is a strong inductive argument? 4. What is the difference between a cogent argument and a sound argument? 3 | Making Sense of Arguments Say whether the following arguments are deductive or inductive. 5. If you don't stop talking, then you're going to embarrass yourself. You seem determined to keep talking. So you're just going to end up embarrassing yourself. 6. There's an 80 per cent chance that the hurricane will veer northward tomorrow and hit Halifax. So Halifax will probably feel the force of the hurricane tomorrow. 7. Professor Goss is an expert. Whatever he says about accounting has got to be true. 8. Whatever Neil deGrasse Tyson says is pretty much always true. He says scientific literacy is important. So we should emphasize science more in our school's curriculum. In each of the following arguments, identify the implicit premise that will make the argument either valid or strong. 9. Spizzirri has ordered his engineers to design a perpetual motion machine. Clearly, he has no idea of how the laws of physics work. 10. KC Roberts and the Live Revolution is a funk band. So they're not likely to play any Drake tunes during their show Saturday night. 11. Given that so many people can't tell fake news from real news and can't even explain what counts as fake news, the future of the country does not look bright. Grades in university science courses will probably drop dramatically. 12. For each of the following exercises, give an example of the argument pattern indicated. a. Affirming the consequent b. Denying the antecedent c. Modus tollens d. Modus ponens Diagram the following arguments: 13. Bullock was rude to Al this morning, and Martha said Bullock didn't even apologize when he knocked over the milk at breakfast. He's in a bad mood! 14. The rule against lying is not a universal moral rule. If it were, then telling the truth should come naturally to everyone. But it does not come naturally to everyone because we all know lying is actually very common. 15. If dolphins have minds comparable to ours, then these creatures are self- conscious, intelligent, and creative. If they are self-conscious, then they should react appropriately when they see their reflections in a mirror. They do react appropriately. If they're intelligent, they should be able to solve complex problems. They can solve such problems. If they're creative, they should be able to 111 112 Part One | Basics create some form of art. In a rudimentary way, they do create art. They are definitely self-conscious, intelligent, and creative. 16. Someone left me a nice present after the party! But the only people who know that I like dark chocolate are Mark and his boyfriend Dave and also Francine. But Francine wasn't at the party. Oh, wow, it must have been Mark and Dave! 17. It is absolutely unacceptable for anyone to bring cats into my house. Cats shed everywhere, and I have a serious allergy to fur. I also can't stand their constant meowing. The sound drives me crazy! 18. It conflicts with science, so creationism is an inadequate theory about the origins of life. Also, it is incapable of predicting any new facts. Integrative Exercises These exercises pertain to material in Chapters 1–3. For each of the following passages, state whether it contains an argument. If it does, specify the conclusion and premises, any argument indicator words, whether the argument is deductive or inductive, and whether it contains an example of face-saving or group-pressure thinking. Also identify any implicit premises, and diagram the argument. 1. Dr Jeckel, the world's leading expert on schizophrenia, has suggested that the mental disorder is a direct result of psychological trauma suffered during early childhood. He sounds like he knows what he's talking about, so that must be the cause of schizophrenia. 2. If today's more potent marijuana were more dangerous than the marijuana of days gone by, then you would expect to see more drug-related deaths in Europe, where hashish—a more potent drug from the same plant as marijuana—is more common. But we do not, in fact, see higher rates of drug-related deaths in Europe. So marijuana that is more potent is not necessarily more dangerous. 3. "If it is to maintain the confidence of Canadians and their governments, which have generously bankrolled the company for decades, Bombardier must make public the results of its internal investigation into the Multiserv relationship and take appropriate action against any executives found to have acted contrary to the company's Code of Ethics and Business Conduct." (Konrad Yakabuski, Globe and Mail, 3 January 2018) 4. "[Is] there scientific evidence that prayer really works? . . . The problem with . . . any so-called controlled experiment regarding prayer is that there can be no such thing as a controlled experiment concerning prayer. You can never divide people into groups that received prayer and those that did not. The main reason is that there is no way to know that someone did not receive prayer. How would anyone know that some distant relative was not praying 3 | Making Sense of Arguments for a member of the group . . . identified as having received no prayer?" (Free Inquiry, Summer 1997) 5. "The handling of Occupy Vancouver by the authorities is eroding public faith in the rule of law. It is clear that what started as a protest with significant public sympathy for the core cause has now settled into a squat by people who either believe they are not covered by the laws that govern everyone else or who are spoiling for a confrontation with authorities." (Vancouver Sun, 11 November 2011) 6. "A diverse workplace is a wonderful thing. First, it's a sign (although an imperfect one) that a company's hiring practices are fair. Second, it means that diverse viewpoints are brought to bear on any problem the company faces." (Business Ethics Highlights, 6 December 2017) 7. Life on Earth today is better than it has ever been. We have technologies that our grandparents could only dream of. Life expectancies keep going up and up. And despite all the criticisms, I just don't think there's anything wrong with our modern consumer culture. 8. Alfred has decided that the best way for his company to save money is for it to dump its waste into the ocean instead of paying to dispose of it properly. Unfortunately, this practice is highly controversial. Therefore, it is very likely that Alfred's company will be featured in the local magazine's next issue as the worst business in town. 9. We evaluated the accuracy of recent news reports on a wide range of news topics. We focused on reports aired or published by three major media outlets. We found that 40 per cent of their news reports were highly inaccurate. So, though it's hard to believe, 40 per cent of all the news reports that people are exposed to are questionable. 10. Allow me to explain to you why I think that hockey is the greatest sport ever in the history of the entire world. It is incredibly fast-paced, since skating allows the players to move at great speeds. Also, a lot of skill is involved in controlling such a small puck with something like a hockey stick with so much precision. Lastly, the checking and even fighting makes the sport very physical and exciting to watch. 11. People who have more than 10 pairs of shoes are not financially responsible. There's no reason to have that many pairs of shoes, since there wouldn't even be time to wear them all. And people who spend money on things they can't use are obviously irresponsible with their money. Also, my mom only has a couple of pairs of shoes, and she's the most financially responsible person I know. 12. If sex education in the schools can reduce the teen pregnancy rate or help delay the onset of teen sexual activity, I'm all for it. A recent study of several hundred teens showed that sex education in school lowered the incidence of teen pregnancy. We should have sex ed in all public schools. 113 114 Part One | Basics 13. The worst calamity that will befall the world in the next 20 years will be the use of small nuclear weapons by terrorists or rogue states. The death toll from such a state of affairs is likely to be higher than that of any other kind of human devastation. The United Nations just issued a report that comes to the same conclusion. We should act now to prevent the proliferation of nuclear weapons and nuclear-weapons-grade material from falling into the wrong hands. 14. "Dr. [Martin Luther] King was 26 when the Montgomery bus boycott began. He started small, rallying others who believed their efforts mattered, pressing on through challenges and doubts to change our world for the better. A permanent inspiration for the rest of us to keep pushing towards justice." (Barack Obama, Twitter, 15 January 2018) 15. Magazines regularly publish articles on "the sexiest man alive" or "the most beautiful woman in the world." All you have to do to see that these claims of superior attractiveness are crazy is to stroll down any main thoroughfare in any nation's capital. There you will see people—male and female—who make the magazines' favourite personifications of beauty or sexiness look like dogs. 16. The movie The Godfather is praised by many as one of the greatest mobster films ever produced. Even Mafia members have remarked on the astounding accuracy with which their lifestyles were recreated on the big screen, and critics consider historical accuracy a vital characteristic of a good mobster film. Marlon Brando and Al Pacino were both credited with delivering outstanding performances. 17. Peanuts are good for you. A million little monkeys can't be wrong. 18. "Coco is one of the most beautiful movies I've ever watched. I laughed and cried and left the cinema smiling. Such a joy" (Trevor Noah, Twitter, 24 N ovember 2017) 19. "So Stephen Harper has officially declared that the time for debating Canada's presence in Afghanistan is over (Now magazine, 16–22 March 2006). I have the utmost respect for our soldiers, but don't we owe it to them to have a legitimate debate on the issue to ensure they're there for the right reasons? Years into the mission, the government has completely lost sight of why we went in the first place and has become more concerned with saving face. Now that we're being told Canada might be in Afghanistan upwards of 10 years, there's never been a more important time for debating the issue. This idea of giving the government unquestioned support for war is dangerously close to the backwards mentality of the US." (Letter to the editor, Now magazine, 23–29 March 2006) 20. Freedom is a necessary component of the good life. The good life is something that every human being has a right to. Everything that humans have a right to should be acquired by any means necessary. Therefore, any war conducted to secure freedom for any of us is justified. 3 | Making Sense of Arguments Critical Thinking and Writing Exercise From Thesis to Outline In the "Critical Thinking and Writing Exercise" in Chapter 1, we saw that the second step in writing an argumentative essay (after determining your thesis statement, or conclusion) is to create an outline. Outlines are useful because, among other things, they help to avert disaster in the essay-writing phase. Imagine writing two-thirds of your essay, then discovering that the second premise of your argument cannot be supported and is, in fact, false. You might have to throw out the whole argument and start over. At the head of your outline, insert your thesis statement, expressing it as clearly and as precisely as possible. At every stage of outlining, you can then refer to the statement for guidance. The premises and conclusion of your argument (or arguments) will constitute the major points of your outline. The following, for example, is the preliminary outline for the essay discussed in the module at the end of Chapter 2: Thesis: Allowing coal-burning power plants to emit more sulphur dioxide will most likely increase the incidence of respiratory illnesses. I. High amounts of sulphur dioxide in the air have been linked to increases in the incidence of asthma and other respiratory illnesses. II. Many areas of the country already have high amounts of sulphur dioxide in the air. III. Most sulphur dioxide in the air comes from coal-burning power plants. IV. Therefore, allowing coal-burning power plants to emit more sulphur dioxide will most likely increase the incidence of respiratory illnesses. After you clearly state the premises, you need to ask yourself whether any of them need to be defended. As we discussed in the module at the end of Chapter 1, any premise likely to be questioned by your readers will need support. That is, the premise itself will need arguments to back it up, and the supporting arguments should be indicated in your outline. (Some premises, though, may not need support because they are obvious or generally accepted.) As discussed in this chapter, you can support a premise (claim) through deductive or inductive arguments with premises made up of examples, analogies, empirical evidence (such as scientific research or trustworthy observations), and authoritative judgments (such as those from reliable experts). Here's how the preceding outline might look with (fictional) supporting arguments clearly shown: Thesis: Allowing coal-burning power plants to emit more sulphur dioxide will most likely increase the incidence of respiratory illnesses. 115 116 Part One | Basics I. High amounts of sulphur dioxide in the air have been linked to increases in the incidence of asthma and other respiratory illnesses. A. Environment Canada data show an association between high amounts of sulphur dioxide and increased respiratory illnesses. B. Cities that monitor air pollution have noted increases in hospital admissions for asthma and other respiratory illnesses when sulphur dioxide emissions are high. II. Many areas of the country already have high amounts of sulphur dioxide in the air. A. Scientists have reported high levels of sulphur dioxide in the air in 15 major cities. III. Most sulphur dioxide in the air comes from coal-burning power plants. A. Many environmental scientists assert that coal-burning power plants are the source of most sulphur dioxide. B. A few owners of coal-burning power plants admit that their plants emit most of the sulphur dioxide in their region. IV. Therefore, allowing coal-burning power plants to emit more sulphur dioxide will most likely increase the incidence of respiratory illnesses. You should expand your outline until you've indicated how you intend to provide support for each claim that requires it. This level of detail helps to ensure that you will not encounter any nasty surprises during the writing phase. Your essay should somehow address objections or criticisms that your readers are likely to raise, and your outline should show how you intend to do this. Answering objections can make your case stronger and lend credibility to you as the writer. Sometimes it's best to address objections where they are likely to arise— in connection with specific premises or arguments. At other times, your essay may be more effective if you deal with objections at the end of it, near the conclusion. As you work through your outline, don't be afraid to rework your thesis statement or to make changes in arguments. Satisfy yourself that the outline is complete and that it reflects a logical progression of points. Argument and Ambiguity Good writing is clear writing. Writing that isn't clear is ineffective—not to mention exasperating to its readers and sometimes embarrassing to its writer. An argument with unclear premises or conclusion is likewise ineffective. The lack of clarity undermines the argument, perhaps even rendering it useless. Ambiguity is one of the many ways that a piece of writing can be unclear. A term or statement is ambiguous if it has more than one meaning and if the context doesn't reveal which meaning is intended. Consider these claims: 1. Morgan ate the ice cream with relish. 2. Kids make nutritious snacks. 3 | Making Sense of Arguments 3. 4. 5. 6. 7. It is impossible to live on water. John met the girl that he married at a dance. Helen saw the bird with powerful binoculars. Luc hit the boy with the book. The guy was all over the road; I had to swerve a number of times before I hit him. 8. Officers help dog bite victims. 9. Include your children when baking cookies. All these claims are ambiguous, but they are ambiguous in different ways. Claims 1, 2, and 3 involve semantic ambiguities. Semantic ambiguities are due to possible multiple meanings of a word or phrase. In claim 1, the phrase "with relish" could mean "accompanied by a condiment made of chopped pickles" or "with pleasure or delight." In claim 2 the word "make" could mean either "prepare" or "constitute"—a difference between the kids' making food and being food. In claim 3 the phrase "live on water" could mean "subsist by drinking water" or "reside on water"—a distinction between the culinary and the sociological. Semantic ambiguities often spark unnecessary and tedious debates. Disputants, for example, may disagree dramatically over whether a photo in a magazine is pornographic—but they disagree only because they have different ideas about what the term pornographic means. They may actually be in agreement about which photos they find offensive. But to one person, pornographic may describe any representation of nudity. To another person, pornographic may refer only to depictions of sexual acts. Another example: people might disagree over whether a particular politician counts as a leader simply because for some, the word merely names a role, while for others the word is reserved for people held in high regard. Claims 4, 5, and 6 involve syntactic ambiguities. Syntactic ambiguities arise because of the sloppy way that words are combined. In claim 4, did John meet his bride-to-be at a dance, or did he marry her at a dance? In claim 5, did Helen use the binoculars, or did the bird use them? In claim 6, did Luc use a book to hit the boy, or did Luc hit a boy who was carrying a book? Claims 7, 8, and 9 are not plainly either semantically or syntactically ambiguous, but they are unclear (and silly) just the same. In claim 7, was the writer deliberately trying to hit the guy or not? In claim 8, are the officers helping people who had been bitten, or are they using dogs to bite people? In claim 9, are we supposed to bake cookies alongside our children—or bake the children into the cookies? For each of these nine claims, there are two different, perfectly legitimate ways to understand the words that have been used—that is, different ways of understanding the meaning of those words if taken literally. As a critical reader, your job is to be on alert for possible ambiguities, to understand the contexts that can help to clear up ambiguities, and to constantly ask, "What does this mean?" If the meaning of a claim is unclear, you are under no obligation to accept it. Likewise, if an argument contains ambiguous claims, 117 118 Part One | Basics you need not accept the argument. However, it may well be wise, and honourable, for you to make an effort to clear up the ambiguity by asking questions. Not all ambiguous claims are as silly as the ones listed above, and so it can be worthwhile to do your best to clear them up. For example, if someone said to you, "Jeff asked Akbar to give him his hat," there is genuine ambiguity there. Whose hat is it? Which "him" does the "his" in "his hat" refer to? Is it Jeff's hat (which he wants back) or Akbar's (which he wants to borrow)? The sympathetic listener here ought to do more than reject the claim. It is better simply to ask the question: whose hat are you referring to? As a critical writer, your job is not to suppose that your readers will understand exactly what you mean but to strive to be perfectly clear about what you mean. Inexperienced writers too often assume that because they know what they mean, others will know too. The best corrective for unclear or ambiguous writing is the objective stance—the viewing of your writing from the standpoint of others. Good writers try hard to view their writing as others will, to step back mentally and try to imagine coming to their writing for the first time. In effect, they ask themselves, "Will my audience understand what I mean?" Achieving an objective attitude toward your writing is not easy. One thing that helps is to put your writing aside for a day or two after you complete it and then read it cold. Often after this "cooling down" period, passages that you thought were unambiguous turn out to be murky. Another good tactic, of course, is to state explicitly what you intend your words to mean by offering a definition. But of course, you can't offer definitions for every word you use—not without ruining the "flow" of your essay. So definitions, while useful, must be used sparingly. (For more about definitions, see "Defining Terms" on page 170.) Writing Assignments 1. Create an outline for Essay 8 ("Unrepentant Homeopaths") in Appendix A. Specify the thesis statement, each premise, arguments supporting premises, any objections considered, and the conclusion. 2. Study the argument presented in Essay 7 ("Yes, Human Cloning Should Be Permitted") in Appendix A. Identify the conclusion and the premises and objections considered. Then write a two-page critique of the essay's argument. 3. Select an issue from the following list, and write a three-page paper defending a claim pertaining to the issue. Follow the procedure discussed in the text for outlining the essay and choosing a thesis and an appropriate argument to defend it. Where necessary, clarify terms. • Should Canada seek diplomatic ties with North Korea—a dictatorship with a terrible history of human rights violations? • In the fight against terrorism, should law enforcement agencies be allowed to spy on Canadian citizens by monitoring their email, wiretapping 3 | Making Sense of Arguments 119 their phones, and checking records from public libraries—all without warrants? • Should university student governments have input into university curriculum? • Should children as young as 10 years of age be encouraged to carry mobile phones? Notes 1. This step-by-step procedure is inspired, in part, by Greg Bassham et al., Critical Thinking: A Student's Introduction (San Francisco: McGraw-Hill, 2002), 56–62. 2. This procedure is inspired, in part, by Brooke Noel Moore and Richard Parker, Critical Thinking, 6th ed. (Mountain View, CA: Mayfield, 2001), 274–5. PART TWO Reasons 4 Reasons for Belief and Doubt Chapter Objectives When Claims Conflict You will be able to • understand that when a claim conflicts with other claims we have good reason to accept, we have good grounds for doubting it. • recognize that if a claim conflicts with our background information, we have good reason to doubt it. • appreciate that when we are confronted with a claim that is neither completely dubious nor fully credible, we should proportion our belief to the evidence. • realize that it is not reasonable to believe a claim when there is no good reason for doing so. Experts and Evidence You will be able to • understand what makes someone an expert and what does not. • understand that if a claim conflicts with expert opinion, we have good reason to doubt it. • realize that when the experts disagree about a claim, we have good reason to suspend judgment. • recognize fallacious appeals to authority. • distinguish true experts from non-experts by using the four indicators of expertise. 4 | Reasons for Belief and Doubt Personal Experience You will be able to • understand that it is reasonable to accept the evidence provided by personal experience only if there is no good reason to doubt it. • appreciate the importance of the common factors that can give us good reason to doubt the reliability of personal experience—impairment, expectation, and innumeracy. Fooling Ourselves You will be able to • appreciate why we need to resist the human tendency to resist contrary evidence. • become sensitive to the possibility of confirmation bias. • be alert to the possibility of the availability error. Claims in the News You will be able to • gain a basic understanding of how the news media work and what factors influence the claims they generate. • understand the skills involved in evaluating claims in the news. Advertising and Persuasion You will be able to • understand and apply the guiding principle for thinking critically about advertising. • exhibit familiarity with common tactics of persuasion used in advertising. L et's remind ourselves once again what we are up to here. If we care whether our beliefs are true or reliable, and about whether we can safely use them to guide us and inform our choices, then we must care about the reasons for accepting those beliefs. The better the reasons for acceptance, the more likely are the beliefs, or statements, to be true. Inadequate reasons, no reasons, or fake reasons (discussed in the next chapter) should lead us not to accept a statement but instead to doubt it. As we saw in earlier chapters, the reasons for accepting a statement are often spelled out in the form of an argument, with the statement being the conclusion. The reasons and conclusion together might constitute a deductive argument or an inductive argument. In such cases, the reasons are normally there in plain sight. 123 124 Part Two | Reasons But in our daily lives, statements or claims very often appear on their own, without any accompanying stated reasons. An unsupported claim may be intended by the speaker, or writer, to act as the premise of an argument (and its truth value may then determine whether the argument is sound or cogent). Or the claim may simply be a stand-alone assertion of fact. Either way, if we care whether the claim is acceptable, we must try to evaluate the claim as it stands. Of course, it helps to be knowledgeable about the subject matter of a claim. But it can be even more useful to understand and apply some critical thinking principles for assessing unsupported claims. Let's take a close look at these principles. When Claims Conflict Suppose you come across this claim on Twitter: "The whole problem with the world is that fools and fanatics are always so certain of themselves, but wiser people so full of doubts." —Bertrand Russell [Claim 1] The historic CHUM–CityTV building at the corner of Queen and John was demolished yesterday to make way for a parking lot. But imagine that the next tweet you see, from a different source, is this: [Claim 2] The historic CHUM–CityTV building at the corner of Queen and John was not demolished yesterday to make way for a parking lot. What do you make of such a conflict between claims? Well, as a good critical thinker, you can know at least that this conflict means that you have good reason to doubt claim 1 and therefore have no good grounds for immediately accepting it. You have good reason to doubt it because it conflicts with another claim you have just as much reason to believe (claim 2). When two claims conflict like this, they simply cannot both be true; at least one of them has to be false. So the following principle comes into play: If a claim conflicts with other claims we have good reason to accept, we have good grounds for doubting it. With conflicting claims, you are not justified in believing either one of them fully until you resolve the conflict. Sometimes this job is easy. If, for example, the competing claims are reports of personal observations, you can often decide between them by making further observations. If the two tweets about the CHUM– CityTV building are from people who claim to have seen these things with their own eyes, then (if you live nearby) you can go to the corner of Queen and John streets to see with your own eyes whether the building really has been demolished. If a friend says your dog is sleeping on top of your car and you say your dog is not sleeping on top of your car (because you checked a short time ago), you can see who's right by simply looking again at the roof of your car. (Remember, though, that even personal observations can sometimes mislead us, as we'll soon see.) Many times, however, sorting out conflicting claims requires a deeper inquiry. You may need to do some research to see what evidence exists for each of 4 | Reasons for Belief and Doubt 125 Food For Thought Fact and Opinion When we evaluate claims, we are often concerned with making a distinction between facts and opinions. But just what is the difference? We normally use the word fact in two senses. First, we may use it to refer to a state of affairs—as in "We should examine the evidence and find out the facts." Second, we use the word fact to refer to true statements—as in "John smashed the dinnerware—that's a fact." Thus, we say that some claims, or statements, are facts and some are not. However (and here the English language is a bit tricky), a claim that is about some state of affairs is still referred to as a factual claim, as opposed to a normative claim about what should be done. We use the word opinion, however, to refer to a belief—as in "It's John's opinion that he did not smash the dinnerware." Some opinions are true, so they are facts. Some opinions are not true, so they are not facts. Sometimes we may hear somebody say, "That's a matter of opinion." What does this mean? Often it's equivalent to something like "Opinions differ on this issue" or "There are many different opinions on this." But it also frequently means that the issue is not a matter of objective fact at all but is instead entirely subjective—a matter of individual taste. Statements expressing matters of opinion in this latter sense are not the kind of things that people can really disagree on, just as two people cannot sensibly disagree about whether they like chocolate ice cream. When opinions differ in this sense, no amount of research will settle the dispute! the conflicting claims. In the best-case scenario, you may quickly discover that one of the claims is not credible because it comes from an unreliable source (a subject discussed in the next few pages). Now suppose that you're confronted with another type of conflict—this time a conflict between a claim and your background information. Background information is that huge collection of very well-supported beliefs that we all rely on to inform our actions and choices. A great deal of this knowledge consists of basic facts about everyday things, beliefs based on very good evidence (including our own personal observations and excellent authority), and justified claims that we would regard as "common sense" or "common knowledge." Suppose, then, that you're asked to accept this unsupported claim: I saw a baby bench-press a 500-kilogram weight. You are not likely to believe this claim for the simple reason that it conflicts with an enormous number of your background beliefs concerning human physiology (and the physiology of babies in particular), gravity, weightlifting, and so on. Given what you already know about the world, the odds of that claim being true are very low. Or how about this claim: The prime minister is entirely under the control of the chief justice of the Supreme Court of Canada. background information The large collection of very well-supported beliefs that we all rely on to inform our actions and choices. It consists of basic facts about everyday things, beliefs based on very good evidence (including our own personal observations and excellent authority), and justified claims that we would regard as "common sense" or "common knowledge." 126 Part Two | Reasons This claim is not as clearly ridiculous as the previous one, but it too conflicts with our background beliefs, specifically those having to do with the structure and workings of the Canadian government. If you know just a little about Canada's political system, you know that this claim is simply implausible. So we would have good reason to doubt this one also. The principle we are using here is this: If a claim conflicts with our background information, we have good reason to doubt it. Generally speaking, the more background information the claim conflicts with, the more reason we have to doubt it. We would normally—and rightfully—assign a low probability to any claim that conflicts with a great deal of our background information. You would be entitled, for example, to have a little doubt about the claim that Joan is late for work if it conflicts with your background information that Joan has never been late for work in the 10 years you've known her. But you are entitled to have very strong doubts about, and to assign very low credibility to, the claim that André can turn a stone into gold just by touching it. You could even reasonably dismiss the claim without further investigation. Such a claim conflicts with too much of what we know about the physical world. Joan being late for work seems unlikely. But André turning a stone into gold seems impossible. It's always possible, of course, that a claim that conflicts with our background information is true and that some of our background information is wrong. So in many cases it's reasonable for us to examine a conflicting claim more closely. If we find that it has no good reasons in its favour and that it is not credible, we may reject it. If, on the other hand, we discover that there are strong reasons for accepting the new claim—say, a series of reliable scientific studies—then we may need to revise our background information. For example, we may be forced to accept the claim about André's golden touch (and to rethink some of our background information) if the claim is backed by strong supporting evidence. Our background information would be in need of some serious revision if André could produce this stone-to-gold transformation repeatedly under scientifically controlled conditions that ruled out error, fraud, and trickery. So it is not reasonable to accept a claim if there is good reason to doubt it. And sometimes, if the claim is dubious enough, we may be justified in dismissing a claim out of hand. But what should we believe about a claim that is not quite dubious enough to discard immediately and yet not worthy of complete acceptance? We should measure out our belief according to the strength of reasons or evidence provided. That is, We should proportion our belief to the evidence. The more evidence a claim has in its favour, the stronger our belief in it should be. Weak evidence for a claim warrants (that is, justifies) weak belief; strong 4 | Reasons for Belief and Doubt evidence warrants strong belief. And the strength of our beliefs should vary across this spectrum according to the evidence. Implicit in what we've said so far is a principle that deserves to be made explicit because it's so often ignored: It's not reasonable to believe a claim when there is no good reason for doing so. 127 "A belief which leaves no place for doubt is not a belief; it is a superstition." —José Bergamin The famous twentieth-century philosopher Bertrand Russell tried hard to drive this idea home. As he put it, "It is undesirable to believe a proposition when there is no ground whatever for supposing it true."1 When you read this, it may seem pretty obvious, but it is amazing how many people do believe things without any good reason for doing so. Food For Thought Folk Psychology A big part of our "background information" comes from folk psychology, the skill we all have for correctly attributing to other people (and sometimes animals) moods, beliefs, desires, intentions, memories, and so on. We use the fact that other people have those things as a way to explain and predict their behaviour. Have you ever seen someone lifting cushions off a couch one at a time or lifting up pieces of paper on a desk to look under them? If you have, you probably immediately knew what was going on: he or she was searching for something. You recognize the behaviour: that's what searching looks like. Or imagine you know that your friend John loves chocolate and hates vanilla. The waiter at lunch tells you that the dessert special today is chocolate or vanilla. What will John choose? Yes, you can quite easily predict the future here and without any magical powers. You know that John will choose chocolate. How do you know? Not just because you know that John loves chocolate but because you know that people tend to choose things they love. That's a basic psychological principle, and you don't need a PhD in psychology to know it. The term folk psychology was coined by the philosopher Daniel Dennett in 1981. Folk psychology consists, according to Dennett, of the stuff everyone knows about how other people's minds work. You know that other people have hopes and dreams; that they love some things and hate other things; that they remember things that happen to them; that they can perceive the world around them using their senses of sight, smell, hearing, touch, and so on. Our capacity for folk psychology is essential; it's what allows us to live and work together in groups. Folk psychology is what lets you know that punching someone will make them mad, that gossiping about them will hurt their feelings, and that flirting with their girlfriend will make them jealous. And you can typically predict how they might react in response. Folk psychology is also what allows you to motivate them to alter their behaviour: you know that they will have a tendency to do more of something if you reward them for it and to do less of something if you punish them for it. Continued 128 Part Two | Reasons For that matter, if it weren't for our command of folk psychology, how could we ever do something like drive on a highway? Think about it: hundreds of vehicles zooming all around us, each one of them a potentially lethal threat. How do we know that this is actually a pretty safe activity? Because we know that humans generally try to avoid getting killed, and so you can generally expect other drivers to behave in ways that will help them avoid an accident that might kill them as well as you. Our capacity for folk psychology is, however, imperfect. Sometimes people behave in ways that make no sense to us: we see their behaviour but can't map it onto any particular understanding of what is on their mind. Sometimes it may simply reflect the fact that different people are different—we don't all think identically. So we may find ourselves truly puzzled and ask ourselves, "What on earth are they doing?" But the very fact that we sometimes ask this question just reinforces the fact that we generally do understand other people as creatures with minds, beings that have beliefs and act upon them in somewhat predictable ways. If we didn't see other people that way, if we didn't see them as doing things intentionally, we wouldn't bother to wonder why they do what they do. Experts and Evidence expert Someone who is more knowledgeable in a particular subject area or field than most others are. When an unsupported claim—one for which no premises have been p rovided— doesn't conflict with what we already know, we are often justified in believing it simply because it comes to us from experts. An expert is someone who is more knowledgeable about a particular subject area or field than most other people are. Relevant expertise provides us with reasons for believing a claim because, in their specialty areas, experts are more likely to be right than we are. They are more likely to be right because (1) they have access to more information on the subject than we do and (2) they are better at judging that information than we are. Experts are familiar with the established facts and existing data in their field, and with the state of existing controversies in their field, and they know how to properly evaluate that information. Essentially, this means that they have a handle on the information and know how to assess the evidence and arguments for particular claims involving that information. They are true authorities on a specified subject. Someone who knows the basic information relevant to a particular field but who can't evaluate the reliability of a claim is no expert. In a complex world where we can never be knowledgeable in every field, we must rely on experts—a perfectly legitimate state of affairs. And as the world grows more complex, our need to rely on a range of experts keeps on growing. But good critical thinkers are careful about expert opinion, guiding their use of experts by some common-sense principles. One such principle is this: If a claim conflicts with expert opinion, we have good reason to doubt it. This principle follows from our definition of experts. If they really are more likely to be right than non-experts about claims in their field, then any claim that conflicts with expert opinion is, at least initially, dubious. 4 | Reasons for Belief and Doubt 129 Here's the companion principle to the first: If a claim is subject to significant dispute among experts, then non-experts can have no good reason for accepting (or rejecting) it. Throwing up your hands and arbitrarily deciding to believe or disbelieve the claim is not a reasonable response. The claim must remain in doubt until the experts resolve the conflict or you resolve the conflict yourself by becoming informed enough to decide competently on the issues and evidence involved—a course that's possible but usually not feasible for non-experts. Sometimes we may have good reason to be suspicious of unsupported claims, When experts disagree, critical thinkers begin to have doubts. In even when they are purportedly derived what other cases might it be reasonable to be suspicious of experts? from expert opinion. Our doubt is justified when a claim comes from someone appeal to authority The fallacy of relying on the put forward as an expert who in fact is not an expert in the subject at hand. opinion of someone deemed When we rely on such bogus expert opinion, we commit the fallacy known as to be an expert who in fact is the appeal to authority. not an expert. Everyday Problems and Decisions It's at the Drugstore. Should I Buy It? Who should you trust when seeking health advice? Health is an area in which we are almost certain to need to rely on the advice of experts. Health is complex because the human body, and the way that body interacts with its environment, is complex. Making smart decisions about our health is important, since good health allows us to enjoy life to the fullest. Some health-related decisions necessarily involve the input of licensed health professionals such as physicians, pharmacists, and public-health nurses. Other decisions are ones we might make on our own. A trip to the local pharmacy, for example, might leave us asking whether to buy some of the products we see on the shelves there. Should we trust these products just because their packages state (or merely imply) that they will keep us healthy or restore our health when we're sick? What about the fact that Continued Aaron Bacall/www.CartoonStock.com When there is disagreement about a claim among the relevant experts, we have good reason to doubt it. 130 Part Two | Reasons these products are being sold at a pharmacy rather than at a corner store? Is that a guarantee of quality? As it happens, there are all sorts of products for sale at your local drugstore that you probably should not trust. Before you buy that "amazing" and "all-natural" cold remedy or that bracelet that is "guaranteed" to improve your "overall well-being," you should ask yourself: • Does the package clearly specify what the product will do, or does it use vague weasel words, with claims that it will "support" health or "boost" your immune system? • Does the package include warnings to the effect that "these claims have not been verified by Health Canada" or fine print stating that "this product is not intended to treat or cure any disease"? • Does the product claim to be "amazing," "revolutionary," or "all-natural"? Reputable makers of health products rarely use such words. If in doubt, talk directly to the pharmacist, and ask tough questions: is there substantial, reliable evidence that this product is likely to work for me? It's the pharmacist's job to know such things; she has the relevant scientific training. So if she says no or doesn't know, then don't buy! The fallacious appeal to authority usually happens in one of two ways. First, we may find ourselves disregarding this important rule of thumb: just because someone is an expert in one field, he is not necessarily an expert in another. The opinions of experts generally carry more weight than our own—but only in their own areas of expertise. Any opinions that they put forward outside their fields are no more authoritative than those of non-experts. Outside their fields, they are not experts. We don't need to look far for real-life examples of such skewed appeals to authority. On any day of the week we may be urged to accept claims in one field that are based on the opinion of an expert from an unrelated field. An electrical engineer or Nobel Prize–winning chemist may assert that certain herbs can cure cancer. A radio talk-show host with a degree in physiology may give relationship advice. A geneticist expresses opinions about how to reform financial institutions. Sometimes the lack of relevant expertise is quite subtle: a scientist with expertise relevant to detecting global warming may not have the relevant expertise to tell us what we can or should do about global warming. The point is not that these experts can't be right—they might be unusually well-informed about a topic without being an actual expert. The point here is that their expertise in a particular field doesn't automatically give us reason to believe their pronouncements in another. There is no such thing as a general expert, only experts in specific subject areas. Second, we may fall into a fallacious appeal to authority by regarding a non- expert as an expert. We forget that a non-expert—even one with prestige, status, or sex appeal—is still a non-expert. Movie stars, TV actors, renowned athletes, and famous politicians endorse products of all kinds in TV and print advertising. Such people may be very good at what they do, but they are not experts in the sense in which we are using the word here. Consider: award-winning actors may be extremely good at what they do but may be unable to give good advice on how 4 | Reasons for Belief and Doubt other people should become good actors. And when experts speak outside their areas of talent and experience (which is often the case), they give us no good reason for believing that the products are as advertised. Advertisers, of course, know this, but they hope that we will buy the products anyway because of the appeal or attractiveness of the celebrity endorsers. Matthew McConaughey probably knows no more about cars than you do, but the makers of the Lincoln Navigator are betting that his star appeal will be a good substitute for actual expertise and persuade quite a few people to make a purchase. Historically, regarding a non-expert as an expert has probably been the most prevalent form of the appeal to authority—with disastrous results. Political, religious, tribal, and cultural leaders have often been considered authorities, not because they knew the facts and could judge the evidence correctly but because culture, tradition, or whim dictated that they be regarded as authorities. When these "authorities" spoke, people listened and believed; some even went to war, persecuted unbelievers, or undertook countless other ill-conceived projects. If we are to avoid this trap, we must look beyond mere labels and titles and ask, "Does this person provide us with any good reasons or evidence?" This question, of course, is just another way of asking if someone is a true expert. How can we tell? To be considered an expert, someone must have shown that he or she can assess relevant evidence and arguments and arrive at well- supported conclusions in a particular field. What are the indicators that someone has this essential kind of expertise? There are several that provide clues to someone's ability, but they do not guarantee true expertise. In most fields, the following two indicators are considered minimal prerequisites for being considered an expert: 1. Education and training from reputable institutions or programs in the relevant field (usually evidenced by degrees or certificates) 2. Experience in making reliable judgments in the field (generally, the more years of experience, the better) But, unfortunately, people can have the necessary education and experience and still not know what they're talking about in the field in question. Sadly, in the real world there are well-trained, experienced auto mechanics who do terrible work—and tenured professors with Ph Ds whose professional judgment is unreliable. Two additional indicators of expertise, though, are more revealing: 3. Reputation among peers (as reflected in the opinions of others in the same field, relevant prestigious awards, and positions of authority) 4. Professional accomplishments These two additional indicators are more helpful because they are likely to be correlated with the intellectual qualities expected in true experts. People with excellent reputations among their professional peers and with significant 131 Allstar Picture Library/Alamy 132 Part Two | Reasons accomplishments to their credit are usually true experts, and their knowledge and judgment can generally be relied upon. As we've seen, we are often justified in believing an otherwise unsupported claim because it's based on expert opinion. But if we have reason to doubt the opinion of the experts, we are not justified in believing the claim on the basis of that opinion. And chief among possible reasons for doubt (aside from conflicting expert opinion) is some sort of bias. When experts are biased, they are motivated by something other than the search for the truth—perhaps financial gain, loyalty to a cause, professional ambition, emotional needs, political outlook, sectarian dogma, personal ideology, or some other judgment-distorting factor. Therefore, if we have good reason to believe that an expert is biased, we are not justified in accepting the expert's opinion without further investigation. But how can we tell when experts are biased? There are no hard-and-fast rules here. In the more obvious cases, we often suspect bias when an expert is Actress Gwyneth Paltrow has being paid by special interest groups or corporations to provide an opinion. endorsed products such as We sometimes also suspect bias when the expert expresses very strong belief agave nectar. How should critin a claim even though there is no evidence to support it or when the expert ical thinkers approach such stands to gain financially from the actions or policies that he or she supports. endorsements? When an expert says, "My new discovery is great! Go out and buy some!" we have reason, at least, to worry that her professional judgment is being clouded by the prospect of profits. It's true that many experts can render unbiased opinions and do high-quality "An expert is a man who has made all the mistakes which research even when they have a conflict of interest. Nevertheless, in such situacan be made in a very narrow tions we have reasonable grounds to suspect bias—unless we have good reason to field." believe that the suspicion is unwarranted. These good reasons might include the —Niels Bohr fact that the expert's previous opinions in similar circumstances have been reliable or that he or she has a solid reputation for always offering unbiased assessments. In other words, there are things we can find out that may restore our trust, even in situations in which we might normally worry about bias. Food For Thought Evaluating Internet Sources Can you trust the information you find on the Internet? In many cases, no. But if you understand how to judge the reliability of websites, and if you're willing to spend some time doing the judging, you can often uncover material that is trustworthy and useful. Finding reliable information online takes some effort because, unlike books and magazines, much of the information on the Internet is not screened by editors, fact checkers, or anyone else before it hits cyberspace. Anyone can say anything on the Internet. Thus, your online research should be guided by reasonable skepticism. If you want to know more about evaluating online sources, a good place to start is your college or university library. Many of them have, on 4 | Reasons for Belief and Doubt 133 their websites, excellent guides to Internet research. Duke University, for example, has such a site. Among other things, it offers a checklist of questions to ask about online sources to help you assess their credibility. Some of these questions follow, broken down by category: Authority • Who wrote the material? Look for the author's name near the top or the bottom of the website. If you can't find a name, look for a copyright credit (©) or link to an organization. • What are the author's credentials? Look for biographical information (especially information about expertise) or the author's affiliations (university department, organization, corporate title, etc.). • Could the credentials be made up? Anyone who has used social media knows that people don't always describe themselves accurately online. • Did the author include contact information? Look for an email link, address, or phone number for the author. A responsible author should give you the means to contact him or her. Whose Website Is This? • What organization is sponsoring the website? Look at the domain (.ca, .edu, .org, etc.). Look for an "about this site" link. Also look for a tilde (~) in the URL , which usually identifies a personal directory on a website—be careful of a website that has a tilde in its URL , since it may indicate a personal page that is beyond the control of the overarching institution. Internet service provider sites (AOL , Sympatico, MSN , etc.) and online community sites (MySpace, Facebook, Google+, etc.) feature personal pages. Be careful of online material from those sites too. Watch also for personal blogs, hosted on blogging services such as Wordpress and Squarespace. There's nothing inherently dodgy about them, but it's worth knowing that literally anybody can start a blog, on any topic, without special expertise. Purpose or Intended Audience • What is the purpose of the site? Why did the author create it? The purpose could be advertising, advocacy, news, entertainment, opinion, fandom, scholarship, satire, and so on. Some pages have more than one purpose. For example, www.dowjones.com provides free business information but also encourages you to subscribe to the Wall Street Journal or other Dow Jones products. Is the Website Current? • Is there a date at the top or bottom of the website? If so, that's a good sign. But note: a recent date doesn't necessarily mean the information is current. The content might be years out of date even if the given date is recent. (The last "update" of the page might have consisted of someone changing an email address or fixing a typo.) • Is the information up-to-date? This takes a little more time to determine. Compare the information on the website to information available through other sources. Broken links are one measure of an outof-date page. In general, information about science, technology, and business ages quickly, whereas information in the humanities and social sciences ages less quickly. However, depending on your research, old information can still be perfectly valid. Continued 134 Part Two | Reasons Objectivity versus Bias • Is the author being objective or biased? Biased information is not necessarily "bad," but you must take the bias into account when interpreting or using the information given. Look at the facts the author provides and the facts the author doesn't provide. Does the author seem to cite facts accurately and completely? Is the author fair, balanced, and moderate in his or her views or overly emotional or extreme? (Do you recall what Bertrand Russell said, in Chapter 2, about passionately held opinions?) Taking the author's credentials into account, try to identify any conflict of interest. Determine if the advertising is clearly separated from the objective information on the page or if advertisers seem to be influencing the page's content. Support • Does the author provide support for the information he or she provides? Look for citations or links to sources. Some academic websites actually include full bibliographies—this is a very good thing because it gives readers the option of digging deeper. • Is the support respectable? Does the material cite well-known sources or authorities? Does the website cite a variety of sources? Do other websites on the same topic cite some of the same sources? The website in question should have a mix of internal links (links to websites on the same site or by the same author) and external links (links to other sources or experts). If a website makes it hard for you to check the support, be suspicious.2 Food For Thought Do Non-experts Know Best? Some people have a bias against experts—all experts. Such people may be thinking something like this: "It's the uneducated ones, the simple seekers of knowledge, who are the truly wise, for their thinking has not yet been corrupted by ivory-tower learning and highbrow theorizing that's out of touch with the real world. Thus, the wisdom of the non-expert is to be preferred over that of the expert whenever possible." This attitude is, oddly enough, sometimes embraced by very highly educated people. There's a strong strain of it, for example, among New Agers and advocates of some alternative, or unconventional, medicine. This non-expertism is related to the appeal to ignorance discussed in Chapter 5. (The appeal to ignorance says that since there's no evidence refuting a position, it must be true.) The problem is that both tacks, though psychologically compelling, are fallacious. A lack of good reasons—evidence or expert testimony—does not constitute proof of a claim. The history of science shows that virtually all notable scientific discoveries have been made by true experts—men and women who were fully knowledgeable about their subject matter. There have been many more instances, however, of cocksure non-experts who proposed theories, cures, and solutions to problems that turned out to be worthless. 4 | Reasons for Belief and Doubt 135 Food For Thought During the 2016 debate over "Brexit" (the proposed departure of the UK from the European Union), the British Justice Secretary, Michael Grove, who was in favour of Brexit, was asked whether he could name any economists who were in favour of it. He responded by saying that "people in this country have had enough of experts." That might, of course, have been true, but Grove provided no evidence to support his claim. What other reason might Grove have had for making this assertion? Anthony Collins/Alamy Stock Photo Anti-expert Sentiments When major political changes are afoot, how should we balance passion with appeal to the knowledge of credible experts? Finally, keep in mind that there are certain kinds of issues that we probably don't want experts to settle for us. Indeed, in most of these cases the experts are just not capable of settling them for us. These issues usually involve matters of taste or moral, social, or political questions. If we're intellectually conscientious, we want to provide our own final answers to such questions, though we may draw heavily on the analyses and arguments provided by experts. We may study what the experts have to say and the conclusions they draw, and we may well find it useful to pay close attention to their reasoning. But we want ultimately to come to our own conclusions. We prefer this approach in large part because the questions are so important and because the answers we give help to define who we are. What's more, the experts usually disagree on these issues. So even if we wanted the experts to settle one of these questions for us, they probably couldn't. Review Notes Conflicting Claims • If a claim conflicts with other claims that we have good reason to accept, we have good grounds for doubting it. • If a claim conflicts with our background information, we have good reason to doubt it. • We should proportion our belief to the evidence. • It's not reasonable to believe a claim when there is no good reason for doing so. • If a claim conflicts with expert opinion, we have good reason to doubt it. • When the experts disagree about a claim, we have good reason to suspend judgment. 136 Part Two | Reasons Personal Experience We accept a great many claims because they are based on personal experience— our own or someone else's. Personal experience, broadly defined, arises from our senses, memory, and the judgment involved in those faculties. In countless cases, personal experience is just our evidence (or part of the evidence) that something is or is not the case. You believe that Jack caused the traffic accident because you, or someone else, witnessed it. You think that the herbal tea cured your headache because the pain went away after you drank it. You believe that PJ's oyster bar has great food because you had a wonderful meal there one time. You're sure that it was the other guy, not your friend Padraig, who threw the first punch because that's how you remember the incident. Or, as a member of a jury, you vote to convict the defendant because eyewitness testimony puts him at the scene of the crime with a gun in his hand. But can you trust personal experience to reveal the truth? The answer is a qualified and cautious "yes." And here's the qualification in the form of an important principle: It's reasonable to accept the evidence provided by personal experience only if there's no good reason to doubt it. If we have no good reason to doubt what our personal experience reveals to us, then we're justified in believing it. This means that if our faculties are working properly and our use of them is unimpeded by our environment, we're entitled to accept what our personal experience tells us. If we seem to see a cat on the mat under good viewing conditions—that is, we have no reason to believe that our observations are impaired by, say, poor lighting, cracked glasses, or too many beers—then we're justified in believing that there's a cat on the mat. The problem is that personal experience, though generally reliable, is not infallible. Under certain circumstances, our senses, memory, and judgment just can't be trusted. It's easy enough to identify these circumstances in an abstract way, as you'll see later. The harder job is to (1) determine when they actually occur in real-life situations and (2) avoid them or take them into account in the process of proportioning belief. The rest of this section is a rundown of some of the more common factors that can give us good reason to doubt the reliability of personal experience. Impairment This one should be obvious: if our perceptual powers are somehow impaired or impeded, we have reason to doubt them. The clear cases are those in which our senses are debilitated because we are seriously ill, injured, tired, stressed out, excited, drugged, drunk, distracted, or disoriented. And just as clear are the situations that interfere with sensory input—when our environment is, say, too dark, too bright, too noisy, or too hazy. If any one or more of these factors are in play, the 4 | Reasons for Belief and Doubt risk of misperception is high, which gives us reason to doubt the trustworthiness of what we experience. Memories can be affected by many of the same factors that interfere with accurate perception. They are especially susceptible to distortion if they are formed during times of stress—which helps to explain why the memories of people who witness violent crimes or people who think they've seen ghosts are so often unreliable. These situations are understandably stressful. The impairment of our faculties is complicated by the peculiar way they operate. Contrary to what many believe, our faculties are not like recording devices that make exact mental copies of objects and events in the world. Research suggests that they are more like artists who use bits of sensory data or memory fragments to concoct creative representations of things, not exact replicas. Our perception and memory are constructive, which means that what we perceive and remember is to some degree fabricated by our minds. For example, you see a man standing in the shadows by the road—then discover when you get closer that the "man" is a tree stump. Or you are anxiously awaiting a phone call from your elderly aunt Mary, and when a call comes and you hear the person's voice, you're sure it's her—then realize that it's a much younger woman asking for a charitable donation. Or while you're in the shower you hear the phone ring—but no one is calling and the ringing is something your mind is making up. 137 "Besides learning to see, there is another art to be learned—not to see what is not." —Maria Mitchell (nineteenth-century American astronomer) Food For Thought How Reliable Is Eyewitness Testimony in Court? An Interview with Dr John Turtle* What, in general, does the expert literature say about the reliability of eyewitness reports? Research shows that people's memory for events they see for relatively short periods of time is susceptible to a number of factors that limit its accuracy and completeness. One way to gauge these limitations is to analyze cases in which people have been exonerated of crimes they were thought to have committed, usually on the basis of DNA testing of evidence retained from a crime scene. Out of hundreds of such cases of error reviewed over decades of research, mistaken eyewitness identification was involved about 70 per cent of the time. So we know people make mistakes, and that criminal investigation procedures and the court system often don't catch these mistakes. What are some of the main factors thought to account for the low reliability of eyewitness reports? A helpful way to organize the factors that affect eyewitness memory is to think of two categories. Estimator factors are ones whose effect on memory we can only estimate, such as exposure time, viewing conditions, stress, age, retention interval, and others. These are especially difficult to work with, because something like exposure time is often estimated to begin with, plus its effect on memory can only be Continued 138 Part Two | Reasons estimated because so many other factors are involved. Nobody can answer the question of whether or not a particular 15-year-old female witness who saw a 40-year-old male stranger for 15 seconds at night from 6 metres away is likely to be accurate in her description or identification of the offender 3 weeks after the event. The other category of factors that affect eyewitness memory are system variables—factors over which the legal system has at least some degree of control, such as how witnesses will be interviewed, how photos for a police lineup will be selected, how those photos will be presented, who conducts the lineup, and how the information will be used in an investigation or trial. What's the best way for us to deal with what we know about the low reliability of eyewitness reports? Police officers are making decisions every day about how to collect eyewitness evidence, so the recommendation from eyewitness researchers is to use the optimal procedures. For example, it is generally better practice to use a lineup of photos with one suspect and a number of known-innocent distractors instead of showing a single photo of the suspect to a witness. It's important to point out that the purpose of a lineup is not to test the witness for their accuracy at recognizing the perpetrator, because the suspect might not be the perpetrator; rather, the process is to test the investigator's hypothesis that the suspect is the perpetrator of the crime. *Dr John Turtle is an associate professor in Ryerson University's Department of Psychology and an acknowledged expert on eyewitness testimony. The constructive workings of our minds help us to solve problems and deal effectively with our environment. But they can also hinder us by manufacturing too much of our experiences from too little data. Unfortunately, the constructive tendency is most likely to lead us astray precisely when our powers of perception and memory are impaired or impeded. Juries, for example, are expected to be suspicious of the testimony of eyewitnesses who swear they plainly saw the dirty deed committed but were frightened, enraged, or a little tipsy at the time. Expectation A tricky thing about perception is that we often perceive exactly what we expect to perceive—regardless of whether there's anything there to detect. Have you ever watched the second hand on an electric clock move—then suddenly realize that the clock is not running at all? You "see" it moving because that's what you expect to see; after all, moving is what second hands do! Ever been walking through a crowd looking for a friend and hear her call your name—then find out later that she was actually 10 blocks away at the time? Such experiences—again the result of the constructive tendencies of the mind—are common examples of how expectation can distort your perceptions. Scientific research shows that expectation can have a more powerful effect on our experiences than most people think. In numerous studies, subjects who expected to see a flash of light, smell a certain odour, or feel an electric shock did 4 | Reasons for Belief and Doubt 139 Food For Thought Our senses can be easily tricked into "seeing" what we expect to see, and—just as surprisingly—into failing to see what is right before our eyes. For an amazing demonstration of this effect, go to this website: www.theinvisiblegorilla. com/gorilla_experiment.html. Watch the video, paying close attention to the instructions. If your senses do in fact miss what was right in front of you, don't feel bad. Roughly half of the people who take this test do the same! The effect at play here is known as inattentional blindness. It has nothing to do with defective eyesight. Instead, it has to do with your mind being focused on one task or set of stimuli (in this case, counting the number of times a basketball is passed from player to player) and thus failing to notice some different, unexpected phenomenon, such as . . . well, we won't spoil the surprise. Betsy Streeter/www.CartoonStock.com Gorilla? What Gorilla? Sometimes we just don't see the things that are right in front of us. What can critical thinkers learn from the concept of inattentional blindness? indeed experience these things—even though suitable stimuli were never present. The mere suggestion that the stimuli would occur was enough to cause the subjects to report perceiving things that did not in fact exist. Our tendency to sometimes perceive things that are not really there is especially pronounced when the stimuli are vague or ambiguous. For example, we may perceive completely formless stimuli—clouds, smoke, "white noise," garbled voices, random-patterned wallpaper, blurry photos, lights in the night sky, stains on the ceiling—yet think we observe very distinct images or sounds. In the formlessness we may see ghosts, faces, and words and hear songs, screams, or verbal warnings. We may see or hear exactly what we expect to see or hear. Or the mere suggestion of what we should perceive helps us to perceive it. This phenomenon is a kind of illusion known as pareidolia. (See the Food for Thought box "When We Construct the Facts Ourselves" in Chapter 2.) It's the reason some people claim to hear Satanic messages when rock music is played backwards, or to observe a giant stone face in fuzzy pictures of the surface of Mars, or to see the perfect likeness of Jesus in the marks left on a burned tortilla by the pan it was fried in. Scientists are keenly aware of the possible distorting influence of expectancy, so they try to design experiments that minimize it. We too need to minimize it 140 Part Two | Reasons Food For Thought Race Expectations Race, and subtle racial biases, play a role in many areas of life. One especially important role is in the area of education. One US study added to the literature on this topic by examining the role that race plays in expectations of academic achievement. It looked at black and white teachers and their expectations regarding whether specific high school students—some black, some white—were likely to obtain university degrees. Overall, teachers had lower expectations for black students, and white teachers had lower expectations for black students than black teachers did. Importantly, the data also suggested that teachers' expectations actually influenced students' eventual educational attainment. The explanation, roughly, seems to be that when teachers expect great things, they communicate that—explicitly or implicitly—to their students and this gives students confidence. Conversely, when teachers don't signal high expectations, students expect less of themselves—a self-fulfilling prophecy.3 as much as possible. Our strong expectations signal that we should double-check our sensory information and should be careful about the conclusions we draw from it. Innumeracy When we make a quick, off-the-cuff judgment about the chances of something happening (whether an event in the past or one in the future), we should be extra careful. Why? Because, generally, we humans are terrible at estimating probabilities. Here's a classic example. Imagine there are 23 students, including you, in your classroom. What are the chances that at least two of the students have exactly the same birthday? (Not the same date of birth but the same birthday out of the 365 possible ones.) Most people are surprised to find out that the answer is neither 1 chance in 365 (1/365), nor 1 in 52 (1/52). It's 1 chance in 2 (1/2, or 50–50, the same odds as a fair coin coming up "heads")—which is a completely counterintuitive result. Math can give you the right answer, but guessing or estimating is very unlikely to do so. Another common error is the misjudging of coincidences. Many of us often believe that an event is simply too improbable to be a mere coincidence and that something else must surely be going on—such as paranormal or supernatural activity. But we mustn't forget that surprising coincidences occur all the time and, in fact, must occur according to elementary laws of statistics. The probability that a particular strange event will occur—say, that an ice cube tossed out of an airplane will hit the roof of a barn—may be extremely low, maybe one in a billion. But given enough opportunities to occur, that same event may be highly probable over 4 | Reasons for Belief and Doubt 141 Review Notes Personal Experience • It's reasonable to accept the evidence provided by personal experience only if there's no good reason to doubt it. • If our perceptual powers are impaired or impeded, we have reason to doubt them. • Our perception and memory are constructive, which means that our minds are capable of manufacturing what we seem to have experienced. • We often perceive exactly what we expect to perceive, and this tendency is enhanced when stimuli are vague or ambiguous. • The gambler's fallacy is the mistake of thinking that previous events can affect the probabilities in the random event at hand. The lesson here is not that we should mistrust all judgment about probabilities but that we shouldn't rely solely on our intuitive sense in evaluating them. Relying entirely on intuition, or "gut feeling," in assessing probabilities is usually not a reason to trust the assessment but to doubt it. the long haul. It may be unlikely in any given instance for you to flip a coin and get tails seven times in a row. But this "streak" is virtually certain to happen if you flip the coin hundreds of times. Here is another example. What are the odds that someone will be thinking of a person she knew, or had heard of, and then suddenly learn that the person is seriously ill or dead? Believe it or not, such a strange event is likely to occur several times a day somewhere in the world. If we make the reasonable assumption that someone would recognize the names of a few thousand people (both famous and not so famous) and that a person would, each year, learn of the illness or death of several of those people, then the chances of our eerie coincidence happening to someone somewhere are pretty good. We could reasonably expect that each day several people would have this experience.4 Another error is to think that previous events can affect the probabilities in the random event at hand. This mistake is known as the gambler's fallacy. Let's say you toss an unbiased coin six times in a row. On the first toss, the odds are, of course, 1 in 2, or 50–50, that it will land tails. Let's imagine that it lands tails. Astoundingly, on the other five tosses the coin also lands tails. That's six tails in a row. So what are the odds that the coin will land tails on the seventh toss? The answer: 50–50. Each toss has exactly the same probability of landing tails (or heads): 50–50. The coin does not remember previous tosses, and to think otherwise is to commit the gambler's fallacy. You see it a lot in casinos, sporting events, and—alas—everyday decision-making. That sort of reasoning, in fact, is part of the reason that casinos make so much money and why casino-goers collectively lose so much money. gambler's fallacy The error of thinking that previous events can affect the probabilities in the random event at hand. "The first principle is that you must not fool yourself—and you are the easiest person to fool." —Richard P. Feynman 142 Part Two | Reasons Fooling Ourselves As we've seen, it is not reasonable to believe a claim unless we have good reasons for doing so. If we care whether our beliefs about the world are reliable, we must base them on the relevant evidence. Beliefs backed by good evidence are more likely to be true, and true beliefs are more likely to help us get what we want out of life. The kink in this straightforward arrangement is that we too often fail to respect the available evidence. We tend to ignore evidence, deny it, manipulate it, and distort it. And somehow there is very little comfort in knowing that literally everyone occasionally does this. What truly is encouraging is that we can learn to be alert to missteps in using and assessing evidence and that we can take steps to minimize, though not eliminate, the problems. This section looks at three of the most common and most serious mistakes we make when we deal with evidence and what we can do about them. Resisting Contrary Evidence An all-too-human tendency is to try to resist evidence that flies in the face of our deeply held beliefs. We may deny evidence, ignore it, or reinterpret it so it fits better with our prejudices. Resisting evidence may be psychologically comforting (for a while, anyway), but it gets in the way of any search for knowledge and stunts our understanding. The tendency to resist contrary evidence is especially strong—and tempting— when we contemplate the paranormal. Remember the study mentioned in Chapter 2 about researchers who showed subjects both evidence for and evidence against the reality of extrasensory perception (ESP)? The subjects who already had doubts about the existence of ESP recalled both kinds of evidence accurately. But the "true believers"—the subjects who already believed in ESP—remembered both kinds of evidence as proving ESP. They resisted the disconfirming evidence by mentally transforming it into confirming evidence. Their prior beliefs, in other words, warped the way their brains interpreted new information. The result was that they failed to learn from the new data presented to them. These results are typical of studies focusing on the paranormal. Another typical case involves believers in the paranormal who, when confronted with evidence counting against their beliefs, simply refuse to accept it. For example, belief in fairies was given a boost about a century ago when two little girls presented the world with photographs they had allegedly taken of fairies playing with them in the garden. (The episode was the basis for the 1997 movie Fairy Tale: A True Story.) The photos looked fake, the fairies resembling cut-outs from a children's book—which is exactly what they were. But brushing that aside, many people (including Sir Arthur Conan Doyle, the author who created Sherlock Holmes) were convinced that the photos showed real fairies. Many years later, 143 when the girls were grown up, they confessed that the whole thing had been a hoax. But some believers—even those who heard the confession first-hand—refused to accept it.5 Their desire to believe seemingly outweighed the evidence at hand. But we need not look to the fringes of reality to find instances of the denial of evidence. Scientific research and everyday experience show that the practice permeates all walks of life. A political activist may refuse to consider evidence that conflicts with his party's principles. A scientist may be so committed to her theory that she refuses to accept any evidence that undermines it. A sports fan believes deeply that her favourite team is the greatest team there is, despite a string of losing seasons. Often our resistance to contrary evidence takes a subtle form. If we encounter evidence against our views, we often don't reject it outright. We simply apply more critical scrutiny to it— challenging it in various ways and asking hard questions—than we would apply to evidence in favour of our views, which we tend to accept quickly and without question. We might also seek addiTaken in August 1920, this was thought to tional confirming information or find a way to interpret the data be a genuine photograph of the Cottingley so it doesn't conflict with our expectations. fairies. Why might believers resist contrary In one study, proponents and opponents of the death penalty evidence? were presented with evidence about whether capital punishment deterred crime. Both those opposed to and in favour of capital punishment were given two types of evidence—(1) some that supported the practice and (2) some that discredited it. Psychologist Thomas Gilovich describes the outcome of the study: The results of this experiment were striking. The participants considered the study that provided evidence consistent with their prior beliefs—regardless of what type of study that was—to be a well--conducted piece of research that provided important evidence concerning the effectiveness of capital punishment. In contrast, they uncovered numerous flaws in the research that contradicted their initial beliefs. . . . Rather than ignoring outright the evidence at variance with their expectations, the participants cognitively transformed it into evidence that was considered relatively uninformative and could be assigned little weight.6 There is no easy cure for our tendency to resist opposing evidence. The only available remedy is to commit ourselves to examining even our favourite claims critically—which means trying our best to be even-handed in scrutinizing the evidence we like and the evidence we don't like. When a claim is put forward by our friends, our closest family members, an influential professor, or our favourite politician, we should make a special effort to think things through and to examine the relevant evidence for ourselves. Photo by SSPL/Getty Images 4 | Reasons for Belief and Doubt 144 Part Two | Reasons Looking for Confirming Evidence confirmation bias The psychological tendency to seek out and remember information that confirms what we already believe. We often not only resist conflicting evidence but also seek out and use only confirming evidence—a phenomenon known as confirmation bias. When we go out of our way to find only confirming evidence, we can end up accepting a claim that's not true, seeing relationships that aren't there, and finding confirmation that isn't genuine. In scientific research on confirmation bias, when subjects are asked to assess a claim by looking at the evidence, they often look for confirming evidence only, even though disconfirming evidence may be available and just as revealing. For example, in one study a group of subjects was asked to assess whether practising before a tennis match was linked to winning the match; another group, whether practising before a match was linked to losing the match. All the subjects were asked to select the kind of evidence (regarding practice and winning or losing matches) that they thought would be the most helpful in answering the relevant question. Not surprisingly, the subjects deciding whether pre-game practising was linked to winning focused on how many times players practised and then won the match. And subjects assessing whether practising was associated with losing focused on how many times players practised and then lost the match.7 Sometimes we look for confirming evidence even when disconfirming evidence is more telling. For example, take this claim: all swans are white. Is it true? How could you find out? You can easily find confirming instances; white swans are plentiful and ubiquitous. But even seeing thousands of white swans will not conclusively confirm that all swans are white because there may be swans in places where you haven't looked. No number of white swans can ever verify that claim. But all you have to do is find one black swan to conclusively show that the claim is false. (People in Europe used to believe that the claim was absolutely true—until Food For Thought This Is Lunacy! When there's a full moon, do people get crazy? Do they behave like "lunatics"? Folklore says that they do, and many people believe that there's a lunar effect on the way people act. But numerous studies have shown that there is absolutely no causal connection between the moon and human behaviour. So why do so many people believe in lunar power? Part of the reason is the availability error. Since strange behaviour is more noticeable (and so more available) than normal behaviour, we tend to remember such behaviour and end up thinking that weird behaviour is more frequent. And if we look only for confirming instances (and we do), we're likely to believe that the moon is indeed the cause of a lot of peculiar behaviour. On the night of a full moon, we may pay more attention to and watch for examples of strange behaviour— precisely because we've heard it said that people behave weirdly when the moon is full. Other nights, such behaviour is just as common, but we may be less likely to notice it if we're not watching out for it. Of course, many people behave strangely with or without a full moon. 4 | Reasons for Belief and Doubt 145 black swans were discovered in Australia.) In such cases, confirmation bias can lead us way off course. The moral to this story is that when we evaluate claims, we should look for disconfirming as well as confirming evidence. Doing so requires a conscious effort to consider not only the information that supports what we want to believe but also the information that conflicts with it. We have to seek out disconfirming evidence just as we keep an eye out for confirming evidence—an approach that goes against our grain. We naturally gravitate to people and policies we agree with, to the books that support our views, to the magazines and newspapers that echo our political outlook. Acquiring a broader, smarter, more critical perspective takes effort—and sometimes courage. Another common mistake in evaluating evidence is known as availability error. We commit this error when we rely on evidence not because it's trustworthy but because it's memorable or striking—that is, because it is psychologically available. In such cases, we put stock in evidence that's psychologically impressive or persuasive, not necessarily rationally acceptable. You fall for the availability error if as a juror you vote to convict a murder suspect because he looks menacing, not because the evidence points to his guilt; or if you decide that a Honda Civic is an unsafe vehicle because you saw one get smashed up in a highway accident; or if, just because you watched a TV news report about a mugging in your city, you believe that the risk of being mugged is extremely high. In each of these cases, you are relying on readily available evidence rather than looking at all the evidence you could reasonably find. Being taken in by the availability error can lead to some serious misjudgments about the risks involved in various situations. Some people (are you one of them?) believe, for instance, that air travel is more dangerous than many other modes of transportation, so they avoid travel by airplane in favour of the car. Their conclusion is based on nothing more than a few vivid media reports of tragic plane crashes, such as the terrorist attacks of 9/11. But research shows that per mile travelled, flying is far safer than travelling by car. Researchers have calculated that driving a particular distance (say, from Toronto, Ontario, to Fredericton, New Brunswick) is about 65 times How might juries be guilty of committing an availability error? Roy Delgado/www.CartoonStock.com Preferring Available Evidence 146 Part Two | Reasons as risky as a non-stop flight of the same distance. The fact is, there are plenty of less vivid and less memorable (that is, psychologically unavailable) things that are much more dangerous than air travel: falling down stairs, drowning, choking, and accidental poisoning are all more likely causes of death.8 But airplane wreckages make dramatic footage for news stations and sites, and so deaths due to airplane crashes tend to stick in our heads. Social psychologist John Ruscio gives another example: Aside from a close miss by what was reported to be a falling airplane part early in The Truman Show [the 1998 movie starring Jim Carrey], I cannot personally recall ever having heard of such an accident, fictitious or real. Students over the years have told me that they recall stories of people having found fallen airplane parts, but not of an actual fatality resulting from such falling parts. Shark attacks, on the other hand, are easily imagined and widely reported. Moreover, in the first movie that comes to my mind, the shark in Jaws actually did cause several fatalities. It may come as some surprise, then, to learn that in an average year in the United States thirty times more people are killed by falling airplane parts than by shark attacks.9 The availability error is likely at work in many controversies regarding environmental hazards. Because the alleged hazard and its effects can be easily and vividly imagined and the scientific data on the issue are not so concrete or memorable, the imagined danger can provoke a public scare even though the fear is completely unwarranted. Brain cancer from the use of cellphones and autism from childhood vaccines—both of these supposed hazards have provoked fear and public demands for action. But scientific studies have shown these concerns to be groundless.10 Many environmental hazards are real, of course. But to conclude that they exist solely on the basis of scary thoughts is to fall prey to the availability error. On the other hand, some environmental hazards are very hard to imagine vividly. Most of us have never lived through a catastrophic rise in sea level—even a brief one—and so it is hard for us to imagine in a clear way just what a dramatic rise in sea level globally would look like. This may make us underestimate the risks posed by global warming and the rise in sea level that may result from such warming. But we can all imagine vividly the inconvenience of driving less, of changing our diets so that we rely less on energy-intensive animal agriculture, and other lifestyle changes that collectively might help to combat global warming. If we think only of evidence that is easily available to us, we may severely misjudge this issue. If we're in the habit of basing our judgments on evidence that's merely psychologically available, we will also frequently commit the error known as hasty generalization, a mistake discussed in detail in Chapter 8. We're guilty of hasty generalization when we draw a conclusion about a whole group (of things, people, or events) on the basis of an inadequate sample of the group. We fall into this trap 4 | Reasons for Belief and Doubt 147 Food For Thought The Dangers of Fooling Ourselves In many regards, we are our own worst enemies when it comes to thinking critically. In part, this reflects the fact that we are the ones who have the most opportunity to affect our thinking, for better or for worse. Occasionally, other people have the opportunity to affect our thinking. But we ourselves are the only ones who play a constant role in our own thinking. Whenever we are trying to figure out what to believe, our own thought patterns—including assumptions and biases—are sure to have an effect. In this chapter, we outline three specific mechanisms by which we tend to fool ourselves—namely, resisting contrary evidence, looking for confirming evidence, and preferring available evidence. In reality, that is just a very small sample of the wide range of ways in which we have the tendency to fool ourselves. In theory, a rational person wants to try to make sure that the ideas inside her head match reality out in the world. For example, imagine that I currently think that the capital of India is Calcutta, but I find out that it is actually New Delhi. In theory, I should change what I think. I should change my thinking so that it matches reality. But in practice, we often behave as if the world should change to match what we currently think about it. Our prior beliefs are "sticky" in a way that makes them persist even in the face of evidence to the contrary. Of course, in most cases it is impossible for the world literally to change to match our beliefs. But our behaviour often suggests a kind of denial of that fact: we try our best—mostly subconsciously—to try to bend reality so that it fits our prior understanding of it. And so we ignore evidence that the world is different from the way we believe it to be. This is a common human tendency, one that is very difficult to escape. But the implication is that to be a critical thinker means to at least attempt to be honest with oneself about the tendency we all have— each and every one of us—to fool ourselves. We must all work hard to develop the habit of questioning ourselves. In particular, we need to work hard to seek evidence about how the world really is, especially when such evidence could challenge our own prior assumptions. when we assert something like this: "Honda Civics are pieces of junk. I owned one for three months, and it gave me nothing but trouble." Since our experience with a car is immediate and personal, for many of us it can be a short step from this psychologically available evidence to a hasty conclusion. If we give in to the availability error and stick to our guns about Civics being no good in the face of evidence to the contrary (say, automobile reliability research done by the Consumers Union or similar organizations), we should get an F in critical thinking. Claims in the News In the Information Age, we are drenched with, well, information. And the news media are a major source of the information that confronts us every day. Through websites, blogs, social media, newspapers, magazines, television, and radio, information about what's happening in the world hits us like rain almost every waking hour. The claims—supported and unsupported—just keep coming at us. How can we cope with such an onslaught? 148 Part Two | Reasons Once again, critical thinking must play a big role. Remember that information is just pieces of data, bundles of claims—not necessarily true, not always useful, and not the same thing as knowledge. Knowledge is true belief supported by good reasons; mere information doesn't have this lofty status. And to transform information into knowledge—our most useful commodity—we need critical thinking. Through critical thinking we can make sense of a great deal of the information coming from the news media. As you will see, most of the rest is not relevant and not worth our time. Most of the news that reaches us, even when it gets to us through social media outlets such as Facebook or Twitter, has its origins with reporting done by traditional media outlets—namely, TV, newspapers, and radio. So let's begin by looking at how the traditional news media work—how and why they generate the claims that they do. Then we'll discuss how to critically examine the claims embedded in news reports, broadcasts, and multimedia presentations. Inside the News The news media include hundreds of newspapers (among the biggest and the best are the Globe and Mail, the Washington Post, the New York Times, and the Los Angeles Times), network news organizations (CTV, CBC , Global), cable news networks (CBC News Network, CTV News Channel, CNN), local and national radio broadcasts, local television news, American public television and radio, and newsmagazines (notably Maclean's and L'actualité). Most of these sources now have websites, which represent the important extension of their reach. In addition, there are an increasing number of news-containing and news-generating websites, such as TechCruch, Mashable, BuzzFeed, and the Huffington Post. Most news can be found in newspapers (including their online versions) where news stories are generally longer, more comprehensive, and more in-depth than those of any other news source. Newspapers, especially the good ones, devote far more resources to gathering and reporting news than the electronic and Internet media do, usually employing many more reporters and producing many more news stories. A large daily newspaper may contain 100,000 words, while a nightly television news broadcast may contain fewer than 4000. Other kinds of news sources (especially television stations and websites) are far more numerous than newspapers and are the primary news sources for millions of people even though they provide less news. But not all news is created equal. Some news stories or reports are good, some are bad; some are reliable and informative, some are not. Most probably lie somewhere in between. The quality of news reporting depends on many factors, probably most of which are not under the control of the reporters. Foremost among such factors is money. After all, news outlets—whether print, electronic, or online—are businesses with profit margins to maintain, salaries to pay, and shareholders to please. A news organization makes most of 4 | Reasons for Belief and Doubt 149 Food For Thought Fake News Harley Schwadron/www.CartoonStock.com What is "fake news"? There has always been fake news—news presented by sources whose main purpose is to entertain rather than to inform. Tabloids, such as the National Enquirer, are often accused of falsehoods, with some of them even tending to favour silly, sensationalistic headlines along the lines of "Tom Cruise Fathers Space Alien's Baby!" Other sources of "fake" news are more obviously intended to be fun: the satirical news source The Onion reports on "news" stories that are entirely fake but obviously so and clearly aimed at entertaining rather than informing. Unfortunately, the idea of "fake news" took on a new, more sinister meaning during the 2016 US presidential election. During that election, When someone tries to convince you that something really is newsseveral websites and social media ac- worthy, what steps can you take to critically analyze their claim? counts sprang up that were dedicated to spreading false but damaging stories about political candidates. This was fake news in the worst sense of the word. Soon after that problem came to light, Donald Trump began using the term "fake news" to refer to any news story that didn't reflect well on him, including stories reported by reputable, highly reliable news sources, such as CNN and the New York Times. its money not from selling its product (news) through subscriptions or direct sales but from selling opportunities for other companies to advertise to the news outlet's audience. The organization wants a big audience because big audiences bring in big advertising dollars. The pressure on news organizations to turn an acceptable profit is immense and has been growing in the past two decades. Indeed, today many traditional news outlets (especially print outlets such as newspapers) are struggling to survive in the face of competition from online outlets, which tend to be cheaper to run and quicker to update as news unfolds. The old ideal of journalism as primarily a public service and not a cash cow has seldom been able to withstand the corporate push for profits. The effects of this trend on the nature and quality of the news "Everything is being compressed into tiny tablets. You take a little pill of news every day—23 minutes— and that's supposed to be enough." —Walter Cronkite 150 Part Two | Reasons have been profound. Two veteran reporters from the Washington Post explain some of the changes this way: Most newspapers have shrunk their reporting staffs, along with the space they devote to news, to increase their owners' profits. Most owners and publishers have forced their editors to focus more on the bottom line than on good journalism. Papers have tried to attract readers and advertisers with light features and stories that please advertisers—shopping is a favorite—and by de-emphasizing serious reporting on business, government, the country, and the world. If most newspapers have done poorly, local television stations have been worse. Typically, local stations provide little real news, no matter how many hours they devote to "news" programs. Their reporting staffs are dramatically smaller than even the staffs of shrunken newspapers in the same cities. The television stations have attracted viewers—and the advertising that rewards their owners with extraordinary profits—with the melodrama, violence, and entertainment of "action news" formulas, the frivolity of "happy talk" among their anchors, and the technological gimmicks of computer graphics and "live" remote broadcasting. The national television networks have trimmed their reporting staffs and closed foreign reporting bureaus to cut their owners' costs. They have tried to attract viewers by diluting their expensive newscasts with lifestyle, celebrity and entertainment features, and by filling their low-budget, high-profit, prime-time "newsmagazines" with sensational sex, crime, and court stories. All-news cable television channels and radio stations—to which the networks have ceded much of the routine coverage of serious national and foreign news—fill many of their hours as cheaply as possible with repetitive, bare-bones news summaries and talk shows that present biased opinions and argument as though they were news.11 Deliberately or unconsciously, editors and reporters may skew their reporting so as not to offend their advertisers, their audience, or their shareholders. They may also moderate their reporting to keep their sources of information open. Reporters get a great deal of their news from sources such as government officials, corporate public relations people, and advocacy-group spokespersons. A reporter who irritates these sources by writing stories that they don't like could end up being shunned by the sources. A key informant may simply stop taking a reporter's calls or answering emails. There is always the temptation, then, to craft inoffensive or watered-down stories to please the source. Not all news people give in to the temptation, but many do. Editors and reporters are the ones who decide what's newsworthy and what isn't. And these decisions can help to give us a clearer picture of the world or a 4 | Reasons for Belief and Doubt more distorted one. The distortion can happen in several ways. First, it can arise when reporters do what we might call passive reporting. Most reporters aren't investigative reporters, going off into the world and digging up the hard facts. Often, the news is simply handed to them by spokespersons and public relations experts hired by governments, corporations, and others who want to get their own version of the facts into the news media. In these situations, reporters may report only what they're told at press conferences or in press releases. The result is canned news that's slanted toward the views of the people who supply it. Second, for a variety of reasons publishers, editors, producers, and reporters may decide not to cover certain stories or specific aspects of a story. With so much going on in the world, some selectivity is necessary and inevitable: it's literally impossible to report on every possible story and cover every possible angle. Too often, though, decisions not to cover something can lead the public to conclude that there is nothing happening when in fact something very important is happening. During the run-up to the war in Iraq, some massive anti-war protests occurred in the United States and Europe. But at least at first, the mainstream American news media didn't cover them, leading some observers to accuse the news media of bias in favour of the war. Likewise, some observers complain that the Canadian news media do not cover many international stories that news organizations in other countries cover in depth, such as famines and human rights violations in developing nations. The result, the complaint goes, is that Canadians may be blithely ignorant of what's really happening in the world. Also, many times the news media forgo covering a story because they deem it too complex or too unexciting for an audience hungry for titillation, scandal, and entertainment. The RCMP chasing a car thief on Highway 102 may get a full hour of TV coverage, but a debate over the role of the monarchy in Canada may get two minutes or less. Third, editors, reporters, and producers can dramatically alter our perception of the news by playing certain aspects up or down. Television and radio news broadcasts can make a trivial news item seem momentous just by making it the lead story in the broadcast. Or they can make an important story seem inconsequential by devoting only 15 seconds to it near the end of the broadcast. Newspapers can play the same game by putting a story on the front page with a big headline and compelling photo—or embedding it on page 22 with a tiny headline. Parts of a story can also be arranged for the same effect, with the most telling information mentioned last. Every piece of news is filtered through a reporter (as well as an editor or producer), most of whom try hard to get the story right. But reporters are subject to many pressures—internal and external—to push the story this way or that, to stray far from the laudable ideal of objective reporting based on professional journalistic standards. Reporters can slant the news by using loaded language and manipulating the tone of the writing, leaving out (or leaving in) certain details, putting facts in conspicuous (or inconspicuous) positions, inserting arguments and personal opinions, dramatizing parts of the story, and appealing to the reader's prejudices. 151 152 Part Two | Reasons Food For Thought Facebook and the News It is a fact of life today that many people get their news online, and they typically see a particular news item because they spotted it on Facebook or another social media outlet. The problem is that the stuff that shows up in your Facebook "News Feed" is determined by something called "The Algorithm," a fancy equation that Facebook uses to individualize content for each and every user based on the preferences they've previously demonstrated through their clicking behaviour. Based on its understanding of your preferences, the algorithm decides just what mix of stuff to show you, including pictures posted by your friends, news items from mainstream media posted by your friends, items posted in Facebook groups you belong to, and pages that you've "Liked." Most people only ever see just a fraction of the stuff posted by their friends, and Facebook's secret algorithm is deciding for us which stuff we see. Keep in mind that Facebook is free to users but makes money from advertising: the algorithm is aimed at keeping you on the page as long as possible in order to maximize advertising revenue. Naturally, this power to choose for us brings with it a lot of influence. It means that Facebook can effectively shape your reading habits, determining what you read and what you don't. From the point of view of traditional news media, this implies a tremendous threat. If someone at Facebook simply doesn't want a particular news story to be widely read, then a simple adjustment of the algorithm could—in principle—mean that very few people would actually see it, no matter how many times it gets posted. Your friends might post a story from CBC or from CNN about an issue you really care about. But if Facebook's algorithm says you don't see it, then you won't see it without making a special effort to find it. Worries of this kind don't rely on cynical assumptions about the human beings who work at Facebook. There's no need to imagine them hatching evil plans to stop you from finding out about specific stories or specific kinds of news. All that needs to happen is for the self-adjusting algorithm— adjusting in response to your behaviour and that of others—to decide, on your behalf, what stories are of interest to you. Unfortunately, there is a trend these days for reporters to deliberately make themselves part of the story—to editorialize as they report the story, to try to exhibit attitudes common in the community, to offer subtle value judgments that the audience is likely to approve of. Here's an extreme example. On the nightly news, a film clip shows the arrest of activists who have chained themselves to some logging machines in a forest in British Columbia, and the reporter on the scene tells the TV audience, "Once again, the police are jailing those who interfere with the loggers' right to feed their families." Or maybe the reporter takes the opposite tack: "Once again, the police are jailing citizens fighting to protect our shared natural heritage." All of this suggests that we should not assume without good reason that a news report is giving us an entirely accurate representation of events. And deciding whether in fact we have good reason is a job for critical thinking. 4 | Reasons for Belief and Doubt 153 Sorting out the News Sometimes you won't be able to tell whether a news report is trustworthy, no matter how carefully you scrutinize it. Your only recourse then is reasonable skepticism. But most times you can at least get a few clues about the reliability of the report by taking the following critical approach. Consider Whether the Report Conflicts with What You Have Good Reason to Believe A report that conflicts with other reports that you believe are reliable or with facts you already know is not trustworthy. Likewise, a report that conflicts with expert opinion should not be accepted. Look for Reporter Slanting Look for slanting in news accounts just as you would look for it in any set of claims. Check for loaded or biased language; arguments or unsupported opinion; emotional appeals; appeals to authority, popularity, and tradition; and biased or subjective tone. Consider the Source Ask what the source is of the information presented in the story. Did the reporter uncover the facts herself—or does the information come directly from the government, corporations, or interest groups? How does the reporter know that the information is accurate? Does the information seem to be a simple statement of facts—or a pack of assertions designed to put someone in the best possible light? Check for Missing Information Be suspicious if essential facts are not presented in the story or if it seems so heavily edited that the context of remarks is mysterious. Sound bites, for example, are easy to take out of context because they usually have no context. Look for False Emphasis The size of headlines, the position of stories, the order in which facts are presented—all these things can give unmerited emphasis to a story or some of its claims. To counteract this tactic, ask if the emphasis is really deserved—or, more broadly, if the story or story part is really as significant as the reporter would have you believe. Check Alternative News Sources How can you tell if the news you're getting is incomplete—if there's important news you're not seeing? You can't, unless you check alternative news sources for any missing stories. Reading a variety of newspapers, newsmagazines, journals of opinion, and websites is the best way to ensure that you're getting the "In essence, I see the value of journalism as resting in a twofold mission: informing the public of accurate and vital information, and its unique ability to provide a truly adversarial check on those in power." —Glenn Greenwald 154 Part Two | Reasons big picture. To avoid confirmation bias, and to ensure that you're fully informed, you should read not only those sources that agree with you but also those that don't. Advertising and Persuasion Advertising is like air. It is everywhere, so pervasive and so natural that we forget it's there, sinking into and changing us every day. Advertising messages hit us rapid-fire and non-stop from television, radio, email, websites, blogs, podcasts, movie theatres, magazines, newsletters, newspapers, book covers, junk mail, telephones, fax machines, product labels, billboards, vehicle signs, T-shirts, wall posters, flyers, and who knows what else. Ads permeate all media—print, film, video, television, radio, and online. Most of us barely even notice (or at least think we barely notice) the hundreds of ads we see every day in the margins of our Facebook pages, our Google searches, our favourite online news sources. Caught in this whirl of words and sounds and images, we can easily overlook the obvious and disconcerting facts behind them: (1) all advertising is designed to influence, persuade, or manipulate us; (2) to an impressive degree and in many ways, it does successfully influence, persuade, or manipulate us; and (3) we are often oblivious to—or in outright denial about—how effectively advertising influences, persuades, or manipulates us. The purpose of advertising is to sell products and services, promote causes or candidates, or alter attitudes and opinions. How well advertising does these jobs can be measured in money. Advertising in most media costs a great deal. A single full-page magazine ad can cost tens of thousands of dollars; a 30-second TV ad can run into the millions (especially on Super Bowl Sunday). But companies are willing to pay the price because advertising works. The revenues garnered from advertising can outweigh its costs by wide margins; in the case of a magazine ad or a TV spot, the gain could easily be hundreds of thousands or millions of dollars. In addition, advertisers and advertising agencies invest heavily each year in scientific consumer research to determine how to configure ads precisely to elicit the desired response from people. Again, they make these investments because there is a sure payoff. Consumers usually respond just as the research says they will. How do your eyes track across a newspaper ad when you are looking at it? Would you respond better to a TV commercial if the voiceover came from a CBC news anchor or from Taylor Swift? Would the magazine ad be more likely to sell you the cottage cheese if the headline used the word creamy instead of smooth? Would the ad copy on the junk-mail envelope increase sales if it were red instead of blue? You may not care about any of this, but advertisers do because such seemingly trivial bits of information can help them to influence you in ways you barely suspect. However averse we are (or think we are) to advertising or to its aims, we cannot deny its appeal. We like advertising, at least some of it. We can easily point to ads that annoy us or insult our intelligence, but most of us can also recall ones 4 | Reasons for Belief and Doubt 155 that are entertaining, funny, inspiring, even informative. How, then, should good critical thinkers think about advertising? Our guiding principle should be this: This means that usually the most reasonable response to advertising is a degree of suspicion. If we prefer truth over falsehood, if we would rather not be mistaken or bamboozled, if we want to make informed choices involving our time and money, then a general wariness toward advertising ploys is justified. This principle does not assume that all ad claims are false or that advertising cannot be genuinely informative or useful. It simply says that we should not accept uncritically an ad's message or impact on us. There are several reasons for this cautious approach. First, recall the purpose of advertising—to sell or promote something, whether a product, service, person, or idea. To put the point bluntly, though advertising can be both truthful and helpful, its primary function is not to provide objective and accurate information to consumers. Advertisers will tell you many good things about their products but are unlikely to mention all the bad. Their main job is not to help consumers make fully informed, rational choices about available options. Advertising is advertising—it is not intended to be an impartial search for facts or a program of consumer protection. We are therefore justified in maintaining the same attitude toward advertising that we would toward a complete stranger who wants to sell us something. His motives are obviously financial while his commitment to honesty is unknown, so we should beware. Second, advertising has a reputation for—and a history of—misleading messages. The world is filled with ads that make dubious or false claims, use fallacious arguments (stated or implied), and employ psychological tricks to manipulate consumer responses. Some of these methods fit neatly in our rundown of fallacies in this chapter and the next. Ads frequently employ fallacious appeals to authority ("As an Olympic gold medal winner, I can tell you A "beware of dog" sign isn't literally advertising, but it sure can be that PowerVitamin 2000 really works!"), a false message, and in some cases is clearly intended to deceive. In appeals to emotion ("Enjoy the goodness what ways does advertising fall victim to fallacious appeals? Mike Baldwin/www.CartoonStock.com We generally have good reason to doubt advertising claims and to be wary of advertising's persuasive powers. 156 Part Two | Reasons and warmth of Big Brand Soup, just like mother used to make"), appeals to popularity ("The Globe and Mail: Canada's Most Trusted News Source"), hasty generalizations ("Mothers everywhere will love Softie Diapers—our test mothers sure did!"), and faulty analogies ("As a businessman, I got a major corporation out of debt. As premier, I can get this province out of debt!"). But advertisers also use an array of other persuasive techniques, most of which do not involve making explicit claims or providing good reasons for acting or choosing. The following are some of the more common ones. Identification Many ads persuade by simply inviting the consumer to identify with attractive individuals (real or imagined) or groups. Most ads featuring celebrity endorsements use this tactic. The idea is to get you to identify so strongly with a celebrity that you feel his or her product choices are your preferred choices. Without providing a single good reason or argument, endorsement ads say, in effect, that if Kendall Jenner prefers Pepsi, if Gigi Hadid likes Tommy Hilfiger, if LeBron James loves Nike, maybe you should too. At least that's the implicit suggestion. Slogans Catchy, memorable phrases are the stock-in-trade of advertising. How could we forget such gems as "Just do it" (Nike), "I'm Lovin' It" (McDonald's), "Like a rock" (Chevrolet), "Don't leave home without it" (American Express), or "Time for Tims" (Tim Hortons)? Such catchphrases may not say much, but they do get our attention, engender appealing emotions or concepts, and get us to associate them with products or companies—again and again and again. Through repetition that seems to embed them in our brains, slogans surreptitiously get us to feel that one product or brand is better than another. Misleading Comparisons In advertising, comparisons can mislead in many ways. Consider these examples: 1. BeClean Paper Towels are 30 per cent more absorbent. 2. Big sale! The SuperX Gaming System for less than the suggested retail price! 3. Simply better-tasting tacos. No question. 4. Our mobile phone plan beats the competition. Long-distance calling is just 5 cents per minute, compared with our competitors who charge up to 10 cents a minute. The problem with example 1 is its vagueness, which is of course deliberate. What does "30 per cent more absorbent" mean? Thirty per cent more absorbent than they 4 | Reasons for Belief and Doubt used to be? Thirty per cent more absorbent than similar products are? If the latter, what similar products are we talking about? Are BeClean Paper Towels being compared to the least absorbent paper towels on the market? The 30 per cent may seem impressive—until we know what it actually refers to. (Another relevant question is how absorbency was determined. As you might imagine, there are many ways to perform such tests, some of them likely to yield more impressive numbers than others.) The claim in example 2 may or may not be telling us about a true bargain. We would probably view the "big sale" in a different light if we knew whether the store's regular prices are below the suggested retail prices or if all stores sell the gaming system below the suggested retail price. Example 3 contains the same sort of vagueness we find in example 1 plus an additional sort of emptiness. The phrase "better-tasting tacos" is a claim about a subjective state of affairs—a claim that anyone could make about his or her own eating experience. You and a thousand other people might try the tacos and think they taste terrible. So the claim tells you nothing about whether you will like the tacos. The claim would be empty even if it were stretched to "The best-tasting tacos on Earth!" In the ad world, such exaggerations are known as puffery, which is regarded in advertising law as hype that few people take seriously. Example 4 is misleading because it tries to compare apples and oranges. Maybe the service offered by one phone company is not like that offered by the others. Maybe the former gives you bare-bones service for five cents a minute; the latter gives you the same plus caller ID, call waiting, and free long distance on weekends. So comparing the two according to the per-minute charge alone may be deceptive. Weasel Words When advertisers want to appear to make a strong claim but avoid blatant lying or deception, they use what are known as weasel words. Weasel words water down a claim in subtle ways—just enough to ensure that it is technically true but superficially misleading. Consider: 1. You may have already won a new 2019 Ford pickup truck! 2. Some doctors recommend ginseng for sexual dysfunction. 3. When used properly, this product relieves up to 60 per cent of headaches in chronic headache sufferers. Example 1 is typical junk-mail hype that seems to promise a valuable prize. But the weasel word may weakens the claim. Technically, you may have actually won since your winning is at least (remotely) possible. But in the typical sweepstakes, the odds of your winning anything are millions to one. Yes, you may have already won—and you may get hit by an asteroid tomorrow. Example 2 plays on the weasel word some. It is probably true that some (meaning at least one) doctors recommend ginseng for sexual dysfunction, but a huge majority of them do not. 157 158 Part Two | Reasons Using some, we could craft an infinite number of technically true but misleading (and ridiculous) claims about what doctors do and don't do. In Example 3 the weasel words are up to. Notice that many states of affairs would be consistent with this (vague) statement. It would be true even if just 1 per cent of headaches were relieved in almost all headache sufferers, and that would be pretty weak evidence that the product is likely to work for you. Other weasels include as many as, reportedly, possibly, virtually, many, seems, and perhaps. Such words, of course, can have perfectly respectable uses as necessary qualifiers. But when you spot them in ads, watch out. Summary Many times we need to be able to evaluate an unsupported claim—a claim that isn't backed by an argument. There are several critical thinking principles that can help us to do this. An important one is this: if a claim conflicts with other claims we have good reason to accept, we have good grounds for doubting it. Sometimes the conflict is between a claim and your background information. Background information is the large collection of very well-supported beliefs that we rely on to inform our actions and choices. The relevant principle then is this: if a claim conflicts with our background information, we have good reason to doubt the claim. It's not reasonable to accept a claim if there is good reason to doubt it. In the case of claims that we can neither accept nor reject outright, we should proportion our belief to the evidence. We should also do what we can to find out more. An expert is someone who is more knowledgeable than most people in a particular subject area. The important principle here is this: if a claim conflicts with expert opinion, we have good reason to doubt it. We must couple this principle with another one: when the experts disagree about a claim, we have good reason to suspend judgment. When we rely on bogus expert opinion (opinion from a fake "expert" or someone who is an expert on the wrong topic) or on the opinion of an expert not backed up by the consensus of his or her peers, we commit the fallacy known as the appeal to authority. Many claims are based on nothing more than personal experience, ours or someone else's. We can trust our personal experience—to a point. The guiding principle is that it's reasonable to accept the evidence provided by personal experience only if there's no reason to doubt it. Some common factors that can raise such doubts are impairment (stress, injury, distraction, emotional upset, and the like), expectation, and our limited abilities in judging probabilities. Some of the common mistakes we make in evaluating claims are resisting contrary evidence, looking for confirming evidence, and preferring available evidence. To counteract these tendencies, we need to take deliberate steps to examine even our most cherished claims critically, to search for disconfirming evidence as well as confirming, and to look beyond evidence that is merely the most striking or memorable. 4 | Reasons for Belief and Doubt Many of the unsupported claims we encounter are in news reports. Reporters, editors, and producers are under many pressures that can lead to biased or misleading reporting. The biggest factor is money—the drive for profits in news organizations, especially those owned by large corporations or conglomerates. Reporters themselves may introduce inaccuracies, biases, and personal opinions. And the people who produce the news may decide not to cover certain stories (or aspects of stories), thereby sometimes giving a skewed or erroneous picture of an issue or event. Some things that look like news reports may even be entirely fake, though not everything that someone calls "fake" news necessarily is. The best defence against being misled by news reports is a reasonable skepticism and a critical approach that involves, among other things, looking for slanting, examining sources, checking for missing facts, and being on the lookout for false emphasis. Advertising is another possible source of unsupported or misleading claims. We should realize that we generally have good reason to doubt advertising claims and to be wary of the persuasive powers of advertising. Exercise 4.1 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. Review Questions 1. What does the term background information refer to? 2. What is the appropriate next step when faced with a claim that conflicts with several other claims you have good reason to believe? 3. Is background information always reliable? *4. What should we do when faced with a claim that is neither worthy of acceptance nor deserving of outright rejection? 5. Should we generally accept claims made by experts? What should our attitude be toward a claim that conflicts with expert opinion? 6. What should our attitude be toward a claim when experts disagree with each other about it? 7. State two of the usual criteria for identifying someone as an expert. 8. What are the two versions of the fallacy of appeal to authority? 9. What, in most fields, are the two minimum requirements for being considered an expert? *10. Beyond the minimal prerequisites, what are two more telling indicators that someone is an expert? 11. Under what three circumstances should we suspect that an expert might be biased? 159 160 Part Two | Reasons 12. Why is it important to carry out your online research with reasonable skepticism? What are some questions you can ask to determine whether the information you find is accurate? 13. What are two factors that can give us good reason to doubt the reliability of personal experience? 14. What is the gambler's fallacy? 15. What are some ways that people resist contrary evidence? 16. What is confirmation bias? *17. How can critical thinkers counteract confirmation bias? 18. What is the availability error? 19. What is the connection between the hasty generalization and availability error? 20. What are some strategies you can use to help determine whether or not a news report is trustworthy? 21. According to the text, what is the guiding principle that we should use in order to think critically about advertisements? 22. What are some of the strategies that advertisers use to try and make us buy into their claims regarding their products? Exercise 4.2 On the basis of claims you already have good reason to believe, your background information, and your assessment of the credibility of any cited experts, indicate for each of the following claims whether you would accept it, reject it, or proportion your belief to the evidence. Give reasons for your answers. If you decide to proportion your belief to the evidence, state generally what degree of plausibility you would assign to the claim. 1. Humans have caused the Earth's climate to warm over the last few hundred years. 2. India is one of the richest countries in the world. 3. Every year in Canada over 3000 people die of Zika virus. *4. According to Dr Feelgood, the spokesperson for Acme Mattresses, the EasyRest 2000 from Acme is the best mattress in the world for those suffering from back pain. 5. Most Canadians have very low levels of credit card debt. *6. Every person has innate psychic ability that, when properly cultivated, can enable him or her to read another person's mind. 7. All major Western government powers are monitoring and collecting private information on their citizens, even those suspected of no crime, and then sharing the collected information with each other. 4 | Reasons for Belief and Doubt 8. Agnes Macphail, the first Canadian woman elected to Parliament (in 1921) died last year. 9. The New Democratic Party has held a majority of seats in Parliament more than a dozen times in Canada's history. *10. Fifteen women have died this year after smelling a free sample of perfume that they received in the mail. 11. A chain letter describing the struggles of a nine-year-old girl with incurable cancer is circulating on the Internet. The more people who receive the letter, the better the little girl's chances of survival. 12. A report from Health Canada says there is no evidence that high doses of the herb ephedra can cure cancer. Ephedra must be a bogus cure. 13. According to Professor Heath, an expert on the work of Jurgen Habermas and a former student of his, Habermas was critical of Michel Foucault's tendency to smuggle normative claims into arguments that were supposedly only about facts. *14. Crop circles—large-scale geometric patterns pressed into fields of grain or hay—are the work of space aliens. 15. The "fairy photos" produced by two girls early in the twentieth century were fakes. 16. Canada is likely to lead the world in medals at the Summer Olympics in Paris in 2024. *17. Dr Xavier, a world-famous astrologer, says the position of the sun, planets, and stars at your birth influences your choice of careers and your marital status. 18. Eleanor Morgan, a Nobel Prize–winning medical scientist, says that modern democratic systems (including developed nations) are not viable. 19. If the price of GM trucks goes up, people are more likely to buy Ford trucks instead. 20. The highway speed limit in Alberta is 160 km/h. Exercise 4.3 For each of the following claims, decide whether you agree or disagree with it. If you agree with a claim, say what evidence would persuade you to reject the statement. If you disagree with a claim, say what evidence would persuade you to accept the statement. In each case, ask yourself if you would really change your mind if presented with the evidence you suggested. 1. Canada's system of universal, free health care results in a significantly higher quality of service and much shorter wait times compared to the system in the United States. 161 162 Part Two | Reasons 2. Canada needs to promote higher levels of immigration, since immigrants have always been the most productive elements of Canadian society. *3. An alien spacecraft crashed in Roswell, New Mexico, in 1947. 4. Homeopathic remedies are generally effective. 5. Homeopathic remedies generally lack side-effects. 6. My yoga teacher is able to slow his heart rate down to two beats per minute. 7. The US president is a mere puppet, and the British government is "pulling the strings." *8. Meditation and controlled breathing can shrink cancerous tumours. 9. There are no mammals that are native to New Zealand. 10. The pervasive presence of mobile computing devices—mobile phones and computer tablets—is doing damage to young people's brains. Exercise 4.4 Examine the following newspaper story, and answer the questions that follow. Your local newspaper reports on Page 1: In a shocking decision, a provincial court judge sentenced a local thug to a mere six months in prison for sexually assaulting an innocent young girl. The girl, who cannot be identified due to her tender age, testified by video recording at trial. Her silky blonde hair hung down over her sweet face as she tearfully recounted the brutal assault. The accused sat smugly in the defendant's box, his beady eyes rolling toward the ceiling time and time again during the Crown prosecutor's eloquent summation. The defendant's lawyer, while mopping a sweaty brow, spoke after the decision was handed down, rambling about his client's own supposedly difficult childhood. A legal expert unconnected to the case, but who is renowned for his legal acumen, said that the sentence was utterly bizarre. 1. Is the story slanted toward or against a particular party? How? 2. Are there instances of loaded or biased language or emotional appeals in the story? If so, give examples of each. 3. What significant person or persons did the reporter who wrote this story apparently fail to talk to? What effect might that have had on the reporting? 4. Assume the story was found on the Internet. What information would you look for in order to determine whether the website is a credible one? 4 | Reasons for Belief and Doubt Field Problems 1. Find a controversial news story posted on the Internet, and answer the questions in Exercise 4.4 about it. 2. Write down a claim in which you strongly believe—one that pertains to an important social, religious, or political issue. Then state what evidence would persuade you to change your mind about the claim. How easy or difficult would it be to conduct a thorough search for such evidence? 3. Write down a claim that a close friend of yours strongly believes but that you do not believe. Then state what evidence you think it would take to persuade your friend to change his or her mind about the claim. Do you think they would change their mind if you provided the right evidence? If not, why not? 4. Think of the range of experts whose advice you rely on, either directly or indirectly, in your own life. They may or may not be people you know by name. Try to think of at least five, and make a list. For each, name the source of his or her expertise. Is it extensive education, extensive experience, or something else that makes them reliable? Self-Assessment Quiz 1. How should a critical thinker regard an unsupported claim that conflicts with a great deal of his or her background information? 2. What is "folk psychology," and how is it useful? 3. Name at least three of the four factors to consider in deciding whether someone should be considered an expert. 4. According to the text, what are some key signs that an expert may be biased? 5. Why might the memory of an eyewitness be unreliable? Name at least two possible reasons. For each of the following situations and the claim associated with it, indicate whether there may be good reasons to doubt the claim, and, if so, specify the reasons. 6. Hilary is driving through a blizzard when she suddenly sees a person crossing the road up ahead. She concludes that the object is about 250 metres away, so she should have plenty of time to stop the car before she hits it. Gentle braking should be sufficient. 163 164 Part Two | Reasons 7. While walking through the woods on a windy day, Connor thinks he hears a voice whispering his name. It's almost inaudible, but he thinks it says, "Connnnnnorrrrrr . . . come home!" 8. Constable Jones views the videotape of the robbery at the Tim Hortons that occurred last night. He sees the robber look into the camera. "I know that guy," he says. "I put him away last year on a similar charge." For each of the following claims, say whether it is (a) almost certainly false, (b) probably false, (c) probably true, (d) almost certainly true, or (e) none of the above. 9. Canada experiences more blizzards than the United States. 10. A claim on Health Canada's website: about 100 children a year die as a result of their mothers smoking during pregnancy or from exposure to smoke at home. 11. In spite of appearances, no action is ever motivated by the interests of anybody but the doer. 12. The reason the current generation is becoming so lazy and entitled is due to the availability of technology to replace work that traditionally needed to be done by hand. 13. "The world shadow government behind the US government is at it again, destroying US buildings and killing people with staged acts of terrorism [on 11 September 2001], the intent of which being—among other things—to start WW III." (Website devoted to 9/11 theories) 14. "[Crystal healing means u]sing stones and crystals to draw out impurities in the body. These stones are assigned properties which target various kinds of physical, emotional and spiritual energy problems. They are also used as charms to repel negative energy that could harm and affect the body." (www.therockspa.com/types-energy-healing-works/) 15. The reason that funding for research into renewable energy sources is so scarce is that the big oil companies are trying their best to continue being the dominant players in the energy sector. They are constantly lobbying for the government to ignore alternative energy. 16. High unemployment in small towns is in part responsible for the increasing epidemic of drug use in such towns across North America. Read the following news story, and then answer questions 17–20. Reputed MS -13 defendants laugh, smile as slain teen's family glares FoxNews.com, 28 February 2018. Three members of the notorious Salvadoran gang MS -13 showed no remorse Tuesday as they laughed and joked in a New York courtroom while the family of one of their alleged murder victims—a teenage girl—grimly looked on. 4 | Reasons for Belief and Doubt Enrique Portillo and brothers Alexi Saenz and Jairo Saenz laughed, smiled and joked with each other as prosecutors said they were waiting to hear from the U.S. Justice Department about whether they can pursue the death penalty. The family of 16-year-old Kayla Cuevas, the Brentwood, N.Y. girl they are accused of slaughtering in cold blood alongside her friend Nisa Mickens, 15, glared at them from the gallery, the New York Post reported. The two teenage girls were slaughtered in a residential neighborhood near an elementary school on Sept. 13, 2016—the day before Mickens' 16th birthday. Her body was found on a tree-lined street in Brentwood, while Cuevas' beaten body turned up in the wooded backyard of a nearby home a day later. The two teens were lifelong friends who friends and family said had been inseparable and shared an interest in basketball.12 17. Is the story slanted in a way that seems to encourage readers to believe that the defendants in this case are especially good or bad people? How? 18. Are there instances of loaded or biased language or emotional appeals that make the victims in this case seem especially sympathetic? 19. What main source did the reporter use for the details of this story? Is that problematic? Why? 20. On the main page for the Fox News website, the headline for this story was different. It read, "MS -13 monsters laugh in court as feds mull death penalty for heinous murders of teen girls." Can you see the difference? Why might the main page use different wording? Integrative Exercises These exercises pertain to material in Chapters 1–4. 1. What is an inductive argument? What is a deductive argument? 2. How can background information help us to determine the soundness of a deductive argument or the cogency of an inductive one? 3. Can our background information help us to determine whether an argument is valid? If so, how? If not, why not? 4. Is your own expertise more important for determining the validity of a deductive argument or the strength of an inductive one? 5. What is an appeal to authority? Is appealing to authority always fallacious? For each of the following arguments, specify the conclusion and premises, and say whether it is deductive or inductive. If it's inductive, say whether it is strong or 165 166 Part Two | Reasons weak; if deductive, say whether it is valid or invalid. If necessary, fill in any implicit premises and conclusions. 6. "[Paid d]onors [of blood plasma] receive, on average, $25–50 per donation. In Manitoba, where this practice has existed since 1984, donations are compensated at greater-than-minimum-wage levels. Canadian Plasma Resources pays between $30 and $50, while in the United States, donors receive between $25 and $50 per donation. Compensation is therefore not low, but it is not, on the other hand, so high as to unduly induce a potential donor into a donation. Given that the risks are not undue, and that payment, although not low, is not too high, there is no particularly good reason to worry about wrongful exploitation based on undue inducement." (www.donationethics .com/) 7. "The people of PEI have a voice and it deserves to be heard in return for a vote. Too many times people have voted for the Liberals and PCs and too many times those people have been let down by the party they voted for because the party has their own hidden agendas." (Online comment, 4 February 2011, The Guardian, Charlottetown, PEI) 8. If the United States pulls out of NAFTA , the United States will suffer economically. Fortunately, the United States won't actually pull out of NAFTA . So the United States will not suffer economically. 9. Of course Canadians should retain their link to the British monarchy. Sure, Canada is a democracy now, but our link to the monarchy is an important reminder of our history and an important part of what makes us different from other North American countries. 10. My high school teacher swears that smoking cigarettes is actually good for you. He says his father smoked two packs of cigarettes a day and lived to the ripe old age of 92 without even a hint of cancer or other serious disease. The rest of his family tree never smoked a day in their lives, and all died before they reached their seventies. 11. The fear generated by the terrorist attacks on 11 September 2001 allowed the US government to enact legislation that increased its own power and tightened control over its citizens. It also provided a good excuse to invade the Middle East for oil under the pretext of "hunting down terrorists." That's why many believe that the US government probably had something to do with attacks. 12. The prime minister's popularity in BC will not go up if he goes ahead and approves the Kinder Morgan pipeline. And it looks as if he's going to approve it. Thus, his popularity in BC is not going to rise. 13. Yes, the monarchy is part of our heritage. But Canada is a modern democracy, and in a modern democracy there is simply no room for the remnants of an outdated form of authoritarian rule. The people deserve a say. Our head of state should be elected. 4 | Reasons for Belief and Doubt 14. If you cared about social justice, you would be down there with your friends at the Occupy Toronto protest. If you were down at the protest, you wouldn't be sitting on the couch. But there you are, sitting on the couch eating Doritos. You don't care about social justice at all! 15. "Cold-FX is an undeniable Canadian sales success, but this seems to be due more to marketing, rather than science. The data published to date suggest that it may have some sort of a biological effect—but it's a small one, and for many people that take it, the data suggest it will not be effective in preventing colds or the flu." (Science-Based Pharmacy, 27 February 2009) 16. The park is muddy from a week of rain. And the forecast is calling for more rain again tomorrow. And half of our staff have been off sick. It's likely the picnic will be cancelled. 17. Nancy is serving lasagna and spaghetti at dinner tonight. Since Hendricus can't stand lasagna, you can bet he'll have the spaghetti. For each of the following unsupported claims, specify whether it seems worthy of acceptance, rejection, or a degree of belief in between. 18. The woman who was just arrested couldn't explain where she was last evening, so she had to be the person who committed last evening's series of muggings in Stanley Park. 19. The heads of Canada's three biggest mobile phone companies agree that there's no need to reform the regulations regarding the pricing of telecom services in Canada. 20. I saw Ling last night. I know she moved back to China, but I woke up in the middle of the night and saw a shadow in the corner of my room and heard her voice saying she missed me. 21. RBC , BMO, Scotiabank, TD, and CIBC run the oligopoly that is Canada's banking sector, and they work together closely to make sure that simply having a bank account stays as expensive for us—and as profitable for them— as possible. Critical Thinking and Writing Exercise From Outline to First Draft If you have developed a detailed outline for your essay, then you have a path to follow as you write. And while you're writing an argumentative essay, having a path is much better than searching for one. Your outline should make the writing much easier. No outline is a finished work; however, the structure of your essay is likely to evolve as you write it. As you write, you may discover that your arguments are 167 168 Part Two | Reasons not as strong as you thought, or that other arguments would be better, or that changing a point here and there would make an argument more effective. If so, you should amend your outline to help you keep track and then continue writing. The act of writing is often an act of discovery, and good writers are not afraid of revisions or multiple drafts. Recall from the exercise in Chapter 1 that good argumentative essays generally consist of these elements: • • • • • Introduction (or opening) Statement of thesis (the claim to be supported) Argument supporting the thesis Assessment of objections Conclusion Start your draft with a solid opening that draws your readers into your essay and prepares the way for your arguments. Good openings are interesting, informative, and short. Grab the attention of your readers with a bold statement of your thesis, a provocative quotation, a compelling story, or interesting facts. Prepare the way for your arguments by explaining why the question you're addressing is important, why you're concerned about it, or why it involves a pressing problem. Don't assume that your readers will see immediately that the issue you're dealing with is worth their time. Include a clear statement of your thesis in your opening (in the first paragraph or very close by). In many cases, you will want to tell the reader how you plan to develop your argument or how the rest of the essay will unfold (without going into lengthy detail). In any case, by the time your audience reads through your opening, they should know exactly what you intend to prove and why. Consider this opening for our imaginary essay on air pollution from the module at the end of Chapter 3: Respiratory experts at Health Canada say that sulphur dioxide in the air is a poison that we should avoid. Yet the provincial government wants to loosen environmental rules to allow coal-burning power plants to emit more sulphur dioxide than they already do. That's a bad idea. The latest evidence shows that letting the plants emit more of this poison will most likely increase the incidence of respiratory illnesses in hundreds of communities. This opening gets the reader's attention by sounding the alarm about a serious health hazard. It provides enough background information to help us understand the seriousness of the problem. And the thesis statement in the last sentence announces what the essay will try to prove. The body of your essay should fully develop the arguments for your thesis statement, or conclusion. You should devote at least one paragraph to each premise, though several paragraphs may be necessary. You may opt to deal with objections to your argument as you go along, perhaps as you put forth each premise or 4 | Reasons for Belief and Doubt at the end of the essay just before the conclusion. Each paragraph should develop and explain just one idea, which is usually expressed in a topic sentence. Each sentence in each paragraph should relate to the paragraph's main idea. Any sentence that has no clear connection to the main idea should be deleted or revised. Be sure to link paragraphs together in a logical sequence using transitional words and phrases or direct references to material in preceding paragraphs. Here are two paragraphs that might follow the air pollution opening: Scientists used to wonder whether there is a connection between airborne sulphur dioxide and respiratory illness—but no more. Research has repeatedly shown a strong link between high levels of sulphur dioxide in the air and diseases that affect the lungs. For example, data from studies conducted by Health Canada show that when levels of airborne sulphur dioxide in urban areas reach what the agency calls the "high normal" range, the incidence of respiratory illnesses increases dramatically. According to several Health Canada surveys of air quality, many major cities (not just Toronto) often have high normal levels of sulphur dioxide in the air. In addition, data from health departments in large cities show that when levels of airborne sulphur dioxide are at their highest, hospital admissions for asthma and other respiratory illnesses also increase. These findings, however, tell only half the story. Many parts of the country have more than just occasional surges in levels of airborne sulphur dioxide. They must endure unsafe levels continuously. New studies from Health Canada demonstrate that in at least 10 major cities, the amount of sulphur dioxide in the air is excessive all the time. In this passage, a single paragraph is devoted to each premise. Each paragraph develops a single idea, which is stated in a topic sentence. (The topic sentence for the first paragraph is "Research has repeatedly shown a strong link between high levels of sulphur dioxide in the air and diseases that affect the lungs." For the second paragraph, the topic sentence is "Many parts of the country must endure unsafe levels continuously.") Each sentence in each paragraph relates to the topic sentence, and the relationships among the sentences are clear. Likewise, the connection between the discussion in the first paragraph and that of the second is apparent. The transitional sentence in the second paragraph ("These findings, however, tell only half the story.") helps to bridge the gap between the paragraphs. Both of them help to support the thesis statement. How you end your essay is often as important as how you start it. In short or simple essays, there may be no need for a conclusion. The thesis may be clear and emphatic without a conclusion. In many cases, however, an essay is strengthened by a conclusion, and sometimes a conclusion is absolutely essential. Often, without an effective conclusion, an essay may seem to end pointlessly or to be incomplete. 169 170 Part Two | Reasons The typical conclusion reiterates or reaffirms the thesis statement without being repetitious. Or the conclusion of the essay's argument serves as the conclusion for the whole essay. In long or complex essays, the conclusion often includes a summary of the main points discussed. Sometimes a conclusion is a call to action, an invitation to the reader to do something about a problem. Sometimes it relates a story that underscores the importance of the essay's argument. Sometimes it highlights a provocative aspect of a claim defended earlier. In all cases it serves to increase the impact of the essay. The conclusion, however, is not the place to launch into a completely different issue, make entirely unsubstantiated claims, malign those who disagree with you, or pretend that your argument is stronger than it really is. These tactics will not strengthen your essay but weaken it. Defining Terms Your essay will do its job only if it is understood, and it will be understood only if the meaning of its terms is clear. As noted in the exercise in the module at the end of Chapter 3, sometimes a dispute can hang on the meaning of a single term. Clarify the meaning, and the disagreement dissolves. In an argumentative essay, clarifying terms often comes down to offering precise definitions of words that are crucial to your argument. There are several different kinds of definitions. A lexical definition reports the meaning that a term has among those who use the language. For example, among English-speaking people, the word rain is used to refer to condensed atmospheric moisture falling in drops, which is the lexical definition. A stipulative definition reports a meaning that a term is deliberately assigned, often for the sake of convenience or economy of expression. If you assign a meaning to a familiar term or to a term that you invent, you give a stipulative definition. A precising definition reports a meaning designed to decrease ambiguity or vagueness. It qualifies an existing term by giving it a more precise definition. Someone, for example, might offer a precising definition for the word old (as it applies to the age of humans) by specifying that old refers to anyone over 80. A persuasive definition reports a meaning designed to influence attitudes or beliefs. It is usually not meant to be purely informative but is calculated to appeal to someone's emotions. Someone who opposes taxation, for example, might define taxation as "a form of state-run extortion." Someone who thinks that taxation is generally a good thing might define taxation as "a way for individuals to contribute financially to important social programs." In general, any definition you offer should decrease vagueness or ambiguity and thereby increase the effectiveness of your writing. Your definitions should also be consistent. If you provide a definition for a term in your essay, then you should stick to that definition throughout. Altering the meaning of a term mid-essay or using more than one term to refer to the same thing can be confusing to the reader—and might even subvert your essay's argument. 4 | Reasons for Belief and Doubt Good writers are also very much aware of another kind of meaning—the meaning that comes from a word's connotations. Connotations are the feelings, attitudes, or images associated with a word beyond the literal meaning of the term. Consider these words: food, sustenance, cuisine, and grub. These terms have nearly the same literal meaning, but they differ in the emotions or attitudes they convey. Or what about these terms: tavern, saloon, bar, watering hole, and dive. They refer to the same kind of establishment, but the images or emotions conveyed are diverse, ranging from the respectable and pleasant (tavern) to the lowly and odious (dive). Good writers make use of both the literal meaning of words and their connotations. Connotations, however, can sometimes mislead by obscuring or minimizing the facts. In debates about, for example, Quebec independence, those who want greater independence for Quebec may characterize their position as favouring "sovereignty and self-determination." Those opposed to it might label it as "seeking to break up Canada." Both these labels are meant to provoke certain attitudes toward the subject matter—attitudes that may not be supported by any evidence or argument. Words used to convey positive or neutral attitudes or emotions in place of more negative ones are known as euphemisms. Words used to convey negative attitudes or emotions in place of neutral or positive ones are called dysphemisms. Consider the disparate impact on the reader of each of the words within these pairs of terms, both of which refer to the same thing: downsized fired revenue enhancements tax increases full-figured fat guerrillas freedom fighters resolute pigheaded emphatic pushy sweat perspire crippled disabled lied to misled passed away died Keep in mind that euphemisms often perform a useful social purpose by allowing us to discuss sensitive subjects in an inoffensive way. We may spare people's feelings by saying that their loved ones "have passed on" rather than that they "have died" or that their dog was "put to sleep" rather than "killed." Nevertheless, as critical thinkers, we should be on guard against the deceptive use of connotations. As critical writers, we should rely primarily on argument and evidence to make our case. 171 172 Part Two | Reasons Writing Assignments 1. Write an alternative opening for Essay 4 ("What's Wrong with 'Body Mass Index'") in Appendix A. If you want, you may invent quotations or stories. 2. Write an outline for Essay 7 ("Yes, Human Cloning Should Be Permitted") in Appendix A. Include a thesis statement, each premise, and points supporting each premise. 3. Study Essay 9 ("What If You Could Save 250 Lives by Feeling a Little Disgusted?") in Appendix A. Identify the role that emotion plays in making arguments on both sides of the issue discussed in the essay. 4. Select one of the following topics, and extract an issue from it that you can write about. Investigate arguments on both sides of the issue, and write a three-page paper defending your chosen thesis. • supervised injection sites for drug addicts • drug-testing in the workplace • veganism • the #MeToo movement • diversity in the workplace • government censorship of media coverage of military activities • commercial whaling • religion as a source of ethics • endangered species • animal rights • the dangers of too much "screen time" for kids • Indigenous land claims • sexual harassment • medical assistance in dying • an oil pipeline from northern Alberta to Texas 5. Write a two-page rebuttal to Essay 8 ("Unrepentant Homeopaths") in Appendix A. Use the testimony of experts to help defend your view. Notes 1. 2. 3. Russell, Let the People Think, 1. Adapted from Duke University Libraries, "Evaluating Web Pages," guide/evalwebpages.html (accessed 8 September 2009). "Who Believes in Me? The Effect of Student–Teacher Demographic Match on Teacher Expectations," Economics of Education Review 52 (June 2016): 209–24, S0272775715300959. 4. 5. 6. 7. This example was inspired by L.W. Alvarez, letter to the editors, Science (18 June 1965): 1541. Terence Hines, Pseudoscience and the Paranormal (Buffalo, NY: Prometheus Books, 1988), 4–5. Thomas Gilovich, How We Know What Isn't So (New York: Free Press, 1991), 54. J. Cocker, "Biased Questions in Judgment of Covariation Studies," Personality and Social Psychology Bulletin 8 (June 1982): 214–20. 4 | Reasons for Belief and Doubt 8. Michael Sivak and Michael Flannagan, "Flying and Driving after the September 11 Attacks," American Scientist (January–February 2003): 6–8. 9. John Ruscio, "Risky Business," Skeptical Inquirer (March 2000), 22–6. 10. Peter Kan, Sara E. Simonsen, Joseph L. Lyon, and John R.W. Kestle, "Cellular Phone Use and Brain Tumor: A Meta-analysis," Journal of Neurooncology 86 (2008): 71–8; 173 Institute of Medicine, Immunization Safety Review: Vaccines and Autism (National Academies Press, 2004). 11. Leonard Downie Jr. and Robert G. Kaiser, The News about the News (New York: Vintage Books, 2003), 9–10. 12. Benjamin Brown, "Reputed MS -13 defendants laugh, smile as slain teen's family glares," Fox News, 28 February 2018, . 5 Faulty Reasoning Chapter Objectives Irrelevant Premises You will be able to • recognize fallacies of irrelevant premises (genetic fallacy, composition, division, appeal to the person, equivocation, appeal to popularity, appeal to tradition, appeal to ignorance, appeal to emotion, red herring, and straw man). • understand the concept of burden of proof and when it applies. Unacceptable Premises You will be able to • recognize fallacies of unacceptable premises (begging the question, false dilemma, slippery slope, hasty generalization, and faulty analogy). 5 | Faulty Reasoning 175 Bradford Veley/www.CartoonStock.com A n argument is meant to prove a point—to provide good reasons for accepting a claim. As you know by now, sometimes an argument succeeds, and sometimes it doesn't. When it doesn't succeed, the problem will be that the premises are false, or the reasoning is faulty, or both. In any case, the argument is defective, bad, or bogus—call it what you will. There are countless ways that an argument can be defective. But there are certain types of defective arguments that occur so frequently that they have names (given to them, in many cases, by ancient philosophers or medieval scholars) and are usually gathered into critical thinking texts so students can become aware of them. Such fallacy common, flawed arguments are known as fallacies, and they are therefore said An argument form that is to be fallacious. both common and defective; Fallacies are often convincing; they can seem plausible. Time and again they a recurring mistake in are psychologically persuasive though logically impotent. The fact that they tend reasoning. to be persuasive explains why they are so common. The primary reason for studying fallacies, then, is to be able to detect them so that you're not fooled by them. We can divide fallacies into two broad categories: (1) those that have irrelevant premises and (2) those that have unacceptable premises.1 Irrelevant premises simply have no bearing on the truth of the conclusion they are supposed to support. An argument may seem to offer reasons for accepting the conclusion, but the "reasons" have nothing to do with the conclusion. Such premises make it no more reasonable (or unreasonable) to believe the argument's conclusion than it was before you heard them. Unacceptable premises, on the other hand, are relevant to the conclusion but are nonetheless dubious in some way. An argument may have premises that pertain to the conclusion, but they do not adequately support it. Premises can be unacceptable because they are as dubious as the claim they're intended to support, because the evidence they offer is too weak to support the conclusion adequately, or because they're otherwise so defective that they provide no support at all. So in good arguments, premises must be both relevant and acceptable. In fallacious arguments, at least one of these requirements is not met. In this chapter we examine numerous fallacies of both types. We won't be able to discuss all known fallacies—there are just too many—but we will take a look at the most common ones. By the time you have finished this chapter, you should be able to spot these Critical thinkers know that a lot of ideas are bad fallacies a mile away and have some sense of how to ones. What common fallacies should you watch out respond to them. for when making an argument or expressing an idea? 176 Part Two | Reasons Irrelevant Premises Genetic Fallacy genetic fallacy The fallacy of arguing that a claim is true or false solely because of its origin. Despite its name, the genetic fallacy has nothing to do with genes in the biological sense. The genetic fallacy consists of arguing that a claim is true or false solely because of its origin. (The word "genetic" is related to the word "genesis," which means "origin" or "beginning.") Some examples of this fallacy: Selena's argument regarding Indigenous rights can't be right because she's of European descent. We should reject that proposal for solving the current welfare mess. It comes straight from an economist with known conservative leanings. Russell's idea about tax hikes came to him in a dream, so it must be a silly idea. "One must accept the truth from whatever source it comes." —Moses Maimonides These arguments fail because they reject a claim solely on the basis of where that claim comes from, not on its merits. In most cases, the source of an idea is irrelevant to its truth. Good ideas can come from questionable sources; bad ideas can come from sources that are usually reliable. Generally, judging a claim only by its source is a recipe for error. There are times, however, when the origins of a claim can be a relevant factor. In court cases, when an eyewitness account comes from someone known to be a pathological liar, the jury is entitled to doubt the account. Or when a claim comes from someone who says they are an expert but who is in fact not an expert, then we should recognize that the claim deserves no more respect than it would if it came from any other non-expert. (See the discussion of "Appeal to Authority" in Chapter 4.) Appeal to the Person appeal to the person/ad hominem The fallacy of rejecting a claim by criticizing the person who makes it rather than the claim itself. Ad hominem means "to the man." To commit the fallacy of appeal to the person (or ad hominem, meaning "to the man") is to reject a claim by criticizing the person who makes it rather than by examining the claim itself. For example: Watanabe has argued for an increase in the tax on cigarettes. But he once ran as the NDP candidate in a provincial election, so he's a raving socialist who thinks all taxes are good. Anything he has to say on this issue is sure to be loony. We should reject Chen's argument for life on other planets. He relies on fortune-tellers for financial advice! You can't believe anything Beauchemin says about the benefits of federalism. She's a known separatist. You can't believe anything Morris says about welfare reform. He's a left-leaning softy. 5 | Faulty Reasoning 177 Such arguments are fallacious because they attempt to discredit a claim by appealing to something that's almost always irrelevant to it, such as a person's character, motives, or personal circumstances. Claims must be judged on their own merits—they are not guilty by association. We are never justified in rejecting a claim because of a person's faults unless we can show how a person's faults translate into faults in the claim—and this is almost never the case. Even when a person's character is relevant to the truth of claims (for example, when we must consider the merits of testimonial evidence), we are not justified in believing a claim false just because the person's character is dubious. If the person's character is dubious, we are left with no reason to think the claim is either true or false. The fallacy of appeal to the person is usually regarded as a special case of the genetic fallacy. What distinguishes an appeal to the person is that it not only mentions a person as the origin of an argument, but it also attacks the person (usually his or her character) and usually ignores the argument altogether. To reject a claim simply because "it was made by Barry" is to commit the genetic fallacy; to reject a claim because "it was made by that moron Barry" is to commit the fallacy of appeal to the person. The fallacy of appeal to the person comes in several varieties. One is the personal attack (just mentioned), which often simply consists of insults. The gist of these arguments is familiar enough. The arguer suggests that X's claims, ideas, or theories should be rejected because X is a radical, reactionary, extremist, rightwinger, left-winger, fool, bonehead, moron, nutbar, or scum of the earth. Whatever psychological impact such terms of abuse may have, logically they carry no weight at all. Another form of this fallacy emphasizes not a person's character but his or her circumstances. Here, for instance, someone making a claim might be accused of inconsistency—specifically, of maintaining a view that is inconsistent with his or her previous views or social or political commitments. For example: Edgar asserts that global warming is real, but he's a card-carrying member of a political party that is officially skeptical about climate change. So he can't believe in global warming; he's got to deny it. Madison says she's in favour of higher levels of immigration, but you can't take her seriously. That view goes against everything her whole family believes in. These arguments are fallacious if they're implying that a claim must be true (or false) just because it's inconsistent with some aspect of the claimant's circumstances. The circumstances are irrelevant to the truth of the claim. When such arguments are put forth as charges of hypocrisy, we get another ad hominem fallacy known as tu quoque (Latin for "you're another"). The fallacious reasoning goes like this: Ellen claims that X, but Ellen doesn't practise/live by/ condone X herself—so X is false. Look: tu quoque ("you're another") A type of ad hominem fallacy that argues that a claim must be true (or false) just because the claimant is hypocritical. 178 Part Two | Reasons West coast granola crunchers tell us we shouldn't drive SUVs because they use too much gas and are bad for the environment. But they drive SUVs themselves. What hypocrites! I think we can safely reject their stupid pronouncements. But whether someone is hypocritical about their claims can have no bearing on the truth of those claims. We may, of course, condemn someone for hypocrisy, but we logically cannot use that hypocrisy as a justification for rejecting his or her views. Their views must stand or fall on their own merits. In another variation of circumstantial ad hominem reasoning, someone might deduce that a claim is false because the person making it, given his or her circumstances, would be expected to make it. For example: Wilson claims that the political system in Cuba is terrific. But he has to say that. He's a card-carrying communist. So forget what he says. But whether Wilson is a communist, and whether he would be expected or required to have certain views because of his connection to communism, is irrelevant to the truth of his claim. Finally, we have the ad hominem tactic known as "poisoning the well." In this one, someone argues like this: X has no regard for the truth or has non-rational motives for espousing a claim, so nothing that X says should be believed—including the claim in question or possibly any claim made in the future! The idea is that just as you can't Food For Thought Hypocrisy in Politics The version of ad hominem attack known as tu quoque plays an important—and typically unfortunate— role in political debate. Often it occurs in response to a critic who offers an argument against a decision or policy by a sitting politician. For example, imagine that the mayor of your city has proposed a hike in property taxes in order to support a new road repair initiative. A critic might point out that taxes are already high and that other sources of revenue would be preferable. It is common in such instances for a defender of the new policy to point out that the critic herself (or her own favourite political candidate or politician) has advocated raising property taxes in the past. The accusation is essentially that the critic is being hypocritical: if you supported raising taxes in the past, why aren't you supporting that now? The implication is that the critic's stance is merely political, that she is criticizing the move now merely because a politician she opposes is proposing it. Of course, whether that's true or not will depend on the details. Perhaps there's a difference in the proposed size of the tax hike—perhaps the critic has supported a 1 per cent tax hike in the past but thinks that the mayor's proposed 5 per cent hike is excessive. Whether the charge of hypocrisy is fair, or is instead an illegitimate tu quoque, will depend on the situation. 5 | Faulty Reasoning 179 get safe water out of a poisoned well, you can't get reliable claims out of a discredited claimant. This tactic is fallacious because the fact that someone might have dubious reasons for making a claim does not show that the claim is false, nor does it mean that everything that comes out of the "poisoned well" can be automatically dismissed. Composition The fallacy of composition involves arguing that what is true of the parts must be true of the whole. The error here is to think that the characteristics of the parts of a thing are somehow transferred to the thing as a whole, which is certainly not always the case. Likewise, the error is committed whenever we assume that what's true of a member of a group is true of the group as a whole. For example: The atoms that make up the human body are invisible. Therefore, the human body is invisible. composition The fallacy of arguing that what is true of the parts must be true of the whole. The error is thinking that the characteristics of the parts are somehow transferred to the whole, something that is not always the case. Each member of the club is productive and effective. So the club will be productive and effective. Each note in the song sounds great. Therefore, the whole song will sound great. A piece of metal cannot do math, so a machine made out of pieces of metal cannot do math. Sometimes, of course, the parts do in fact share the same characteristics as the whole. We may safely conclude that since all the parts of the house are made of wood, the house itself is made of wood. We commit the fallacy of composition, though, when we assume that a particular case must necessarily be like this. The fallacy of composition often shows up in statistical arguments. Consider the following: The average small investor puts $2000 into the stock market every year. The average large investor puts $100,000 into stocks each year. Therefore, large investors (as a group) invest more money in the stock market than the small investor group does. The fact that the average small investor invests less than the average large investor does not mean that small investors as a group invest less than large investors as a group. After all, there may be many more small investors than large investors. Division The flip side of the fallacy of composition is the fallacy of division—arguing that what is true of the whole must be true of the parts. This fallacy is also committed when we assume that what is true of a group is true of individuals in the group. division The fallacy of arguing that what is true of the whole must be true of the parts. The error is thinking that characteristics of the whole must transfer to the parts or that traits of the group must be the same as traits of individuals in the group. 180 Part Two | Reasons This machine is heavy. Therefore, all the parts of this machine are heavy. The building Dimitri lives in is huge, so his apartment must be huge. A university degree is a valuable thing to have! So how can you possibly think that this course in underwater basket-weaving isn't valuable? These arguments are fallacious because they assume that characteristics of the whole are transferred to the parts or that traits of the group must be the same as traits of individuals in the group. Like the fallacy of composition, the fallacy of division is frequently used in statistical arguments: Don't tell me you've had trouble finding a job. Unemployment in this entire province is at an all-time low! Just because people in general have had good luck finding jobs, this doesn't mean that any specific job-seeker must necessarily have an easy time. The talents and opportunities of individuals, who make up the total workforce, may vary greatly. Equivocation equivocation The fallacy of using a word in two different senses in an argument. The fallacy of equivocation is the use of a word in two different senses in an argument. For example: The end of everything is its perfection. The end of life is death. Therefore, death is the perfection of life. Everyday Problems and Decisions The High Cost of a Fallacy Did you know that fallacies can sell cars? Take a look at this conversation: BRUNO: I really like this car. Looks pretty sweet. Is it very expensive? I want something in the "economy" range–like, under $20,000. SALESPERSON: Oh, the price is very reasonable. You can easily afford it. The payments are only $190 a month. BRUNO: Wow, I'll take it. SALESPERSON: (Thinking to himself) Sucker! He just bought a $31,000 car. Don't let the fallacy of composition lead you into making an expensive bad decision. 5 | Faulty Reasoning 181 Only man is rational. No woman is a man. Therefore, no woman is rational. Laws can only be created by law-givers. There are many laws of nature. Therefore, there must be a law-giver, namely, God. In the first argument, end is used in two different senses. In the first premise it means purpose, but in the second it means termination. Because of this flip-flop in meanings, the conclusion doesn't follow from the premises—but it looks as if it should. In the second argument, man is the equivocal term. In the first premise it means humankind, but in the second it means male. So the conclusion doesn't follow because a claim about what makes humans different from animals can't support a conclusion about how women are (supposedly) different from men. In the third argument, laws is used in two senses—rules of human behaviour in the first premise, regularities of nature (as in "law of gravity") in the second. Consequently, the conclusion that tries to establish the existence of God doesn't follow. The fallacy of equivocation occurs whenever a word has one meaning in one premise and another meaning in another premise or the conclusion. This shift in meaning always invalidates the argument. Equivocation has historically played a central part in arguments over abortion because so much depends on the meaning of the terms used to refer to the unborn. Consider the following: "The exact contrary of what is generally believed is often the truth." —Jean de la Bruyère Everyone agrees that a fetus is a human. All human beings have a right to life. Therefore, a fetus has a right to life. In the first premise, human is used in the sense of something having human physical characteristics such as human DNA . In the second premise, the word is used with beings in the sense of a person with moral rights. Because of this shift in meaning, the argument fails. The conclusion might be either true or false, but this argument cannot possibly support it. Appeal to Popularity appeal to popularity (or to the masses) The fallacy of the appeal to popularity (or to the masses) involves arguing that a claim must be true merely because a substantial number of people believe it. The fallacy of arguing that a claim must be true merely because a substantial number of people believe it. 182 Part Two | Reasons The basic pattern of this fallacy is "Everyone (or almost everyone, most people, many people) believes X, so X must be true." For example: Guy & Rodd/www.CartoonStock.com Most people approve of the provincial government's decision not to pay for in vitro fertilization treatments. So I guess that decision must be a good one. Of course Nova Scotia's rules for new drivers are justified. Everyone believes that they're justified. The vast majority of Canadians believe that the monarchy is a good thing. So how can you disagree? These arguments are fallacious because they assume that a proposition is true merely because a The fact that someone else is doing something foolgreat number of people believe it. But as far as the ish, or even that a lot of people are, isn't a good argument in favour of you doing it too! How have appeals truth of a claim is concerned, what many people believe is typically irrelevant. Many people used to to popularity affected your own decision-making? believe that certain women were witches and should be burned, that slavery was perfectly acceptable, that the Earth was the centre of the universe, and that blood-letting and purging were cures for just about every illness. In each of these cases, those people were absolutely mistaken. A large group's belief in a proposition, by itself, is no indication of truth. Food For Thought Bamboozling the Taxpayers Suppose you hear these words in a speech by a prominent federal politician: "My tax cut plan will result in a financial windfall for the Canadian taxpayer. Under my plan, the average tax savings will be $1100 per person. Think of what each of you could do with that much extra income." Sounds like great news—except that this is very likely an example of the fallacy of division. The fact that the tax savings for Canadian taxpayers as a group is an average of $1100 doesn't mean that each individual taxpayer will get $1100. It's possible that only a few taxpayers will get $1100 or more while some get much larger amounts and most won't get any tax break at all. Compare: the fact that the average height for Canadian women is 164 centimetres (about 5-foot-4) doesn't mean that all Canadian women are that height. Some are much shorter, and some are much taller. The average tells you about the population as a whole but doesn't tell you much at all about individuals. 5 | Faulty Reasoning What many people believe, however, can be an indication of truth if those people are experts or have expert knowledge in the issue at hand. If almost all ecologists say that a particular ecosystem is being threatened, ordinarily we should believe them. When the argument at hand is not about what many people believe but rather about what many people do, we may have a case of appeal to common practice. For example: Of course it's OK to speed! Everybody does it. But Mom, why can't I get a tattoo? All the other girls in my class already have one! There's nothing wrong with cheating a bit on your taxes. I read somewhere that nearly half of all taxpayers lie about something on their tax returns. 183 appeal to common practice The fallacy of accepting or rejecting a claim solely on the basis of what groups of people generally do or how they behave (when the action or behaviour is irrelevant to the truth of the claim). The problem here is very similar to the problem with appeal to popularity. The fact that a lot of people do something is generally not an indication that it's ethical, polite, or wise for you to do it too. Appeal to Tradition The appeal to tradition involves arguing that a claim must be true just because it's part of a tradition. For example: Acupuncture has been used for a thousand years in China. So it must work. Of course publishing pornography is wrong. In this community there's a tradition of condemning it that goes back to the early days of photography. Of course it's OK to have the company's CEO approve her own expense claims. We've always done it that way. Such appeals are fallacious because tradition, like the masses, can be wrong. Remember that established traditions barred women from voting, stripped Indigenous peoples of their land, promoted the vengeful policy of "an eye for an eye," and sanctioned the sacrifice of innocents to the gods. These may have been traditions, but they were bad ones. Be careful, though. It is also unreasonable to automatically reject a claim on the grounds that it's traditional. The point really is that a tradition should be neither accepted nor rejected without good reason. Knee-jerk acceptance of a tradition is just as bad as knee-jerk rejection of one. appeal to tradition The fallacy of arguing that a claim must be true just because it's part of a tradition. 184 Part Two | Reasons Appeal to Ignorance appeal to ignorance The fallacy of arguing that a lack of evidence proves something. In one type of this fallacy, the problem arises from thinking that a claim must be true because it hasn't been shown to be false. In another type, the breakdown in logic comes when you argue that a claim must be false because it hasn't been proven to be true. The appeal to ignorance consists of arguing that a lack of evidence proves something. In one variation of this fallacy, the problem arises from thinking that a claim must be true because it hasn't been shown to be false. For example: No one has shown that ghosts aren't real, so they must be real. It's clear that God exists because science hasn't proved that he doesn't exist. You can't show me one bit of evidence to disprove my theory that the current "Stanley Cup" is a fake and that the real one is hidden in Wayne Gretzky's basement. Therefore, my theory is correct. The problem here is that a lack of evidence is supposed to prove something—but it logically can't do that. A lack of evidence alone can neither prove nor disprove a proposition. A lack of evidence simply reveals our ignorance about something. In another variation of this fallacy, the breakdown in logic comes when you argue that a claim must be false because it hasn't been proved to be true. Look at these examples: No one has shown that ghosts are real, so they must not exist. It's clear that God doesn't exist because science hasn't proved that he does. You can't provide clear evidence for your theory that the current "Stanley Cup" is a fake and that the real one is hidden in Wayne Gretzky's basement. Therefore, your theory is false. Again, the key lesson is that a lack of evidence proves nothing. It does not give us a reason for believing a claim. But what if our lesson here were wrong? If we could prove something with a lack of evidence, then we could prove almost anything. You can't prove that invisible men aren't having a keg party on Mars—does this mean that it's true that invisible men are having a keg party on Mars? You can't prove that Gandhi liked Uber (since he died more than 60 years before the ride-sharing service was launched)—does this prove that he didn't like Uber? There are cases, however, that may seem like appeals to ignorance but actually are not. Sometimes when we carefully search for something, and when such a thorough search is likely to uncover it if there is anything to uncover, the failure to find what we're looking for can in fact show that it probably isn't there. A botanist, for example, may search a forest looking for a rare plant that used to grow only there but not find it even though she looks in all the likely places. In this case, her lack of evidence—her not finding the plant after a thorough search—may be considered good evidence that the plant has gone extinct. This conclusion would not 5 | Faulty Reasoning rest on ignorance but on the knowledge that in these circumstances any thorough search would probably reveal the sought-after object if it were there at all. In such cases, an accusation that the botanist is making an appeal to ignorance would be off-target: she is instead accurately reporting the results of her diligent search. This kind of inductive reasoning is widespread in science. Drugs, for example, are tested for toxicity on rodents or other animals before they are given to humans. If after extensive testing no toxic effects are observed in the animals (which are supposed to be relatively similar to humans in relevant ways), then the lack of toxicity—the fact that we haven't found negative effects—is considered evidence that the drug will probably not cause toxic effects in humans. Likewise, in the realm of "alternative" health care, most scientists regard the failure to find, after decades of testing, any evidence that homeopathic remedies have any physical effect as strong evidence that such remedies do not in fact work. In order to understand the significance of appeals to ignorance it is important to understand the notion of burden of proof. Burden of proof is the weight of evidence or argument required by one side in a debate or disagreement. Problems arise when the burden of proof is placed on the wrong side. For example, if Louise declares that "no one has shown that zombies aren't real, so they must be real," she implicitly puts the burden of proof on those who don't agree with her. She's asserting, in effect, "I say that zombies are real, and it's up to you to prove I'm wrong." Or to put it another way, "I'm entitled to believe that zombies are real unless you prove that they're not." But as we saw earlier, this line is just an appeal to ignorance, and the burden of proof for showing that zombies are real rests with her— not with those who don't share her belief. If her claim is unsupported, you need not accept it. If you take the bait and try to prove that zombies don't exist, you are accepting a burden of proof that should fall on Louise's shoulders, not yours. Usually, the burden of proof rests on the side that makes a positive claim—an assertion that something exists or is the case rather than that something does not exist or is not the case. So in general, if a person (the claimant) makes an unsupported positive claim, he or she must provide evidence for it if the claim is to be accepted. If you doubt the claim, you are under no obligation to prove it wrong. You need not—and should not—accept it without good reasons (which the claimant should provide). Of course, you also should not reject the claim without good reasons. If the claimant does give you reasons for accepting the claim, you can either accept those reasons or reject them. If you reject them, you are obligated to explain the reasons for your rejection. 185 burden of proof The weight of evidence or argument required by one side in a debate or disagreement. Appeal to Emotion The fallacy of the appeal to emotion is the use of emotions as premises (or as stand-in for premises) in an argument. That is, it consists of trying to persuade someone of a conclusion solely by arousing his or her feelings rather than by presenting relevant reasons. When you use this fallacy, you appeal to people's guilt, appeal to emotion The fallacy of using emotions in place of relevant reasons as premises in an argument. 186 Part Two | Reasons anger, pity, fear, compassion, resentment, pride—but not to good reasons that could actually give logical support to your case. Take a look: You should hire me for this network analyst position. I'm the best person for the job. If I don't get a job soon, my wife will leave me, and I won't have enough money to pay for my mother's heart medication. Come on, give me a break. Joel Carillet/iStockphoto Political ad: If school music programs are cut as part of the school board's new budget, we will save money—and lose our children to a world without music, a landscape without song. Let the children sing. Write to your member of the school board now and let them know what you think! As arguments, these passages are fallacious not just because they appeal to strong emotions, but because they appeal to almost nothing but strong emotions. They urge us to accept a conclusion but offer no good reasons for doing so. We may feel compassion for the job hunter and his mother, but those feelings have no bearing on whether he is truly the best person for the job. We may recoil from the idea of children in a stark, tuneless world, but that overblown image and the emotions it evokes in us provide no logical support for the conclusion. This kind of wielding of emotion in discourse is an example of rhetoric, the use of non-argumentative, emotive words and phrases to persuade or influence an audience. Arguments try to persuade by providing reasons logically connected to the point the arguer is trying to make. Rhetoric tries to persuade primarily through the artful use of language. There's nothing inherently wrong with using rhetoric, but its use becomes fallacious when there's an attempt to support a conclusion by rhetoric alone. But in such cases the fallacy is easily avoided. Good writers often combine arguments with appeals to emotion in the same piece of writing, and no fallacy need enter the picture. A strong argument is presented, and it's reinforced by strong feelings. Consider this piece of persuasive prose regarding the legal drinking age in various American states: Apple is famous for using appeals to emotion to get potential customers to stop thinking of iPhones and iPads in terms of technology and to focus instead on feelings. What other brands similarly appeal to emotion in their ad campaigns? I am a mother though my child is dead. He did not die of an incurable disease, of a virus beyond the ken of medical science. He was not taken from me by a foreign enemy while 5 | Faulty Reasoning 187 defending his country. No, he was needlessly slaughtered on the highway. A drunk driver ran broadside into his motorcycle. My son was shot fifty feet through the air by the collision and hit the blacktop at forty-five miles per hour. My son's assassin is not yet out of high school and yet that boy was able to walk into a liquor store and purchase two six-packs of beer, most of which he drank that evening. This boy does not have the mental capability to graduate from high school in the prescribed time (he was held back in his senior year), and yet the law has given him the right to purchase alcohol and decide for himself what is appropriate behavior with regard to alcoholic consumption. I do not trust most of my adult friends to make such mature judgments. How can anyone trust the eighteen-year-old? The law must change. Statistics have shown that states that have a minimum drinking age of twenty-one years also have significantly fewer automobile accidents caused by drunken teenagers. I lost my son, but why do any of the rest of us have to suffer as I have? Please, support legislation to increase the drinking age to twenty-one.2 There are appeals here to the reader's sympathy and indignation—but also an argument using facts to support a conclusion about the need for new legislation. Red Herring Perhaps the most blatant fallacy of irrelevance is the red herring, the deliberate raising of an irrelevant issue during an argument. This fallacy gets its name from the practice of dragging a smelly fish across a trail to throw a tracking dog off the scent. The basic pattern is to put forth a claim and then couple it with additional claims that may seem to support it but in fact are mere distractions. For instance: Canada needs tougher immigration policies. I've got a neighbour who says we should let in more immigrants. The sixties . . . boy, what a great time that was for druggies and wackos! You should see the way that hippie dresses. . . . He hasn't figured out that the nineteen-sixties are over! The federal government should bring in mandatory minimum sentences for a greater range of serious crimes. I'm telling you, crime is a terrible thing when it happens to you. It causes death, pain, and fear. And I wouldn't want to wish these things on anyone. Notice what's happening here. In the first example, the issue is whether Canada should have tougher immigration policies. But the arguer shifts the subject to the intelligence and dress of one particular person who favours more immigration. red herring The fallacy of deliberately raising an irrelevant issue during an argument. The basic pattern is to put forth a claim and then couple it with additional claims that may seem to support it but, in fact, are mere distractions. "It's very easy to have slogans and rhetoric that people will follow, but eventually the slogans fall away." — Saad Hariri (prime minister of Lebanon) 188 Part Two | Reasons That person's intelligence and way of dressing, of course, have nothing to do with the main issue. The argument is bogus. In the second example, the issue is whether the federal government should institute more mandatory minimum sentences. But the subject gets changed to the terrible costs of crime, which is only remotely related to the main issue. (There's also an appeal to fear, here.) We can agree that crime can have awful consequences, but this fact has little to do with the merits and demerits of instituting mandatory minimum sentences. Straw Man straw man The fallacy of distorting, weakening, or oversimplifying someone's position so it can be more easily attacked or refuted. Related to red herring is the fallacy of the straw man—the distorting, weakening, or oversimplifying of someone else's position so it can be more easily attacked or criticized. A straw man argument distracts the listener by focusing on a distorted version of the target argument rather than focusing on that argument itself. A straw man argument works like this: reinterpret claim X so that it becomes the weak or absurd claim Y. Attack claim Y. Conclude that X is unfounded. For example: David says he's in favour of equal marriage rights for gay people. Obviously, he thinks gay relationships deserve special treatment and that being gay should be celebrated and promoted. Do you really want your kids being taught that being gay is best? David does, and he's dead wrong. The Official Opposition is opposed to the government's plan to increase spending on Canada's military. Why does the Opposition always want to leave Canada defenceless? Why do they want the military's budget slashed? They want Canada to be stuck with a military that can't defend our borders, let alone participate in our proud tradition of peacekeeping overseas. The premier says that the federal government ought to correct the "fiscal imbalance" by transferring more money to the provinces and territories. I think if he had his way, the federal government would give up all its powers and eventually waste away to nothing at all. Then there'd be nothing left to hold this country together. We can't let that happen! Oppose the premier's plan! In the first passage, David is in favour of equal marriage rights for LGBTQ people. His opponent, however, distorts his view, claiming that David is actually in favour of teaching children that being gay is best. David, of course, is not asserting this. This distorted version of David's position is easy to r idicule and reject, seemingly allowing his actual view to be dismissed without a further thought. In the second passage, the Official Opposition is against increasing military spending. Their position, though, is twisted into the claim that the military's budget should actually be reduced to such an extent that the military becomes 5 | Faulty Reasoning 189 useless. But it is unlikely that that is what the Opposition really wants. They simply don't want the military's budget increased. The third passage is typical of the kind of fallacious arguments that crop up in debates over federal–provincial relations. Here, the premier wants the federal government to transfer more money to the provinces to help correct what some people see as the "fiscal imbalance" (i.e., the supposed mismatch between the responsibility the provinces have for major expenditures such as health care and education and their relative lack of financial resources compared to the federal government). But the premier's view gets characterized as implying that the federal government should eventually waste away to nothing. But wanting to make some change in the balance of power (and financial ability) between the two levels of government is not at all the same thing as wanting the federal government to have no role at all. Characterizing the premier's point of view as so extreme, however, is a way to generate strong opposition to it. After all, if the premier really did want to get rid of the federal government, that would indeed be an alarming proposition. Note that in debates over federal–provincial relations, the straw man tactic is also taken to bolster the other side of the dispute. Those who favour greater powers for the federal government are sometimes characterized as wanting to reduce the provinces to mere administrators of federal decisions and policies. But, of course, from the fact that someone wants to increase the powers of the federal government, it does not follow that they want to render the provinces entirely powerless. Review Notes Fallacies with Irrelevant Premises • Genetic fallacy: Arguing that a claim is true or false solely because of its origin. • Appeal to the person: Rejecting a claim by criticizing the person who makes it rather than the claim itself. • Composition: Arguing that what is true of the parts must be true of the whole. • Division: Arguing that what is true of the whole must be true of the parts or that what is true of a group is true of individuals in the group. • Equivocation: The use of a word in two different senses in an argument. • Appeal to popularity: Arguing that a claim must be true merely because a substantial number of people believe it. • Appeal to common practice: Arguing that a practice is ethical or wise merely because a substantial number of people do it. • Appeal to tradition: Arguing that a claim must be true or good just because it's part of a tradition. • Appeal to ignorance: Arguing that a lack of evidence proves something. • Appeal to emotion: The use of emotions as premises in an argument. • Red herring: An irrelevant issue raised during an argument. • Straw man: A distorted, weakened, or oversimplified representation of someone's position that can be more easily attacked or refuted than their true position. 190 Part Two | Reasons Unacceptable Premises Begging the Question begging the question The fallacy of attempting to establish the conclusion of an argument by using that conclusion as a premise. Also called arguing in a circle. The fallacy of begging the question (or arguing in a circle) is the attempt to establish the conclusion of an argument by using that conclusion as a premise. To beg the question is to argue that a proposition is true because the very same proposition supports it: p Therefore, p. The classic question-begging argument goes like this: God exists. We know that God exists because the Bible says so and we should believe what the Bible says because God wrote it. Or, more formally: The Bible says that God exists. The Bible is true because God wrote it. Therefore, God exists. This argument assumes at the outset the very proposition ("God exists") that it is trying to prove. That is, it uses its own conclusion as a premise. Any argument that does this is fallacious. Unfortunately, most question-begging arguments are not as obviously fallacious as "p is true because p is true." They may be hard to recognize because they are intricate or confusing. Consider this argument: It is in every case immoral to lie to someone, even if the lie could save a life. Even in extreme circumstances a lie is still a lie. All lies are immoral because the very act of prevarication in all circumstances is contrary to ethical principles. Food For Thought Are We Begging the Question Yet? In everyday usage, the phrase "beg the question" often refers to this famous fallacy; however, many times it does not. It is sometimes used (some would say misused) to mean something like "prompts the question" or "raises the question," as in "The rise in the crime rate begs the question of whether we have enough police officers on the job." As a critical thinker, you need to make sure you don't get these two uses confused. 5 | Faulty Reasoning 191 At first glance, this argument may seem reasonable, but it's not. It reduces to this circular reasoning: "Lying is always immoral because lying is always immoral." Among the more subtle examples of question-begging is this famous one, a favourite of critical thinking textbooks: To allow every man unbounded freedom of speech must always be, on the whole, advantageous to the state; for it is highly conducive to the interests of the community that each individual should enjoy a liberty, perfectly unlimited, of expressing his sentiments.3 This argument, as well as the one preceding it, demonstrates the easiest way to subtly beg the question: just repeat the conclusion as a premise, but use different words. False Dilemma The fallacy of false dilemma consists of either: • asserting that there are only two alternatives to consider when there are actually more than two, or false dilemma The fallacy of asserting that there are only two alternatives to consider when there are actually more than two. • asserting that there are two distinct alternatives that may in fact not be mutually exclusive. Let's start with the first kind. Here's an example: Look, either you're in favour of government support for the arts or you're an uncultured thug. You're not in favour of government support for the arts. So you're an uncultured thug. This argument contends that there are only two alternatives to choose from: either you're in favour of the government spending money to support the arts (painters, musicians, etc.) or you're an uncultured thug. And the arguer hopes that since you don't want to be seen as a thug, you'll change your mind and choose the other option—namely, to favour government support for the arts. But this argument works only if there really are just two alternatives. (A "dilemma" is a situation in which there are two equally undesirable possibilities.) But here there are actually other plausible possibilities. Maybe you like art but don't want to see the government spending tax dollars on it. Maybe you spend a lot of money on art and just don't think it's necessary for the arts to be supported by government. Because these possibilities are excluded, the argument is fallacious. Here's another example: Either I saw you at the party, kissing Mark, or I was too drunk to see straight. But I wasn't drunk. So I saw you at the party, kissing Mark! "I'm for truth, no matter who tells it. I'm for justice, no matter who it's for or against." —Malcolm X 192 Part Two | Reasons This argument says that there are only two possibilities: your friend was at the party, kissing Mark, or you were too drunk to see straight. And so your friend must have been there, kissing Mark, because you weren't drunk. But clearly in a situation like this there are more possible explanations than the ones being offered. You might have seen someone (at a distance) who was kissing Mark and who merely looked like your friend. You might not have been wearing your glasses. You might be misremembering and confusing that night with another night. Since the argument ignores these reasonable possibilities, it's fallacious. Finally: We must legalize drugs. We either legalize them or pay a heavy toll in lives and the taxpayers' money to continue the war on drugs. And we cannot afford to pay such a high price. At first glance, these two alternatives may seem to exhaust the possibilities. But there is at least one other option—to launch a massive effort to prevent drug use and thereby reduce the demand for illegal drugs. The argument does not work because it fails to consider this very reasonable possibility. Note that these three arguments are expressed in disjunctive (either–or) form. But they can just as easily be expressed in a conditional (if–then) form, which says the same thing: Look, if you aren't in favour of government support for the arts, then you're an uncultured thug. You're not in favour of government support for the arts. So you're an uncultured thug. If I wasn't too drunk to see straight, then I saw you at the party, kissing Mark. I wasn't drunk. So I saw you at the party, kissing Mark! We must legalize drugs. If we don't legalize them, then we will pay a heavy toll in lives and the taxpayers' money to continue the war on drugs.

And we cannot afford to pay such a high price. Sometimes we encounter stand-alone disjunctive phrases rather than fullblown false dilemma arguments. These are false choices often presented as oneliners or headlines in tabloid newspapers, TV news programs, and magazines. For example: Canada's Oil Sands: Economic Boon or Environmental Disaster? Apple: Innovator or Evil Giant? Is the Government Incompetent or Just Evil? By limiting the possibilities, these headlines can imply that almost any outlandish imaginary state of affairs is actual occurring—without even directly asserting anything. 5 | Faulty Reasoning 193 Food For Thought False Dilemmas, Evolution, and Creationism False dilemmas seem to crop up in all kinds of controversies, including debates in science and philosophy. The following is an example of how the fallacy is thought to arise in the ongoing dispute between creationism and evolution. Creationists also assume that any data that counts against evolution counts in favor of creationism. But to argue in this way is to commit the fallacy of false dilemma: it presents two alternatives as mutually exclusive when, in fact, they aren't. Gish sets up the dilemma this way: "Either the Universe arose through naturalistic, mechanistic evolutionary processes, or it was created supernaturally." This argument is a false dilemma for a number of reasons. In the first place, there is no need to assume that the universe was created even if evolution is not supported. The universe, as many non-Western peoples believe, may be eternal, that is, without beginning or end. . . . Second, evolution is not the only natural account of creation, and Genesis is not the only supernatural account. Theories of creation are as varied as the cultures that conceived them. The Vikings believed that the universe developed naturally from the void whereas the Gnostics believed that it's the supernatural work of the devil. Thus, even if the creationists could totally discredit evolution, they would not thereby prove their own position, for there are many other alternatives.4 People are often taken in by false dilemmas because they don't think beyond the alternatives laid before them. Out of fear, the need for simple answers, or a failure of imagination, they don't ask, "Is there another possibility?" To ask this is to think outside the box and reduce the likelihood of falling for simplistic answers. False dilemmas also arise when the arguer asserts that there are two distinct alternatives when in fact the two options offered may not be mutually exclusive. For example: She's either delusional or a liar, but I can't figure out which! This counts as a false dilemma because these two possibilities—being delusional and being a liar—are not in fact mutually exclusive. It is possible to be both, and some people are both. Here's another example: Why are you so concerned about the rights of the accused? Are you interested in protecting the rights of accused criminals or protecting the rights of their victims? Again, this is a false dilemma because the two options being offered are not necessarily in opposition to each other. We can be concerned with protecting the rights of those accused of crimes (e.g., presuming them "innocent until proven 194 Part Two | Reasons guilty") while at the same time wanting to work to assist and protect the victims of crime. In the face of a false dilemma of this kind, we should reply, "Why can't I be concerned with both?" Thomas Bros./www.CartoonStock.com Slippery Slope Sometimes a step that looks like progress can be the first step on a slippery slope. But then again, sometimes progress is just progress. When is the slippery slope argument fallacious? slippery slope The fallacy of arguing, without good reasons, that taking a particular step will inevitably lead to further, undesirable steps. The fallacy of slippery slope is to argue, without good reasons, that taking a particular step will inevitably lead to a further, undesirable step (or steps). The idea behind the metaphor, of course, is that if you take the first step onto a slippery slope, you will have to take others because, well, the slope is slippery. A familiar slippery slope pattern is "Doing action A will lead to action B, which will lead to action C, which will result in calamitous action D. Therefore, you should not do action A." It's fallacious when there is no good reason to think that doing action A will actually inevitably result in undesirable action D. Take a look at this classic example: Americans absolutely must not lose the war in Vietnam. If South Vietnam falls to the communists, then Thailand will fall to them. If Thailand falls to them, then South Korea will fall to them. And before you know it, all of Southeast Asia will be under communist control. This argument was commonplace during the Cold War (roughly 1947–91). It was known as the domino theory because it asserted that if one country in Southeast Asia succumbed to communism, they all would succumb, just as a whole row of dominoes will fall if the first one is pushed over. It was fallacious because there was no good evidence that the dominoes would inevitably fall as predicted. In fact, after South Vietnam was defeated, they did not fall as predicted. Here are some more examples: If supporters of the federal government's firearms registry get their way, all recreational and hunting weapons will have to be registered with the federal government. Next thing you know, it'll be illegal to own a gun for target practice or to go hunting for rabbits, like my Dad and I did when I was a boy. Eventually, the government will want to know if you own any weapon, whether it's a pocket knife or a baseball bat. So if you support the firearms registry, you're inviting the government to invade your privacy and interfere with your basic freedoms. We must ban pornography in all forms. Otherwise, rape and other sex crimes will be as common as jaywalking. 5 | Faulty Reasoning 195 All Canadians should oppose gay marriage. If gay marriage is allowed, before you know it anything goes—polygamy, incest, marrying animals . . . who knows! These arguments follow the basic slippery slope pattern. They are fallacies, not because they assert that one event or state of affairs can inevitably lead to others but because there is no good reason to believe the assertions. Some arguments may look like slippery slope fallacies but are not because there is good reason to think that the steps are connected as described. Observe: If you have Lyme disease, you definitely should get medical treatment. Without treatment, you could develop life-threatening complications. Man, you could die. You should see your doctor now. This one is not a fallacious slippery slope argument. There are good reasons to believe that the series of events mentioned would actually happen. Hasty Generalization In Chapter 4, we pointed out the connection between the availability error and the fallacy known as hasty generalization. In Chapter 8, we will examine hasty generalizations at length. For now we need only recall that we are guilty of hasty generalization when we draw a conclusion about a whole group based on an inadequate sample of the group. This mistake is a genuine fallacy of unacceptable premises because the premises stating the sample size are relevant to the conclusion but they provide inadequate evidence. There is always an additional premise implied—namely, that the sample provided is adequate to justify the conclusion given. And that premise is unacceptable. For example: You should buy a Dell computer. They're great. I bought one last year, and it has given me nothing but perfect performance. The only male professor I've had this year was a sexist pig. All the male professors at this school must be sexist pigs. Psychology majors are incredibly ignorant about human psychology. Believe me, I know what I'm talking about: my best friend is a psych major. What an ignoramus! Americans are snobby and rude. Remember those two loud guys with really bad manners? They're American. I rest my case. The food at Pappie's Restaurant is awful. I had a sandwich there once, and the bread was stale. hasty generalization The fallacy of drawing a conclusion about a target group on the basis of a sample that is too small. 196 Part Two | Reasons "One cool judgment is worth a thousand hasty counsels." —Woodrow Wilson Note that in each of these cases, the evidence given may be true and relevant, but the assumption that that evidence is sufficient is faulty—it is an unstated and false premise. Faulty Analogy argument by analogy (analogical induction) An argument making use of analogy, reasoning that because two or more things are similar in several respects, they must be similar in some further respect. faulty analogy A defective argument by analogy. We will also discuss arguments by analogy in Chapter 8. Like hasty generalizations, defective arguments by analogy, or faulty analogies, are also fallacies involving unacceptable premises. An analogy is a comparison of two or more things that are alike in specific respects. An argument by analogy reasons this way: because two or more things are similar in several respects, they must be s imilar in some further respect. For example: The last time we went on vacation and left you in charge of the house, you said you wanted to have "a few friends" over for a party, and the house was a mess when we got home. Likewise, this time you say you want to have "a few friends" over. So if we let you, I'm sure the house will be a disaster area when we get home! A watch is a mechanism of exquisite complexity with numerous parts precisely arranged and accurately adjusted to achieve a purpose—a purpose imposed by the watch's designer. Likewise, the universe has exquisite complexity with countless parts—from atoms to asteroids—that fit together precisely and accurately to produce certain effects as though arranged by plan. Therefore, the universe must also have a designer. Review Notes Fallacies with Unacceptable Premises • Begging the question: The attempt to establish the conclusion of an argument by using that conclusion as a premise. • False dilemma: Asserting that there are only two alternatives to consider when there are actually more than two. • Slippery slope: Arguing, without good reasons, that taking a particular step will inevitably lead to a further, undesirable step (or steps). • Hasty generalization: The drawing of a conclusion about a target group based on an inadequate sample size. • Faulty analogy: An argument in which the things being compared are not sufficiently similar in relevant ways. 5 | Faulty Reasoning In a faulty analogy, the things being compared are not sufficiently similar in relevant ways. Such analogical arguments are said to be weak. For instance, you could argue that: Dogs are warm-blooded, nurse their young, and give birth to puppies. Humans are warm-blooded and nurse their young. Th erefore, humans give birth to puppies too. This argument by analogy is about as weak as they come—and a little silly. Dogs and humans are not sufficiently similar in relevant ways (in physiology, for one thing) to justify such a strange conclusion. Summary Certain types of defective arguments that occur frequently are known as fallacies. Fallacies are often psychologically persuasive but logically flawed. We can divide fallacies into two broad categories: (1) those that have irrelevant premises and (2) those that have unacceptable premises. Fallacies with irrelevant premises include the genetic fallacy (arguing that a claim is true or false solely because of its origin), composition (arguing that what is true of the parts must be true of the whole), division (arguing that what is true of the whole must be true of the parts or that what is true of a group is true of individuals in the group), appeal to the person (rejecting a claim by criticizing the person who makes it rather than the claim itself), equivocation (the use of a word in two different senses in an argument), appeal to popularity (arguing that a claim must be true merely because a substantial number of people believe it), appeal to ignorance (arguing that a lack of evidence proves something), appeal to tradition (arguing that a claim must be true or good just because it's part of a tradition), appeal to emotion (the use of emotions as premises in an argument), red herring (the deliberate raising of an irrelevant issue during an argument), and straw man (the distorting, weakening, or oversimplifying of someone's position so it can be more easily attacked or refuted). Fallacies with unacceptable premises include begging the question (the attempt to establish the conclusion of an argument by using that conclusion as a premise), slippery slope (arguing, without good reasons, that taking a particular step will inevitably lead to a further, undesirable step or steps), hasty generalization (the drawing of a conclusion about a group based on an inadequate sample of the group), and faulty analogy (an argument in which the things being compared are not sufficiently similar in relevant ways). 197 198 Part Two | Reasons Exercise 5.1 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. Review Questions 1. According to the text, what are the two broad categories of fallacies? 2. What is appeal to the person? 3. Can the origin of a claim ever be relevant to deciding its truth or falsity? *4. What is the fallacy of composition? How is it different from the fallacy of division? 5. What are the two forms of the fallacy of division? 6. Why is the genetic fallacy fallacious? 7. What type of ad hominem argument is put forth as a charge of hypocrisy? 8. What is the fallacy of poisoning the well? 9. What is the fallacy of equivocation? *10. Why are appeals to popularity fallacious? 11. What is the appeal to tradition? 12. What are the two forms of the appeal to ignorance? 13. What is the proper response to an appeal to ignorance? 14. What is rhetoric? *15. According to the text, is it ever legitimate to use rhetoric and argument together? 16. What is a red herring? How is it different from the straw man fallacy? 17. What is the basic pattern of argument of the straw man fallacy? 18. What is the fallacy of hasty generalization? *19. What are two types of false dilemma? Why are people often taken in by this fallacy? 20. What is the burden of proof? 21. What is the fallacy of slippery slope? Exercise 5.2 In the following passages, identify any fallacies of irrelevance (genetic fallacy, composition, division, appeal to the person, equivocation, appeal to popularity, appeal to ignorance, appeal to tradition, appeal to emotion, red herring, and straw man). Some passages may contain more than one fallacy, and a few may contain no fallacies at all. *1. "Seeing that the eye and hand and foot and every one of our members [i.e., body parts] has some obvious function, must we not believe that, likewise, a human being has a function over and above these particular functions?" (Aristotle) 5 | Faulty Reasoning 2. The protesters on Parliament Hill yesterday said they're against greed and corporate corruption. But they're really just a bunch of whiny, unwashed hipsters who are trying to avoid having to get a real job. 3. The world just keeps getting more dangerous. Crime is up, and war seems to be breaking out all over the place. Just ask anyone, and they'll tell you it's all over the news! 4. It was a bad idea for all the countries of Europe to give up their old currencies and adopt the euro. Just ask any German how he feels about linking his country's economic fate to that of Greece! *5. The National Post says that a proposal to force companies to embrace corporate social responsibility amounts to a denial of the basic principles of the market economy. But you know that's false—after all, it's from the National Post! 6. I think that students who cheat on exams should automatically be expelled from school. But Geraldo says he thinks that's harsh. I can't believe he thinks cheating is such a trivial thing! 7. Of course there is a God. Almost every civilization in history has believed in a deity of some kind. 8. Does acupuncture work? Can it cure disease? Of course it can. It has been used in China by folk practitioners for at least 3000 years. 9. The prime minister has misled the country about whether he was behind that decision. Surveys show that almost everyone in Canada thinks so. *10. Kelly says that many women who live in predominantly Muslim countries are discriminated against. But how the heck would she know? She knows nothing about the world's religions! 11. A lot of people think that football jocks are stupid and rude. That's ridiculous. Anyone who saw the fantastic game that our heroic team played on Saturday, with three touchdowns before halftime, would not believe such nonsense. 12. That car you just bought was pretty expensive! I didn't realize that car parts are so expensive! 13. The study found that 80 per cent of women who took the drug daily had no recurrence of breast cancer. But that doesn't mean anything. The study was funded in part by the company that makes the drug. *14. "The only proof capable of being given that an object is visible, is that people actually see it. The only proof that a sound is audible, is that people hear it: and so of the other sources of our experience. In like manner, I apprehend, the sole evidence it is possible to produce that anything is desirable, is that people actually desire it." (John Stuart Mill, Utilitarianism, 1863) 15. Imagine the way your friends would look admiringly at the brand new Ram 1500 parked in your driveway. Imagine the joy you'll feel. 199 200 Part Two | Reasons 16. How do you know that everything you see around you is real and that we aren't actually in a simulation, similar to the world in The Matrix? Famous philosophers have accepted this scenario as a very real possibility. Besides, you can't actually know whether or not it's true because it would be impossible to find any evidence that disproves this idea. Any "evidence" you find might just be part of the illusion! 17. "The most blatant occurrence of recent years is all these knuckleheads running around protesting nuclear power—all these stupid people who do not research at all and who go out and march, pretending they care about the human race, and then go off in their automobiles and kill one another." (Ray Bradbury) 18. I can't believe that lady got such a big legal settlement from McDonald's by spilling coffee on herself. I guess our legal system just doesn't care much about taking responsibility for your own mistakes. Now everyone will "accidentally" spill hot coffee on themselves and become millionaires. 19. Dear Professor, I deserve a better grade than a D on my paper. I'm a scholarship student, and if I don't keep my grade point average up, I'll lose my scholarship. And my family is too poor to pay for my education. Please help me. *20. The former mayor was convicted of drug possession, and he spent time in jail. So you can safely ignore anything he has to say about legalizing drugs. 21. Of course I believe in miracles. Every Christian does! I defy you to show me one bit of proof that miracles aren't possible. 22. Is the holy book the true word of God? There can be no doubt that it is, for it has inspired millions of believers for centuries. 23. We know that at its most basic level, matter is not alive. Clearly a bunch of non-living things can't just come together and make one living thing, so God must have created life. 24. We've built this orchestra by selecting the very best players from over 20 high school orchestras. This is clearly going to be the best orchestra in the province. Exercise 5.3 In the following passages, identify any fallacies of unacceptable premises (begging the question, false dilemma, slippery slope, hasty generalization, and faulty analogy). Some passages may contain more than one fallacy, and a few may contain no fallacies at all. 1. J.J. drives a big SUV! I can't believe he cares so little for the environment. He might as well be taking a chainsaw to the park and cutting down all the trees! I'm sure the police would arrest him in a heartbeat if he started doing that, so why aren't they taking his littering more seriously? I tell you, there'll 5 | Faulty Reasoning be anarchy in the streets soon if people find out you can get away with committing crimes like littering! 2. If we don't allow professional athletes to use steroids, then how can we justify them taking cold medication when they've got a cold? And if cold medications get counted as "performance enhancing," shouldn't we just go all the way and say "no health care at all for professional athletes"? 3. Three thieves are dividing up the $7000 they just stole from the local bank. Robber number one gives $2000 to robber number two, $2000 to robber number three, and $3000 to himself. Robber number two says, "How come you get $3000?" Robber number one says, "Because I am the leader." "How come you're the leader?" "Because I have more money." *4. Either you are rich or you are poor. If you're rich, you don't have to worry about money. And if you're poor, you don't have any money to worry about. Either way, you've got no worries! 5. I met these two girls on a plane, and they said they were from Edmonton. They were both wearing hockey sweaters and Edmonton Oilers ball caps. That city must just be 100 per cent full of hockey-heads. *6. I used to work with this engineering major, and, man, they are totally geeky. 7. Ivan doesn't talk about his political views. But he's got to be either a Liberal or a Conservative. And he's certainly no Liberal. So he must be a Conservative! 8. Managing a country's budget is just like managing your family budget. You've got income, you've got expenses. And so it shouldn't take a PhD in economics to balance our federal budget! 9. A recent study conducted by PETA has shown that meat-eaters are significantly more likely to engage in violent behaviour than are vegetarians and vegans. Their study involved handing out questionnaires to 20 meat-eaters and 20 non–meat-eaters and scoring their answers on a behavioural scale. *10. Either we fire this guy or we send a message to other employees that it's OK to engage in sexual harassment in the workplace. Clearly, we need to fire him. Exercise 5.4 For each of the following claims, devise an argument using the fallacy shown in parentheses. Make the argument as persuasive as possible. 1. Hard drugs should be legalized. (red herring) 2. Black Panther is the best superhero movie ever made. (appeal to popularity) *3. Mrs Anan does not deserve the Nobel Prize. (appeal to the person) 4. Zombies—just like in The Walking Dead—are real. (appeal to ignorance) 5. Wall Street needs to be held accountable for the 2008 financial crisis. (slippery slope) 201 202 Part Two | Reasons *6. It's great that Scouts Canada welcomes LGBTQ kids as members. (begging the question) 7. Quebec should separate from Canada. (false dilemma) 8. That sociology department is absolutely the worst department in the entire university. (hasty generalization) 9. We should reject the American suggestion that NAFTA is unfair and that Canada gains more from it than the United States. (genetic fallacy) 10. The Nigerian court was right to sentence that woman to be stoned to death for adultery. (appeal to popularity) *11. Newfoundland's fisheries are a mess because the Department of Fisheries and Oceans—a federal department—has too much power over them. (red herring) 12. The Canadian government needs to do more to support our most elderly citizens. (appeal to emotion) Field Problems 1. Find a piece of writing on a popular blog that contains at least one fallacy. Point out the fallacious part, name the fallacy involved, and then rewrite the passage to eliminate the fallacy and strengthen the argument. (To rework the argument effectively, you may have to make up some facts.) 2. Print out at least two pages of comments posted under an online news story. Look through them all, circling and labelling any examples of fallacies. Find at least three examples. 3. What is one of the major political topics discussed in your city right now? Find a speech or editorial on the subject. Can you find any fallacies being used? Do you think the fallacious argument is being used on purpose because it is psychologically persuasive? Or do you think he or she is using it without realizing it is a bad argument? Self-Assessment Quiz Name the fallacy or fallacies in the following passages: 1. The mayor is a racist! At a city council meeting last night, he said that he won't support our proposal to name a street after Nelson Mandela. How can we tolerate elected officials who say that great black leaders don't deserve to be recognized? 5 | Faulty Reasoning 2. People keep repeating anecdotes about how greedy capitalists were r esponsible for keeping our province's minimum wage so low. But where's the real proof? Show me the evidence, or stop complaining because you don't happen to like how much you're earning. 3. Legislation to officially recognize gay marriage was opposed by crazy religious groups across the country—which proves that the legislation is on the right track! 4. You want to know about this car's gas mileage? Well, I'll be happy to tell you all about it, and I think you'll be pleasantly surprised. But first, have you noticed the detailing on the dashboard? That's pure, hand-cut cherry wood! 5. I've got black friends, and their life seems just fine, so racism in Canada is not a problem. 6. You can safely ignore Helena's argument for a freeze on tuition because after all she's active in the Canadian Federation of Students. 7. You gave me a bad grade because you simply don't understand how awful it is to be given an "F", and to have your hopes and dreams crushed under a cruel, heartless professor's heel. 8. It would appear that human cloning is inevitable. Either we push forward with ground-breaking technology or we admit that we have no scientific curiosity at all. And we do not lack scientific curiosity! 9. True knowledge is unattainable because it is impossible to know anything with certainty. 10. "If the parts of the Universe are not accidental, how can the whole Universe be considered as the result of chance? Therefore the existence of the Universe is not due to chance." (Moses Maimonides) 11. That must have been a terrible book. I don't know anyone who read it. 12. Atheistic philosophers have been trying for thousands of years to prove that there is no God, and they haven't succeeded yet. This shows that there is indeed a God after all. 13. How can you, with a straight face, tell me that I should be a vegetarian? You're wearing a leather jacket! 14. Judges should not hand down anything but maximum sentences for all convicted criminals. If you start making exceptions, prosecutors will start asking for lighter sentences. Next thing you know, every criminal will be getting off with mere warnings. 15. Either you believe in God or you lack values entirely! 16. Cops give people tickets for failing to stop completely at a stop sign. But I saw a cop car roll through a four-way stop yesterday. Cops may have power, but they have no moral authority! 17. If the professor really appreciated my hard work, he would have given me an A+ on my essay. But he only gave me a B+, so he obviously doesn't care about the time and effort I put into it. 203 204 Part Two | Reasons 18. When I was in elementary school, we were supposed to stand and recite "The Lord's Prayer" every day before class. That was dead wrong. No child should have to submit to such brainwashing. 19. There's no way she's a good real estate agent. I mean, have you seen her dorky billboard ads? They're terrible. 20. Dilraj was caught stealing office supplies from the supply cabinet. But why should the boss fire him? After all, lots of people steal stuff from that cabinet. Integrative Exercises These exercises pertain to material in Chapters 1–5. For each of the following passages, say whether it contains an argument. If it does, specify the conclusion and premises, whether the argument is deductive or inductive, whether it is a good argument (sound or cogent), and whether it is a fallacy. Some passages may contain no argument. 1. Michael always blushes when Mark walks into the room, so he must have a crush on him! 2. Are you seriously trying to tell me that there is no such thing as life after death when in actual fact you have no proof at all that there isn't? 3. "Didn't Tom Cruise make a stock-car movie in which he destroyed thirtyfive cars, burned thousands of gallons of gasoline, and wasted dozens of tires? If I were given the opportunity, I'd say to Tom Cruise, 'Tom, most people don't own thirty-five cars in their life, and you just trashed thirty-five cars for a movie. Now you're telling other people not to pollute the planet? Shut up, sir.'" (radio personality Rush Limbaugh) 4. "The large number of female voters for Arnold Schwarzenegger in California announces one thing: the death of feminism. That so many women would ignore his sexual misconduct and vote for him bespeaks the re-emergence of the reckless phallus." (Letter to the editor, Newsday) 5. Miley Cyrus and Ellen Page are vegetarians. And Nazi leader Adolf Hitler was also a vegetarian. We are forced to conclude that Cyrus and Page are Nazis! 6. If you park illegally, you're breaking the law. And if you break one law, you'll break another. Soon, you'll be shoplifting. Next thing you know, you'll be committing major crimes and ending up in jail. 7. Since it looks like nobody is willing to speak up, I'll come out and say it. I think your clothing designs are awful, and I know for a fact that every other designer in this room thinks so too. 8. Thinking is like swimming. Just as in swimming, it's easy to float on the top but hard to dive deep; it's easy in thinking to float along on the surface of an issue but difficult to use your brain to dive down into the deeper layers. 5 | Faulty Reasoning 9. "If a cell, under appropriate conditions, becomes a person in the space of a few years, there can surely be no difficulty in understanding how, under appropriate conditions, a cell may, in the course of untold millions of years, give origin to the human race." (Herbert Spencer) 10. Either you call your grandmother right now or you admit that you just don't care about her at all. 11. Everything must happen either by random accident or by divine intervention. Nothing happens by pure accident, so everything must happen because of divine intervention. 12. You should avoid carbs. I've talked to two different doctors, and they both pretty much told me carbs are evil. 13. Ripped jeans are totally in fashion this season. Just look around, and you'll see everyone is wearing them. 14. My professor says that telling a lie is never morally permissible. But that's ridiculous. The other day I heard him tell a boldfaced lie to one of his students. 15. "Not all forms of gender discrimination are unethical. There are a number of exclusively male or female fitness clubs around the country utilized by religious individuals who shun the meat market scene. If a woman wants to spare herself the embarrassment of being ogled in her sports bra while doing thigh-thrusts, it is her right to work out with women only. Similarly, if a man wants to spare himself the temptation of working out with lingerie models, he should be allowed membership to strictly male fitness clubs. It would be unreasonable to require non-discrimination of these private clubs, or to make them build separate facilities to accommodate everyone." (Letter to the editor, Arizona Daily Wildcat) 16. "Highway checkpoints, drug testing, ubiquitous security cameras and now the government's insistence on the use of sophisticated software tools to spy on the American people all point to a single vision. This vision was shared with us years ago, in George Orwell's book 1984. Big Brother is indeed watching." (Letter to the editor, Buffalo News) 17. There are those on campus who would defend a professor's right to question the teachings of Islam. But there is no such right. Racism is wrong and will always be wrong. 18. We must protect our historical landmarks because they can give us glimpses into what life was like for our ancestors. This is important because it is unlikely that we will be able to build a successful future without learning from the mistakes of the past 19. Give a man a fish, and he'll eat for a day. Teach a man to fish, and he'll ask you to buy a fishing rod for him, and then bait, and then a cooler to store the fish, and then a car so he can drive to the stream. Clearly it's better to just give the man a fish. 20. It's true! The British explorers of the seventeenth century saved the First Nations people from their backward ways. If it weren't true, it wouldn't be in my history textbook! 205 206 Part Two | Reasons Critical Thinking and Writing Exercise An Annotated Sample Paper Let's see how the lessons of the four previous writing modules might be applied in an actual student essay.5 The essay on the following pages incorporates the main elements of good argumentative papers and, as even the best essays do, exhibits both strengths and weaknesses—many of which are noted in the margins. Read the paper carefully, taking in the annotations as you go and making sure you understand each point before moving on to the next. 5 | Faulty Reasoning 207 Free Speech on Campus Seems to be three arguments to discuss, but this summary does not make that as clear as it should. Provides background for first argument First argument for thesis In order to meet the goals and purposes of higher education, free speech must remain intact. Thus, the University of Missouri should not adopt a campus hate speech code. 1. The First Amendment protects all speech outside the university setting, and what happens outside of the university setting also should be allowed inside. 2. Without an open forum for thought, though it may include hate speech, the university fails in its mission to provide a realistic experience for its students. By abolishing hate speech on university campuses, that open forum for discovery and knowledge is eliminated. As a result, learning and knowledge are stunted. 3. Without the exchange of controversial ideas and opinions, there can be no real change in our society. Experiencing and debating is almost always better than suppressing because censoring speech can never invoke real change. The First Amendment protects the right for every person to express opinions about the government and about each other. It actually "protects speech no matter how offensive the content" (Hate speech on campus, 1996). Just because something is offensive to one person does not mean it is offensive to another. Justice John M. Harlan wrote in Cohen v. California (1971), "One man's vulgarity is another's lyric" (Free speech, 1996). In other words, just because something is offensive to one person does not mean that it is offensive by definition. Speech that is protected outside of the university setting also should be protected inside. Some would argue that hate speech hinders the abilities of minority students to learn, but part of the goal of higher education is to put students out of their comfort zone and to challenge their ways of thinking. In response to a sexual-harassment policy being implemented at the University of Massachusetts, lawyer Harvey A. Silvergate (1995) wrote a memo to university administrators opposing the proposal. Thesis statement Summarizes the arguments to be made Needs a more explicit transition to first argument Sources cited Responds to an objection to thesis 208 Part Two | Reasons One of the primary purposes of a college education and experience is to challenge students, to make them question their comfortable lives and assumptions in short, to discomfort them in one way or another (Silvergate, 1995). In the same memo, Silvergate also wrote: Not clear how these quotations— which refer to sexual harassment— relate to hate speech If I am allowed to say something on the street corner, in a letter to the editor of a newspaper, or on a radio talk show, surely I should be allowed to say it on the campus of the University of Massachusetts. First argument for thesis This is equally true for the University of Missouri. What can possibly be gained by excluding an element of real life such as offensive speech from the campus experience? The university would only serve to deceive its students by shielding them from realistic situations while they are in school. This, in turn, only serves to place them into the real world with false expectations. Alternatively, exploring and debating is almost always better than suppressing. The organization Justice on Campus (1995) contends that: When we hear speech or see images that offend us, nothing is more human than our urge to suppress or to destroy them. But as deeply human is our need to think and to share our thoughts with others. Censorship is the greatest evil because the censor's goal is to imprison the human spirit. Second argument for thesis In addition to providing a realistic picture of nonacademic life, allowing all types of speech on campus encourages an open forum for the discussion of all types of ideas. Discussion of controversial issues and different points of view are the fuel for a useful education. That is why higher education has a responsibility to ensure that all forms of speech are protected, analyzed, and addressed. "The right of free speech is indivisible. When one of us is denied this right, all of us are denied" (Hate speech on campus, 1996). By denying one point of view, we eliminate the open forum. A speech code on any university campus only hinders the ability of students and faculty to fully explore the market of ideas available to them. The University of Missouri is no exception to the idea that academic freedom is the bedrock of a free society. Introduces quotation 5 | Faulty Reasoning Third argument for thesis Conclusion summarizes main arguments If we do not allow open expression, however hateful it is, then there can be no change, no growth. Racism, sexism, ageism, etc. are not going to diminish without being addressed in higher education. As noted by the ACLU (Hate speech on campus, 1995), "Verbal purity is not social change." Barring certain types of speech would be a seeming quick fix for issues such as racism, sexism, ageism, and homophobia, which often comprise hate speech. But racist statements are not the real problem between the races; racism is. If we bar all racially biased comments on campus, all we have done is fuel the racism. We have then given hatred the power to lurk and grow within us instead of communicating and debating about it in the open. If hate speech is not allowed to occur openly, the problem of racism is never addressed. Like racism, hate speech itself is not the problem; hate is. As members of a society, we must communicate in order to solve problems and grow as individuals. This includes addressing hateful ideas and opinions. We can make no progress if we do not allow offensive kinds of speech to exist on campus. By barring them, we run the risk of being silenced ourselves. A hate speech code at the University of Missouri would be detrimental to everyone, from students to faculty. The First Amendment protects all kinds of speech, including the offensive. It does this in order to ensure that all voices are heard and that all issues can be addressed. To go through college with the idea that offensive speech does not happen is detrimental to students and to the society in which they live. The educational system is based on the idea that communication leads to learning and that learning leads to personal growth. Without the open forum for thought and the freedom to express controversial ideas, a higher education is worthless. Moreover, no one ever solved a controversial gender issue or a racial conflict in silence. There must be communication so that debate can transpire. Restatement of thesis 209 210 Part Two | Reasons In order for any change in our society to transpire, offensive speech must be allowed to continue. It can only be addressed and learned from if it is equally protected by the Constitution. Mike Godwin, of the Electronic Frontier Foundation, says, "when it comes to the Bill of Rights, what you don't use, you lose. The First Amendment is a terrible thing to waste" (Comments and quotes, 1995). If anyone has a responsibility to use the freedom granted by the First Amendment, higher education is at the top of the list. References American Civil Liberties Union. (1996). Hate speech on campus. [Online]. Available: www.aclu.org/library/pbp16.html American Civil Liberties Union. (1996). Free speech. [Online]. Available: www.aclu.org/issues/freespeech/isfs.html Justice on Campus. (1996). Comments and quotes on sexual harassment and free speech. [Online]. Available: Justice on Campus. (1995). Speech codes and disciplinary charges. [Online]. Available: Silvergate, H.A. (1995, November 23). Memo from Harvey Silvergate. [Online]. Available: Writing Assignments 1. In a 300-word essay, argue that Canada should take bold action to improve the lives of Indigenous people living in some of Canada's poorest communities. Avoid fallacies. Then exchange essays with a classmate, and write a onepage critique of each other's paper, paying special attention to any fallacies you uncover. Be polite but honest! 2. Write a 500-word response to Essay 10 ("Christmas Is a Secular Holiday") in Appendix A, pointing out any fallacies you find—if any. If you find fewer than three fallacious arguments, describe fallacious arguments that the author could have resorted to in defence of his point of view if he weren't careful. 3. Write a 300-word paper arguing that the legal age for obtaining a regular driver's licence should be raised to 21. Include at least three fallacies in the 5 | Faulty Reasoning 4. 211 paper, but try to make them as convincing as you can. Exchange your paper with a classmate who has done the same assignment. Pinpoint the fallacies in each other's papers. Write a one-page essay criticizing the view that Canada should stop extracting oil from northern Alberta's oil sands. Make use of at least the genetic fallacy and the slippery slope fallacy. Then write a one-page critique of your own paper, making sure to point out the fallacies and explaining why they are problematic. Notes 1. 2. The inspiration for this unconventional categorization comes primarily from Ludwig F. Schlecht, "Classifying Fallacies Logically," Teaching Philosophy 14, no. 1 (1991): 53–64, and Gregory Bassham et al., Critical Thinking: A Student's Introduction (San Francisco: McGraw-Hill, 2002). W. Ross Winterowd and Geoffrey R. Winterowd, The Critical Reader, Thinker, and Writer (Mountain View, CA: Mayfield, 1992), 447–8. 3. 4. 5. Reported in Richard Whately, Elements of Logic (London: Longmans, Green, and Co., 1826). Lewis Vaughn and Theodore Schick, How to Think About Weird Things: Critical Thinking for a New Age (McGraw-Hill, 2010), 192. Student paper reproduced by permission of Mitchell S. McKinney, University of Missouri, www.missouri .edu/_commpjb/comm104/Sample_Papers/Free_Speech/ free_speech.html. PART THREE Arguments 6 Deductive Reasoning Categorical Logic Chapter Objectives Statements and Classes You will be able to • define subject term, predicate term, copula, quantifier, quantity, and quality. • memorize the four standard-form categorical statements. Translations and Standard Form You will be able to • translate ordinary statements into standard categorical form. • translate singular statements into standard form. Diagramming Categorical Statements You will be able to • construct a Venn diagram for any categorical statement. • memorize the Venn diagrams for the four standard-form categorical statements. • use Venn diagrams to tell if two statements are, or are not, equivalent. Assessing Categorical Syllogisms You will be able to • understand the structure of categorical syllogisms. • check the validity of a categorical argument by drawing Venn diagrams. 6 | Deductive Reasoning: Categorical Logic F or centuries, philosophers, monks, scientists, linguists, and students have been enthralled by logic. Yes, logic. For many people, including some great thinkers such as Aristotle, Gottfried Leibniz, and Bertrand Russell, logic has been, ironically, a passion—something deemed worthy of deep study and long devotion. For hundreds of years, logic (along with philosophy) was a required course in universities and was regarded as one of the grand pillars upon which a liberal arts education was based (the others were grammar, rhetoric, arithmetic, music, astronomy, and geometry). Even today scholars continue to be drawn into the depths of logic, never seeming to tire of exploration and application. But why do they bother? Why do they seem to think that logic is anything other than the dry and dusty preoccupation of dry and dusty philosophers? Well, maybe they bother because the study and use of logic, like the study and use of mathematics, is an exercise in exactitude, precision, clarity, and—above all— definite answers. All of which can be very satisfying. Or perhaps they bother because logic is the study of good reasoning or thinking and therefore should be part of every decision and every judgment we make. Logic also produces real results for us. Out of the study of logic have come discoveries now used in electronic engineering, set theory, linguistics, mathematics, and, of course, philosophy. Investigations in logic have yielded insights that made the invention of computers possible. (See the Food for Thought box "Logic and Computers" in Chapter 7.) We begin our study of formal logic by looking at categorical logic. The basic unit of concern in categorical logic is the statement component. In categorical logic, we study the relationships not between entire statements but between components known as the subject and predicate of a statement. In Chapter 7, we will look at formal methods for assessing the relationships between entire statements, or propositions, when we study propositional logic. Both types of reasoning—categorical and propositional—are deductive, and in both our ultimate goal is the evaluation of arguments. In propositional logic, which is discussed in Chapter 7, this task is made easier with "truth tables." In categorical logic the primary tools are diagrams and calculation rules. In categorical reasoning the statements or claims of interest are categorical statements—those that make simple assertions about categories, or classes, of things. They say how certain classes of things are, or are not, included in other classes of things. For example: "All cows are vegetarians," "No gardeners are plumbers," or "Some businesspeople are cheats." Categorical logic is inescapable in daily life. Without thinking much about the process, we often use arguments composed of categorical statements. We may reason, for example, that no pocket knives—no things that fit inside that category—are among the things that are permitted on a commercial airplane because no sharp instruments are things allowed on a commercial airplane and all pocket knives are sharp instruments. In a real-life situation, we wouldn't state the argument so formally (and awkwardly), and we would probably make one of these 215 "The study of logic appeals to no criterion not already present in the learner's mind." —C.I. Lewis "Bad reasoning as well as good reasoning is possible; and this fact is the foundation of the practical side of logic." —Charles Sanders Peirce categorical logic A form of logic whose focus is categorical statements, which make assertions about categories, or classes, of things. categorical statement A statement or claim that makes a simple assertion about categories, or classes, of things. 216 Part Three | Arguments S. Harris/Cartoon Stock premises implicit because it's too obvious to mention. Also, this whole process of reasoning would likely happen in seconds, with the argument zipping through our heads at top speed while we pack for the trip. There are several good reasons why categorical logic—first formulated by Aristotle over 2000 years ago—is still around. Chief among these reasons are that (1) it is part of everyday reasoning and (2) understanding its rules leads to better, clearer thinking. If that is so, then learning how to use it well can only help us. A command of logic is very useful, even if it's not always very romantic. How can Venn diagrams enable you to become a better critical thinker? subject term The first class, or group, named in a standard-form categorical statement. predicate term The second class, or group, named in a standard-form categorical statement. standard-form categorical statement In categorical logic, a categorical statement that takes one of these four forms: 1. All S are P. (All cats are carnivores.) 2. No S are P. (No cats are carnivores.) 3. Some S are P. (Some cats are carnivores.) 4. Some S are not P. (Some cats are not carnivores.) Statements and Classes The words in categorical statements that name classes, or categories, of things are called terms. Each categorical statement has both a subject term and a predicate term. Look, for example, at this claim: All cats are carnivores. The subject term here is cats, and the predicate term is carnivores. The statement says that the class of cats—that is, of all animals that are within that large and varied group—is included within the class of carnivores. We can express the form of the statement like this: All S are P. By convention, S stands for the subject term in a categorical statement; P stands for the predicate term. This kind of statement—All S are P—is one of four standard forms of categorical statements. Here are all four forms together: 1. 2. 3. 4. All S are P. (All cats are carnivores.) No S are P. (No cats are carnivores.) Some S are P. (Some cats are carnivores.) Some S are not P. (Some cats are not carnivores.) At this point, do not worry about whether you think these statements are true or false. What we are concerned with for the time being is the structure of these statements. Standard-form statement 2, "No S are P," asserts that no member of the S class is included in the P class (no members of the class of cats are part of the class of 6 | Deductive Reasoning: Categorical Logic carnivores). Statement 3, "Some S are P," asserts that some members of the S class are also members of the P class (some members of the class of cats are also members of the class of carnivores). Statement 4, "Some S are not P," asserts that some members of the S class are not members of the P class (some members of the class of cats are not members of the class of carnivores). For the sake of simplicity, the terms in these statements about cats are single words, just nouns naming a class. But subject and predicate terms can also consist of noun phrases and pronouns. Noun phrases are used because several words may be needed to specify a class. Sometimes a simple noun like cats won't do to describe the category we are talking about, but a noun phrase like "cats that live outdoors and hunt mice" will. In standard-form categorical statements, subject and predicate terms can't be anything but nouns, pronouns, and noun phrases. Only nouns, pronouns, and noun phrases can properly designate classes. So the statement "All cats are carnivores" is in standard form because cats and carnivores are nouns; however, "All cats are carnivorous" is not in standard form, because "carnivorous" is an adjective, not a noun that designates a category. As you might guess, many categorical statements you'll run into don't strictly fit any of these four patterns. But they eventually must be made to fit if you want to easily evaluate the validity of arguments containing these statements. So part of the job of assessing such arguments is to translate the categorical statements found "in the wild" into the tamer and clearer configurations of the standard forms. The challenge is to do these translations while being faithful to the meaning of the original statement. To translate categorical statements accurately, you need to know more about how they're put together. Categorical statements have four parts and several characteristics expressed in these parts. You already know about two of these parts, the subject term and the predicate term. They are joined together by a third part called the copula, a linking verb—either are or are not. The fourth part is the quantifier, a word that expresses the quantity, or number, of a categorical statement. The acceptable quantifiers are all, no, or some. The quantifiers all and no in front of a categorical statement tell us that it's universal. A categorical statement that begins with either all or no applies to every member of the class being discussed. The quantifier some at the beginning of a categorical statement says that the statement is particular—it applies to at least one member of a class. Categorical statements can vary not only in quantity but also in the characteristic of quality, being either affirmative or negative. A categorical statement that affirms that a class is entirely or partly included in another class is said to be affirmative in quality, whereas a categorical statement that denies that a class is entirely or partly included in another class is said to be negative in quality. With this technical vocabulary, we can describe each of the standard forms of statements noted earlier. 217 copula One of four components of a standard-form categorical statement; a linking verb— either are or are not—that joins the subject term and the predicate term. quantifier In categorical statements, a word used to indicate the number of things with specified characteristics. The acceptable quantifiers are all, no, or some. The quantifiers all or no in front of a categorical statement tell us that it's universal—it applies to every member of a class. The quantifier some at the beginning of a categorical statement says that the statement is particular—it applies to some but not necessarily all members of a class. quantity In categorical statements, the attribute of number, specified by the words all, no, or some. quality A characteristic of a categorical statement, determined by whether the statement affirms or denies that a class is entirely or partly included in another class. A categorical statement that affirms is said to be affirmative in quality; one that denies is said to be negative in quality. 218 Part Three | Arguments 1. All S are P. (All cats are carnivores.) This standard-form statement has a universal quantity and an affirmative quality. It affirms that all cats are included in the class of carnivores. So we characterize it as a universal affirmative statement, or claim. 2. No S are P. (No cats are carnivores.) This one denies that all cats are included in the class of carnivores. Put another way, the whole class of cats is excluded from the class of carnivores. It's a universal negative statement. 3. Some S are P. (Some cats are carnivores.) This one affirms that only some cats are included in the class of carnivores. It's a particular affirmative statement. 4. Some S are not P. (Some cats are not carnivores.) This one is referring to some cats—some particular subset of cats— and denies that those cats are included in the class of carnivores. It doesn't refer to the whole class of cats, just as statement 3 doesn't refer to the whole class. But it denies, instead of affirms, that the partial class of cats is included in the class of carnivores. It's a particular negative statement. Here are the four standard forms of categorical statements again with their quality and quantity listed: A: All S are P. (universal affirmative) E: No S are P. (universal negative) I: Some S are P. (particular affirmative) O: Some S are not P. (particular negative) Notice that, in the way we've listed them this time, the statements are preceded not by numbers but by the letters A, E, I, and O. These letters are the traditional designations for the four standard forms of categorical statements and have been used this way by logicians for hundreds of years. We can say then, for example, that this or that statement is an A-statement or an O-statement, indicating the pattern of the arguments with an easy shorthand. Something important to remember, even if it's obvious, is that all categorical statements should fit into one of these four standard forms and all statements that do fit into one of these have the same form. For example, "All cats are carnivores" and "All computers are electronic devices" are statements that share the same form—in particular, they are both A-statements. Exercise 6.1 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. 6 | Deductive Reasoning: Categorical Logic For each of the following statements, identify the subject and predicate terms and the name of the form (universal affirmative, universal negative, particular affirmative, or particular negative). Also, state the traditional letter designation for each form (A, E, I, O). *1. No scientists are Christians. 2. Most people do not like going to the dentist. 3. No cats that have lived over 15 years in a domestic setting are pets free of health problems. 4. Some airplanes are jets. *5. All theologians who have studied arguments for the existence of God are scholars with serious misgivings about the traditional notion of omnipotence. 6. No politicians are trustworthy. 7. All urbanites who wear lumberjack jackets and big bushy beards are hipsters. *8. Some people who play the stock market are not millionaires. 9. No taxpayers from the 2018 tax year are tax cheats. 10. No Canadian banks that had dealings with Enron are institutions that deserve our business! 11. All who sell homeopathic treatments are either delusional or fraudsters. *12. Some terrorists are Saudi citizens. 13. No Indigenous groups have voluntarily given up their land. 14. Yetis are fictional. 15. Some of the protestors at the Occupy Wall Street protest are not poor. *16. No "new Canadians" are supporters of changes in the immigration rules. 17. All child-abuse caseworkers are overburdened civil servants. Translations and Standard Form This is worth repeating: we translate ordinary statements into standard-form categorical statements so that we can handle them more efficiently. We want to handle them efficiently so that we can more easily evaluate the validity of arguments composed of categorical statements. Translation is necessary to bring out the underlying structure of statements. It is also important because ordinary language is too imprecise and ambiguous to use in the analysis of statements and arguments. You will appreciate this fact more as you work with categorical statements. Translating statements into standard form is a straightforward process consisting of a few simple steps and some rules of thumb. Knowing the steps and the rules is important, but getting some practice translating statements is vital if you want to know how to translate fast and accurately. If you don't understand a particular point, you'll have an easier time if you go over it until you do rather than skipping it and looking at it later. 219 220 Part Three | Arguments Food For Thought Categorical Inspiration Categorical statements don't have to sound like dry logical assertions. Artists, authors, poets, and songwriters have often used categorical statements to inspire. Here are a few examples: "Every child is an artist." (Pablo Picasso) "Some men see things as they are and ask why. Others dream things that never were and ask why not." (George Bernard Shaw) "Any woman who understands the problems of running a home will be nearer to understanding the problems of running a country." (Margaret Thatcher) "Let every man be respected as an individual and no man idolized." (Albert Einstein) "No woman can call herself free who does not own and control her body. No woman can call herself free until she can choose consciously whether she will or will not be a mother." (Margaret Sanger) "We learned about gratitude and humility—that so many people had a hand in our success, from the teachers who inspired us to the janitors who kept our school clean . . . and we were taught to value everyone's contribution and treat everyone with respect." (Michelle Obama) "Many men go fishing all of their lives without knowing it is not fish they are after." (Henry David Thoreau) "All you need is love." (John Lennon) Just as a reminder, here's the pattern of all standard-form categorical statements: Quantifier . . . Subject Term . . . Copula . . . Predicate Term You need to know how to handle each of these parts. Since the copula must always be either are or are not, you don't have to spend a lot time trying to determine the correct verb. But pinning down the terms and quantifiers is a little more challenging. Terms In translating statements, your first order of business is usually to identify the terms and ensure that they designate proper classes. Once you identify the terms and distinguish the subject term from the predicate term, you'll know in what order the terms must appear in the statement because the subject term must 6 | Deductive Reasoning: Categorical Logic always precede the predicate term. Identifying the terms, though, often involves rewording them so they actually name classes. Consider these translations, which we have done for you: [Original] All dogs are loyal. [Translation] All dogs are loyal animals. [Original] Some guys have all the luck. [Translation] Some guys are people who have all the luck. [Original] No nations can thrive without fair immigration policies. [Translation] No nations are things that can thrive without fair immigration policies. Sometimes it's easy to locate statement terms but not as easy to tell which is the subject term and which is the predicate term. This can happen when the order of the subject and predicate is reversed: Beyond the mountains stood the redwood trees. Here the subject is "the redwood trees." The sentence has a normal variation of subject–predicate order, common in English. If you understand the structure of such grammatical reversals, you should be able to identify the true subject and predicate terms. To see this, ask yourself: what is the sentence about? Notice that the key verb is stood. Who or what is doing the standing? It's the redwood trees, and so they are the subject of the sentence. Difficulty distinguishing subject and predicate terms can also arise when the word only is in a statement. For example, which is the subject term and which is the predicate in these A-statements? 1. 2. 3. 4. Only good listeners are wise advisers. Only if something is a music file is it an .m4a file. Hamburgers are the only real junk food. The only crimes prosecuted are murders. We can figure out statements 1 and 2 by using this formula: The words "only" and "only if " precede the predicate term in an A-statement. So the correct translations are: 1. All wise advisers are good listeners. 2. All .m4a files are music files. The translations of statements 3 and 4 follow this formula: The words "the only" precede the subject term in an A-statement. Therefore the correct translations are: 3. All real junk food is hamburgers. 4. All prosecuted crimes are murders. 221 222 Part Three | Arguments Review Notes The Four Standard-Form Categorical Statements A: All S are P. (universal affirmative) E: No S are P. (universal negative) I: Some S are P. (particular affirmative) O: Some S are not P. (particular negative) "Intuition is a suspension of logic due to impatience." –Rita Mae Brown (activist and feminist) "All cars are Hondas." "No cars are Hondas." "Some cars are Hondas." "Some cars are not Hondas." Now, what are the terms in these statements? 5. 6. 7. 8. 9. DeAnne Smith is a Toronto-based comedian. Calgary is Canada's finest city. Monday is the hardest day of the week. Wonder Woman is an amazing movie. Cormac is not a good student. Food For Thought We take the trouble to translate categorical statements into standard form for several reasons—one of them being that language is fuzzy, fuzzy, fuzzy. The famed logician Bertrand Russell agreed: "Because language is misleading, as well as because it is diffuse and inexact when applied to logic (for which it was never intended), logical symbolism is absolutely necessary to any exact or thorough treatment of our subject" (Introduction to Mathematical Philosophy). We can see a good example of language fuzziness in this type of categorical statement: "All S are not P." Take the statement "All Bigfoot monsters are not apes." Does this mean that (1) no Bigfoot monsters are apes or (2) that some Bigfoot monsters are not apes? In principle, it could mean either of those things. Statement 1 is an E-statement; statement 2 is an O-statement. To defeat fuzziness, we have to apply some categorical logic and translate the original sentence into either an E- or O-statement. Mark Heath/Cartoon Stock Standard Form versus Fuzziness Sometimes what looks like categorical logic is really just categorically a mess. In what ways can language be misleading? 6 | Deductive Reasoning: Categorical Logic These are known as singular statements. Each one asserts something about a single person or thing, including objects, places, and times. Each subject term is a noun (including names), pronoun, or noun phrase referring to an individual, particular item. In a way, the predicate terms specify classes but, alas, the subject terms don't. We can transform such statements, though, into universal statements (A-statements or E-statements). The trick is to think of each subject term as naming a class in which there's just one member. We can, for example, treat the subject term in statement 5 ("DeAnne Smith") as designating a class with DeAnne Smith as one member of that class, like this: 5. All persons identical to DeAnne Smith are Toronto-based comedians. We can translate our other singular statements in similar fashion: 6. 7. 8. 9. All places identical to Calgary are places that are Canada's finest city. All days identical to Monday are the hardest days of the week. All things identical to the film Wonder Woman are amazing movies. No persons identical to Cormac are good students. Now we can see more clearly that statements 5–8 are A-statements and that statement 9 is an E-statement. Granted, translations of ordinary statements into standard-form categorical statements can sometimes sound awkward, as the preceding translations surely do. But when we translate statements in this way, we put them into a form that makes their logical connections transparent—which is handy when we're trying to check the validity of complex arguments. Quantifiers Some quantifiers may be in non-standard form, and some may be unexpressed. Consider these statements: 1. 2. 3. 4. 5. Every field-hockey player is an athlete. Whoever is an artist is a genius. Sharks are good swimmers. Nothing for sale is truly valuable. Comets are ice balls. Each is a universal statement with a non-standard or unexpressed quantifier. Here are the translations with the proper quantifiers: 1. 2. 3. 4. 5. All field-hockey players are athletes. All artists are geniuses. All sharks are good swimmers. No items for sale are truly valuable. All comets are ice balls. 223 singular statements In categorical logic, statements that assert something about a single person or thing, including objects, places, and times. 224 Part Three | Arguments Statements 1, 2, and 4 have non-standard quantifiers; statements 3 and 5 have unexpressed quantifiers. Fortunately, most non-standard quantifiers are fairly easy to decipher. "Every professor," for example, obviously means all the professors. "Nothing" and "none" mean not any, which refers to all of them, whatever they are. Usually, unexpressed quantifiers are readily understood because of the nature of the terms. The statement "Sharks are good swimmers" clearly refers to all sharks, not just some of them—any speaker who meant to say this only about some sharks likely would have been careful to say so. In some statements, though, the unexpressed quantifier is not obvious, as, for example, in "Trent University students are radicals." Is it "All Trent students" or "Some Trent students"? When in doubt, be charitable: assume that the speaker intends the quantifier that you think would make the statement most likely to be true. In this case, "All Trent students . . ." is a sweeping generalization that's unlikely to apply to every single student at Trent University. The claim more likely to be true is "Some Trent students . . ." Now consider these statements: 6. There are government workers who are spies. 7. Most movie stars are snobs. 8. Several politicians are space aliens. These are all particular categorical statements. Their translations are: 6. Some government workers are spies. 7. Some movie stars are snobs. 8. Some politicians are space aliens. The quantifier some is appropriate in all these statements because in logic it means "at least one." We therefore have only two options for expressing quantity in categorical statements: all and fewer than all. "Most," "a few," "several," "almost all," and similar terms are all translated as "some." Part of the reason for logic's restrictive definition of "some" is that, in everyday language, "some" is extremely vague. The word could mean "most," "two or three," "10 or more," or "many." Who knows? Logic, though, needs precision—more precision than is found in ordinary discourse. Food For Thought Let Us Count the Ways . . . Plenty of non-standard statements are equivalents of categorical statements in standard form. A-Statement: "All S Are P." Only scientists are experts. Mathematicians are good logicians. Every CEO is a leader. 6 | Deductive Reasoning: Categorical Logic Only if something is a plant is it a flower. Anything is a potential weapon. Something is a true breakfast only if it includes eggs. Whatever is a beaver is a rodent. Every pediatrician is a doctor. If something is not a vegetable, then it is not a potato. E-Statement: "No S Are P." If anyone is an artist, then she is not a banker. All humans are non-reptiles. Territories are not provinces. Nothing that is a mind is a body. Nothing blue is an apple. None of the vegetables are fruits. It is false that some vegetables are fruits. I-Statement: "Some S Are P." There are engineers who are painters. Most criminals are morons. Several countries are islands. At least one survivor is a hero. A few lotteries are scams. Many Ontarians are Torontonians. O-Statement: "Some S Are Not P." Some philosophers are non-Christians. Some non-Christians are philosophers. Not all comedians are Canadian. Many maple trees are not sugar maples. Most Quebecers are not separatists. There are non-Christian philosophers. Canadians are not always peacekeepers. A few rock stars are not maniacs. Exercise 6.2 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. Translate each of the following statements into standard categorical form, and say whether the form is A, E, I, or O. 225 226 Part Three | Arguments *1. All Canucks fans are fanatical. 2. All that glitters is not gold. 3. "Brave are the hearts that beat beneath Scottish skies." ("Scotland the Brave") 4. Most sharks will try to bite you if they get the chance. *5. Only cellphone companies that keep up with the latest technology are good investments. 6. If it's not alive, then it can't be human. 7. "People with pinched faces often have poisonous hearts." (Chinese proverb) 8. It's impossible for any bachelor to also be married. *9. "All intelligent thoughts have already been thought." (Goethe) 10. "If it's worth doing, it's worth doing right." 11. The only players who didn't suit up for the opening game were the ones injured in training. 12. All criminals not already in jail should be found and put in jail. *13. Some things are meant to be forgotten. 14. "There is no excellence without difficulty." (Ovid) 15. Rap music is not very popular among senior citizens. 16. "All's well that ends well." (Shakespeare) Exercise 6.3 Follow the instructions given for Exercise 6.2. *1. Only a fool tests the depth of the water with both feet. (African proverb) 2. Every political party that gets at least 10 per cent of the vote in a general election should be considered a major player in Canadian politics. 3. "People who wish to salute the free and independent side of their evolutionary character acquire cats." (Anna Quindlen) *4. All androids like Commander Data are non-human. *5. Nothing that satisfies the heart is a material thing. 6. It's not often that you see CEOs who aren't overpaid. 7. Work hard, and you'll soon have a good command of categorical logic. *8. Most treatments said to be part of "alternative medicine" are unproven. 9. There are people among us here today who will one day rise to greatness. 10. "People who love only once in their lives are . . . shallow people." (Oscar Wilde) 11. Some Acadians settled on what is called the "French Shore" of Nova Scotia. *12. Friday is the only day that gives her any joy. 13. Many critical thinking textbooks make good bedtime reading. 6 | Deductive Reasoning: Categorical Logic 227 14. "As long as poverty, injustice, and gross inequality persist in our world, none of us can truly rest." (Nelson Mandela) *15. The picture hanging on the wall is crooked. 16. "[P]eople I really trust, none of them were cool in their younger years." (Taylor Swift) 17. "He that is born to be hanged will never be drowned." (French proverb) 18. Only you can prevent forest fires! 19. It is not the case that all birds are non-flightless birds. *20. "A nation without a conscience is a nation without a soul." (Winston Churchill) Diagramming Categorical Statements If you want more help in understanding the relationships between subject and predicate terms, you're in luck. You can represent such relationships visually with the use of Venn diagrams (named after the nineteenth-century British logician and mathematician John Venn). The diagrams consist of overlapping circles, each one representing a class specified by a term in a categorical statement. Here's an example: S P X Some S are P. This is the diagram for an I-statement: "Some S are P." The circle on the left represents the class of S, the circle on the right, the class of P. The area on the left contains only members of the S class; the area on the right contains only members of the P class. The area where the circles overlap is where any individuals that are both S members and P members would be, if they exist. The X in the overlapped area, however, gives more specific information. It shows that at least one S member is a P member. That is, there is at least one S that also is a P. This diagram, of course, represents any statement of the form "Some S are P"—like, for instance, "Some plants are cacti." The X on the diagram where the circles overlap, then, would mean that at least one plant is a cactus. The area of overlap between those two categories is not empty. Venn diagrams Diagrams consisting of overlapping circles that graphically represent the relationships between subject and predicate terms in categorical statements. 228 Part Three | Arguments Now here's the diagram for an O-statement—"Some S are not P": S P X Some S are not P. Here the X is in the S circle but outside the P circle, indicating that at least one S is not a P. In our plant example (in which the S circle represents the class of plants and the P circle represents the class of cacti), this diagram would show that at least one plant is not a cactus. Here's the diagram for an A-statement—"All S are P": S P All S are P. This diagram asserts that all members of the S class are also members of the P class ("All plants are cacti"). Notice that the part of the diagram where the S circle does not overlap the P circle is shaded, or "blacked out," showing that that area is "empty," or without any members. (If you want, think of it this way: in the shaded area, the lights are out because no one is home!) And this means that there are no members of S that are not also members of P. The remaining part of Review Notes Three Steps to Diagramming a Categorical Statement 1. Draw two overlapping circles, each one representing a term in the statement. 2. Label the circles with the letters representing the terms. 3. Shade an area of a circle to show that an area is empty; insert an X to show that at least one member of a class is also a member of another class or that at least one member of a class is outside of another class. 6 | Deductive Reasoning: Categorical Logic the S circle encloses only S's that are also P's—that is, it shows that S members—all of them—are also P members. Finally, here is the diagram for an E-statement—"No S are P": S P No S are P. Here the area where the S circle and the P circle overlap is shaded (empty), meaning that there is no situation in which S overlaps with P (in which members of S are also members of P). So no members of S are also members of P ("No plants are cacti"). Venn diagrams can come in handy when you want to know whether two categorical statements are equivalent—that is, whether they say the same thing—because sometimes we can say the same thing—make the identical logical claim—in two different ways. If the diagrams for the statements are identical, then the statements are logically equivalent. The Four Basic Categorical Statements S P S A. All S are P. S E. No S are P. P X I. Some S are P. P S P X O. Some S are not P. 229 230 Part Three | Arguments Let's say that you want to know whether the following two statements say the same thing: No S are P. No P are S. If you diagram them both, you get your answer: S P S P No S are P. No P are S. You can see that the diagrams are identical—they both show the area of overlap between the two circles as shaded, signifying that there are no members of S that are also members of P and vice versa. So the first statement ("No S are P," an E-statement) says the same thing as the second statement ("No P are S"). Likewise, if we compare the diagrams for "Some S are P" (I-statement) and "Some P are S," we can see that these statements are also equivalent: S P S P X X Some S are P. Some P are S. On the other hand, by comparing diagrams we can see that A-statements and E-statements are not equivalent (something we knew already, of course): S P All S are P. S P No S are P. 6 | Deductive Reasoning: Categorical Logic Let's examine one final pair of statements: All S are P. No S are non-P. The diagrams clearly show that these are equivalent: S P All S are P. S P No S are non-P. Exercise 6.4 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. Construct Venn diagrams for each of the following statements. Specify both the subject and predicate terms. If necessary, translate the statement into standard form before diagramming (A, E, I, or O). *1. No one is exempt from paying taxes. 2. "No man is an island." (John Donne) 3. Not all in our country on Earth is bribery legal. 4. Some mammals are aquatic. *5. "Nothing is more useless in a developing nation's economy than a gun." (King Hussein I of Jordan) 6. Adam Smith is one of the few philosophers whose ideas have truly shaped the modern world. 7. Some books are not written by either J.K. Rowling or Stephen King. *8. Some good talkers are good listeners. 9. There are strong and weak students in every class. 10. Some people with excellent reputations are not persons of excellent character. 11. The man who invented matches didn't get rich from his invention. *12. Every corporation has social obligations. 13. You can always rely on Acme knives because they never break and never get dull. 14. No stone was left unturned. 15. "Few friendships could survive the moodiness of love affairs." (Mason Cooley) 231 232 Part Three | Arguments Exercise 6.5 Construct Venn diagrams for each statement in the following pairs, and then say whether the statements are equivalent. *1. No S are P; No P are S. 2. All S are P; All P are S. 4. Some S are P; Some P are S. *3. All S are P; All P are non-S. *6. All S are non-P; No S are P. 5. Some S are P; No non-P are S. 7. No S are non-P; No S are P. 8. No P are S; No S are P. *9. Some S are not P; Some P are not S. 10. All S are P; All non-P are non-S. 5. Assessing Categorical Syllogisms "Logical consequences are the scarecrows of fools and the beacons of wise men." —Thomas Henry Huxley Once you understand the workings of categorical statements, you're ready to explore the dynamics of categorical arguments, or—more precisely—categorical syllogisms. As we saw in Chapter 3, a syllogism is a deductive argument made up of three statements—two premises and a conclusion. A categorical syllogism is one consisting of three categorical statements (A, E, I, or O) interlinked in a specific way. You can see the interlinking structure in this categorical syllogism: 1. All elected officials are civil servants. 2. All politicians are elected officials. 3. Therefore, all politicians are civil servants. If we diagram this argument as we did in Chapter 3, we come up with this structure: 1 2 3 But this kind of diagram, though handy for understanding the overall structure of the argument, isn't much help here because it doesn't reveal the internal 6 | Deductive Reasoning: Categorical Logic 233 Everyday Problems and Decisions Logic and Racism Being bad at categorical logic is at the heart of an awful lot of racism and general prejudice against various ethnic, racial, and religious groups. For example, in late 2014 an act of terrorism—a shooting—took place in Paris at the offices of the satirical newspaper Charlie Hebdo. The killers were Muslims. Five people died, and eleven were injured. Such incidents are terrible tragedies. And the tragedy of such events is only amplified by the unthinking racism that often follows. Many people, unfortunately, leapt hastily from the fact that the Charlie Hebdo killers were Muslims to a general hatred or mistrust of Muslims. Consider what the relevant categorical syllogism would look like: (1) Some killers (namely, the Charlie Hebdo killers) are Muslims. (2) All killers are terrorists. (3) Therefore, all Muslims are terrorists. You can easily construct a Venn diagram to demonstrate that this is a flawed syllogism. That is, the premises, even if they are true, are incapable of providing support for the conclusion. This is particularly important to see, given that the conclusion of this argument has led so many people to act badly toward their fellow human beings. A good command of categorical logic can save you from being wrong about—and then acting unethically toward—entire groups of people. components and interlinking structure of the statements. Notice that each categorical statement has, as usual, two terms. But there are a total of only three terms in a categorical syllogism, each term being mentioned twice but in different statements. So in the preceding argument, politicians appears in statements 2 and 3, elected officials in 1 and 2, and civil servants in 1 and 3. In a categorical syllogism, we refer to the predicate term in the conclusion (civil servants, in this case) as the predicate term for the whole argument. The predicate term always also appears in one of the premises (premise 1, in the example above). The subject term in the conclusion is the subject term for the whole argument. The subject term always also occurs in one of the premises (premise 2, in the example above). The other term, the one that appears once in each premise but not in the conclusion, is referred to as the middle term. If we map out the argument with the terms labelled in this way, here's what we get: Premise (1) [Middle term] [Predicate term]. Premise (2) [Subject term] [Middle term]. Conclusion (3) Therefore, [Subject term] [Predicate term]. 234 Part Three | Arguments We can symbolize this argument form with letters: (1) All M are P. (2) All S are M. (3) Therefore, all S are P. Here, M stands for the middle term, P for the predicate term, and S for the subject term. So, summarizing, a categorical syllogism is one that has: 1. Three categorical statements—two premises and a conclusion. 2. Exactly three terms, with each term appearing precisely twice in the argument. Food For Thought Living by the Rules Drawing Venn diagrams is a good way to both visualize what a syllogism is saying and test it for validity. But you can also check validity without diagrams. One technique is to assess the validity of a syllogism by determining if the argument follows certain rules. Some of these rules involve the fine points of syllogistic structure. But others are drawn from simple facts about syllogisms that you probably already know—or have suspected. Here are three such rules: 1. A valid categorical syllogism must possess precisely three terms. 2. A valid categorical syllogism cannot have two negative premises. 3. A valid categorical syllogism with at least one negative premise must have a negative conclusion. Any standard-form categorical syllogism that breaks even one of these rules must be invalid. (On the other hand, a categorical syllogism that does not violate any of these rules is not necessarily valid. It may still be defective for other reasons.) Here are some syllogisms that violate at least one rule: All snakes are reptiles. All reptiles are cold-blooded creatures. Therefore, all lizards are cold-blooded creatures. (Violates rule 1) No criminals are law-enforcement officers. Some law-enforcement officers are not bank robbers. Therefore, some bank robbers are not criminals. (Violates rule 2) No Italians are Germans. Some Inuit are Italians. Therefore, some Inuit are Germans. (Violates rule 3) 6 | Deductive Reasoning: Categorical Logic 3. One of the terms (the middle term) appearing in each premise but not in the conclusion. 4. Another term (the predicate term) appearing as the predicate term in the conclusion and also in one of the premises. 5. Another term (the subject term) appearing as the subject term in the conclusion and also in one of the premises. A valid categorical syllogism, like a valid deductive argument of any other sort, is such that if its premises are true, its conclusion must be true. (That is, if the premises are true, the conclusion cannot possibly be false.) This fact, of course, you already know. Of more interest now is how we can check the validity of categorical syllogisms. Fortunately, there are several ways to do this, the simplest of which is the Venn diagramming method. This technique involves drawing a circle for each term in the argument (giving us three overlapping circles), then diagramming the premises on these circles (using shading and Xs, as discussed in the previous section). If the resulting diagram reflects the assertion in the conclusion, the argument is valid. If you know how to diagram categorical statements, you can diagram an entire categorical argument. Remember that since a categorical statement has two terms, we need two circles to diagram it—one circle for each term. And since a categorical syllogism has three terms, we need three circles, overlapping like this: M S P The top circle represents the class designated by the middle term (M); the bottom left circle, the subject term (S); and the bottom right circle, the predicate term (P). For clarity and consistency, it is best always to label the circles in this order. The two lower circles together represent the conclusion, since they stand for the relationship between the subject and predicate terms (S and P). 235 236 Part Three | Arguments Let's diagram our syllogism about politicians and civil servants, diagramming one premise at a time. We can start by labelling the circles like this, with three empty, overlapping circles: Elected officials Politicians Civil servants Now, we diagram the first premise ("All elected officials are civil servants"). To do this, we look only at the two circles involved in premise 1—namely the "elected officials" circle and the "civil servants" circle. For now, ignore the other circle entirely. You should literally pretend that it is not there at all. Premise 1 is an A-statement. So, to represent premise 1, we shade the part of the elected officials circle that does not overlap with the civil servants circle. This signifies that all the existing elected officials are also civil servants: Elected officials Politicians Civil servants Notice that, if you just look at the two circles we're working with here, the diagram looks exactly like our original A-statement diagram on page 228. Diagrams of A-statements always look like that! 6 | Deductive Reasoning: Categorical Logic 237 Next, we diagram premise 2 ("All politicians are elected officials"). Again, we look at only the two circles that are relevant to that premise, ignoring the P circle entirely. Premise 2 is another A-statement, so we diagram it by shading the part of the politicians circle that does not overlap with the elected officials circle: Elected officials Politicians Civil servants Now—and this is very important—we can stop drawing. We have diagrammed only the premises. We never, ever, diagram the conclusion. Why is that? Why not diagram the conclusion too? Recall that in a valid deductive argument, the premises imply the conclusion. So once we diagram the premises, the resulting combined diagram is already supposed to represent the information in the conclusion ("Therefore, all politicians are civil servants"). 6 | Deductive Reasoning: Categorical Logic 2. We Review Notes Five Steps to Checking Validity with Venn Diagrams 1. Draw three overlapping circles, each circle representing a term in the syllogism, with the two circles representing the subject and predicate terms placed on the bottom left and bottom right. 2. Label the circles with the letters representing the terms (S, P, and M). 3. Diagram the first premise. (But always diagram universal premises first. When diagramming a particular premise, if it's unclear where to place an X in a circle section, place it on the dividing line between subsections.) 4. Diagram the other premise. NOW STOP. PUT DOWN YOUR PEN OR PENCIL. OK, now finally . . . 5. Check to see if the two circles at the bottom of the diagram represent what is asserted in the conclusion. If it does, the argument is valid; if not, it's invalid. 238 Part Three | Arguments can see that the politicians circle is shaded everywhere—except in the area that overlaps the civil servants circle. And this is how the diagram of the two circles should be shaded if it were to depict the statement "All politicians are civil servants." (Look at the diagram, and ask yourself: where are the politicians? One part of the politician circle is shaded—empty. The only place you can find any politicians is in the area where the politicians circle overlaps the civil servants circle. Hence, all politicians are civil servants.) So the diagram does express what's asserted in the conclusion. The argument is therefore valid. If you diagram the premises of a categorical syllogism and the resulting combined diagram says the same thing as the conclusion, the syllogism is valid. If the diagram does not "contain" the conclusion (if information is missing), the syllogism is invalid. This syllogism we just examined has two universal ("All") premises (both A-statements). Let's diagram one that has a particular ("Some") premise: All robots are machines. Some professors are robots. Therefore, some professors are machines. Here's the diagram properly labelled: Robots Professors Machines We'll diagram the first premise first ("All robots are machines")—but not just because it happens to be the first premise. In categorical syllogisms with both a universal and a particular premise, we should always diagram the universal premise first. The reason is that diagramming the particular premise first can lead to confusion. For example, in the argument in question, if we were to diagram the particular premise first ("Some professors are robots"), we would end up with an X in the area where the robots and professors circles overlap. That section, however, is split into two subsections by the machines circle: 6 | Deductive Reasoning: Categorical Logic Robots ? ? Professors Machines So the question arises in which subsection we should place the X. (That's why there are question marks in the diagram above—don't put those in, just for now, that uncertainty.) Should we put the X in the area overlapping with the machines circle—or in the part not overlapping with the machines circle? Our choice does affect what the diagram says about the validity of the argument. But if we diagram the universal premise first, the decision of where to insert the X is made for us because there would be only one relevant subsection left (and we can't place an X in a shaded area, because shaded means empty): Robots X Professors Machines The diagram shows that at least one professor is a robot and is also a machine. That represents that some professors are machines—which is what the conclusion asserts. The syllogism, then, is valid. But sometimes, diagramming the universal premise first still leaves us with a question about where the X should go. Consider this syllogism: All barbers are singers. Some Italians are singers. Therefore, some Italians are barbers. 239 240 Part Three | Arguments When we diagram the universal premise first, we see that the section where the Italians and singers circles overlap is divided between a subsection including barbers and a subsection excluding barbers. So the X could go in either subsection, and we have no way of knowing which: Singers ? ? Italians Barbers The question marks in the diagram above suggest (again, just temporarily) our uncertainty. But question marks aren't really part of our diagramming method. So we eventually need to decide where to put the X! In situations like this one, the best approach is to be honest and indicate our uncertainty about where the X should go by placing it on the border between the two subsections, like this: Singers X Italians Barbers An X placed in this position means that among things that are both I talians and singers, something is either a barber or not a barber—but we don't know which. Now, the conclusion says that some Italians are barbers. This conclusion is represented in the diagram only if there is an X unquestionably in the area where the barbers and Italians circles overlap. But we don't have an X unquestionably in that region; we have only an X that may or may not be there. That is, there's a question of just where the X is. Therefore, the diagram does not assert what the conclusion does, and so the argument is ruled invalid. 6 | Deductive Reasoning: Categorical Logic 241 Food For Thought The Limits of the Venn Diagram Method A hard problem in the study of logic is the question of whether a universal statement (like "All S are M" or "No S are M") has what is called "existential import." (The word "import" here means importance, or significance.) That is, does such a statement actually imply that something exists? Does it imply that members of the class S exist? Or does it simply mean, for example, that if there are any Ss in the world, they are all also Ms? Consider this example. If you say that "None of the rides at the theme park are roller coasters," are you necessarily implying that there are some rides at the theme park? You probably are; otherwise, it would be an odd thing to say in the first place. On the other hand, if you say that "No unicorns are dragons," are you necessarily implying that there are some unicorns in the world and that those unicorns happen to not be dragons? Hopefully not! So the "existential import" of a universal statement—that is, whether or not it implies that some members of the predicate term actually exist—depends on the context. But formal logic is, well, formal, and so the systems we use to test logical validity look only at the formal structure of an argument, independent of context. But because of this problem, the Venn diagram method used in this textbook is not entirely foolproof. Consider the following syllogism: All S are M. All M are P. Therefore some S are P. Here's the Venn diagram for it: M S P According to our method, the syllogism is invalid because you can't look at the above diagram and see that "Some S are P." But is it really invalid? Understand, that depends on what we're talking about. What if the argument expressed above is the following: "All cats are mammals. And all mammals are fur-bearing animals. So some cats are fur-bearing." That certainly seems valid. If the premises are true, how could it be false that some cats are fur-bearing? After all, some in logic means "at least one." Continued 242 Part Three | Arguments The problem lies in the fact that both of this syllogism's premises are universal statements and the conclusion is a particular statement. The result is that the Venn diagram method used in this book will work for nearly all syllogisms you run across, and it will work for all the examples given in this book and in the exercises throughout this chapter. But it won't work reliably for syllogisms that have two universal premises and a particular conclusion. Those are relatively rare, but keep your eyes open, and when you spot them, ask yourself, "Does the person putting this argument forward actually believe that members of all those categories actually exist?" Summary Every categorical statement has a subject term and a predicate term. There are four standard forms of categorical statements: (1) universal affirmative ("All dogs are mammals"), (2) universal negative ("No dogs are mammals"), (3) particular affirmative ("Some dogs are mammals"), and (4) particular negative ("Some dogs are not mammals"). Categorical statements must be translated into standard form before you can work with them. Translating involves identifying terms, ensuring that they designate classes, and determining the quantifiers. Drawing Venn diagrams is a good way to visualize categorical statements and to tell whether one statement is equivalent to another. A categorical syllogism is an argument consisting of three categorical statements (two categorical premises and a categorical conclusion) that are interlinked in a structured way. The syllogism consists of a subject term, predicate term, and middle term. The subject term appears in the conclusion and one premise, the predicate term appears in the conclusion and one premise, and the middle term appears in each premise but not the conclusion. You can use Venn diagrams to represent categorical syllogisms, showing how the terms are related. The easiest way to check the validity of a categorical syllogism is to draw a three-circle Venn diagram—three overlapping circles with the relationship between terms depicted graphically. If, after diagramming each premise, the diagram reflects what is asserted in the conclusion, the argument is valid. If not, the argument is invalid. Exercise 6.6 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. For each of the following arguments, label the subject term, predicate term, and middle term. Then translate each syllogism into symbolic form, using S, P, and M to represent the terms. 6 | Deductive Reasoning: Categorical Logic 1. No essays are poems. So some blog entries are poems. So some blog entries are not essays. *2. All horses are mammals, and no mammals are lizards. Therefore, no lizards are horses. 3. All penguins are animals. All birds are animals. Therefore, all penguins are birds. 4. All corporations are structured such that their owners have limited liability, but some businesses are not structured such that their owners have limited liability. That's why some businesses are not corporations. 5. All tweets have less than 140 characters. A piece of writing with less than 140 characters is pithy. Therefore, all tweets are pithy. *6. Some DVDs are not film classics, but all black-and-white movies are film classics. Therefore, some DVDs are not black-and-white movies. DVDs. 7. Some cities are located in Canada. All cities located in Canada are great places to live. So some cities are great places to live. 8. All roads are highways to Rome, but no mere paths are roads. So no mere paths are highways to Rome. *9. No elm trees are cacti. Some tall plants are elm trees. So some tall plants are not cacti. 10. All thieves are criminals. All thieves are dangers to society. Therefore, all dangers to society are criminals. Exercise 6.7 Draw Venn diagrams to test the validity of each argument in Exercise 6.6. Answers are given for 2, 6, and 9. Exercise 6.8 Translate each of the following arguments into categorical syllogistic form (premise, premise, conclusion), symbolize the argument (by using the conventional S, P, M variables), and draw a Venn diagram to test its validity. *1. Some "alternative" medicines are cancer treatments, for all herbal medicines are "alternative" medicines and some herbal medicines are cancer treatments. 2. Doritos are delicious, because Doritos are salty and high in fat and all foods that are salty and high in fat are delicious. *3. All SUVs are evil vehicles because all SUVs are gas guzzlers and all gas guzzlers are evil vehicles. 4. Some arguments are invalid, so some syllogisms must be invalid since all syllogisms are arguments. 243 244 Part Three | Arguments *5. Cancer patients are not allowed to donate their organs because the organs could contain cancer. And no doctor would allow the donation of organs that could contain cancer. 6. Anyone who voted for him is gullible. Since a majority of people in this region voted for him, a majority of people in this region are gullible. 7. Some feminists are not radicals, since all radicals urge the immediate elimination of current power structures and some feminists do not urge the immediate elimination of current power structures. 8. Some people have no strong convictions. And all social activists have strong convictions. So no social activists are people of honest and strong convictions. 9. Most people who drive SUVs are road hogs who don't care about the environment or environmental issues. Road hogs who don't care about the environment or environmental issues are the true enemies of the planet. Therefore, people who drive SUVs are the true enemies of the planet. 10. Some useless gimmicks promoted as sure cures are placebos that can make people feel good. Vitamin pills are useless gimmicks promoted as sure cures for a variety of illnesses. So some vitamin pills are placebos that can make people feel good even if they don't cure anything. Field Problems 1. Go online, and check the opinion or editorial section of your local newspaper or one of the national newspapers (the Globe and Mail or National Post). Within one of the editorials or letters to the editor, find a categorical syllogism that you suspect is invalid. Recall that, in many cases, arguers will leave a premise or conclusion unstated, so you might only see two of the three claims that make up the syllogism in what you're reading. Assess its validity using the Venn diagram method. If it is indeed invalid, write a 150–200-word explanation of how you would explain, to someone who doesn't know about categorical logic, what's wrong with the argument. 2. Check recent news reports to find one categorical statement made by a prominent Canadian or American business leader. Translate the statement into standard form. (1) Construct a valid categorical syllogism using the statement as the conclusion and supplying whatever premises you deem appropriate. Assume that your premises are true. (2) Then construct an invalid syllogism using the same statement as the conclusion and supplying premises, also assumed to be true. In both arguments, try to keep the statements as realistic as possible (e.g., close to what you may actually read in a newsmagazine). 6 | Deductive Reasoning: Categorical Logic 3. Think of a piece of advice you have been given that was presented in syllogistic form. (Hint: this often happens when a speaker's first premise is a general rule of thumb and his or her second premise relates that rule to your current situation.) Was the advice aimed specifically at you.) Is the argument a good one? Did you take the advice? Self-Assessment Quiz 1. What is a quantifier? What are the two quantities that can be used in categorical statements? 2. What are the two qualities that can be expressed in categorical statements? 3. What are the four standard-form categorical statements? (Specify them by quality and quantity and by name or letter designation.) For each of the following statements, identify the subject and predicate terms, the quality, the quantity, and the name of the form (universal affirmative, universal negative, particular affirmative, or particular negative). 4. Some inventions are not beneficial to humanity. 5. No matter how many reasons you give me, there just are no good reasons for supporting the death penalty. 6. Every employee who works under Françoise quits within a month. 7. Some ghost stories are not fabrications devised by true believers. Translate each of the following statements into standard categorical form, and indicate whether the form is A, E, I, or O. 8. Curling is the best sport. 9. A man who sexually harasses women cannot truly be called a man. 10. Hasko is the finest scholar in the department. 11. Nobody who wants an A in this class would wait until the night before the exam to study. 12. "Slow and steady wins the race." (Aesop) 13. A politician is someone who firmly believes that getting elected makes one right. 14. "A fanatic is someone who can't change his mind and won't change the subject." (Winston Churchill) Construct Venn diagrams to test the validity of each of the following syllogisms. 15. Some P are not M. All S are M. Therefore, some S are P. 16. No S are M. No M are P. Therefore, all S are P. 17. All P are M. No S are M. Therefore, no S are P. 18. All M are P. Some S are M. Therefore, some S are not P. 19. All M are P. All M are S. Therefore, some S are P. 20. Some S are M. Some M are P. Therefore, all S are P. 245 246 Part Three | Arguments Integrative Exercises These exercises pertain to material in Chapters 1–6. 1. What is critical thinking? 2. What is an argument? 3. True or false: every argument must include at least two assertions or claims. 4. Can a deductive argument guarantee the truth of its conclusion? For each of the following arguments, specify the conclusion and premises, and indicate any argument indicator words. 5. Jabeen either forgot about class or is just running late. She definitely wouldn't forget, so she must just be running late. 6. I will go for a jog unless it's raining, and I will stay home if my kids are sick. The kids aren't sick. We're going for a jog. 7. Either Canada will deal justly with Indigenous peoples or it will not be satisfied to live with injustice. So Canada will deal justly with Indigenous peoples. 8. If you don't file your taxes on time, you'll get into trouble with the Canada Revenue Agency. However, since I know you filed your tax returns a month before the deadline, you'll be fine. 9. I've worked for our boss for many years, and the only reasons she'd reprimand you like that are if she's in a bad mood or it's for the good of the company. Since I saw her looking really happy this morning, it must have been for the good of the company. For each of the following arguments, determine whether it is deductive or inductive, valid or invalid, and strong or weak. 10. Kevin is either deluded or a fraud. If he sincerely believes in the healing power of herbal tea, he's deluded. If he's selling it without believing in it, he's a fraud. He's too smart to be deluded. He's a fraud. 11. Assad currently works for Microsoft and was hired six months ago. Anyone who isn't fired within three months of being hired by Microsoft stays at the company for the rest of his or her career. That's why Assad will most likely spend the rest of his career at Microsoft. 12. "And certainly if its essence and power are infinite, its goodness must be infinite, since a thing whose essence is finite has finite goodness." (Roger Bacon, The Opus Majus) 13. The comet has appeared in the sky every 60 years for the past four centuries. It will appear in the sky again tonight. Tonight is precisely 60 years since its last appearance. For each of the following arguments, identify the implicit premise that will make the argument valid. 14. Canadians dominate the National Hockey League. So Canada will likely win gold in Olympic Men's Hockey. 15. Either you drank the last beer in the fridge or I did. So it must have been your fault that I got into trouble. 16. My sister just ate sushi at a totally sketchy place in a bad part of town, and the raw tuna she ate smelled a bit funky. I'll just go ahead and dial 911 now. 17. The prime minister accepted a significant gift from someone who happened to be seeking special favours from the government. The prime minister should therefore resign. Writing Assignments 1. Write a 600-word essay arguing either for or against transporting crude oil by rail. Structure your argument as a categorical syllogism. 2. Write a 300-word criticism of your own argument from Question 1 above. Focus your criticism on whichever of your categorical premises you think an opponent is most likely to focus on. 3. Write a 600-word rebuttal to Essay 9 ("What If You Could Save 250 Lives by Feeling a Little Disgusted?") in Appendix A. Make sure to note Essay 9's premises and conclusion. 247 7 Deductive Reasoning Propositional Logic Chapter Objectives Connectives and Truth Values You will be able to • understand the purpose and uses of propositional logic. • understand the meaning, symbols, and uses of the four logical connectives— conjunction, disjunction, negation, and conditional. • define statement and explain the distinction between simple and compound statements. • translate simple statements into symbolic form. • construct a truth table and use it to test the validity of arguments. • identify the situations in which conjunctions, disjunctions, negations, and conditionals are true or false. • understand the structure and the various ways in which the four connectives can be expressed. Checking for Validity You will be able to • determine the validity of very simple arguments using truth tables. • use parentheses effectively in expressing statements in symbolic form. • use the short method to evaluate complex arguments. 7 | Deductive Reasoning: Propositional Logic 249 W e began our exploration of formal logic by studying categorical logic. In categorical logic, the basic unit of our concern was the statement component; that is, we were interested in the logical relationships between the subject and predicate of various statements. Here we take up an exploration of propositional logic (or truth-functional logic)—the branch of deductive reasoning that deals with the logical relationships among entire statements. In propositional logic, we use symbols to represent and clarify these relationships. If you master this material, you should reap at least two rewards right away. The first is a more thorough understanding of the power, precision, and dynamics of deductive reasoning. The second is the ability to evaluate the validity of very complex arguments. How complex? Take a look at this deductive argument. Can you tell if it's valid? propositional logic The branch of deductive reasoning that deals with the logical relationships among statements. (1) Canada will be a just society only if it will improve the situation of Indigenous peoples. (2) Canada will be a just society only if the standard of living of middle-class Canadians is improved. (3) If the standard of living of middle-class Canadians is reduced, then either Canada will not be a just society or it will not improve the situation of Indigenous peoples. (4) Canada will not improve the situation of Indigenous peoples. (5) Therefore, Canada will not be a just society. Food For Thought When Critical Thinking Leads to Strange Places Every year the science humour magazine Annals of Improbable Research hands out its infamous "Ig Nobel Prizes," which honour people whose achievements "cannot or should not be reproduced." We're talking here about actual research of dubious or curious value. Yet many Ig Nobel winners are living examples of what can happen when there are serious lapses in critical thinking. On the other hand, some of the wacky Ig Nobel awards are for research that is definitely intended to be taken seriously (or intended) effect of making people laugh and then really think. You can be the judge. Here's a partial list of the Ig Nobel Prizes for 2017: • Physics: Marc-Antoine Fardin, for using fluid dynamics to probe the question "Can a Cat Be Both a Solid and a Liquid?" • Economics: Matthew Rockloff and Nancy Greer, for their experiments to see how contact with a live crocodile affects a person's willingness to gamble. • Biology: Kazunori Yoshizawa, Rodrigo Ferreira, Yoshitaka Kamimura, and Charles Lienhard, for their discovery of a female penis and a male vagina in a cave insect. • Fluid Dynamics: Jiwon Han, for studying the dynamics of liquid-sloshing to learn what happens when a person walks backwards while carrying a cup of coffee.1 250 Part Three | Arguments If you don't know anything about propositional logic, the only way you can check this argument for validity is to rely on intuition, which is not a very reliable method. You just have to think it through, and the thinking it through will not be easy. But with a grounding in propositional logic, you can figure this one out in straightforward fashion with a high degree of certainty. By the end of this chapter, you will have the relevant tools. Connectives and Truth Values Symbolic logic Modern deductive logic that uses symbolic language to do its work. In propositional logic, the symbols, or letters, used to express a statement. As we've seen, arguments are composed of statements. In Chapter 3, we used geometric shapes to represent the statements in the diagrams we drew. Here, we'll use letters. Propositional logic has techniques that we can use to represent not just statements but also the relationships between statements—relationships that we specify with logical connectives, or words, such as "if . . . then" and "or." Propositional logic gets this work done by using the symbol language of symbolic logic, a branch of logic in its own right. Because these logical connectives specify the relationships between statements, they shape the form of the argument. Recall that the validity of an argument is a matter of the argument's form; that's why we can judge the validity of an argument apart from any consideration of the truth of its premises. So propositional logic helps us to assess the validity of an argument without being distracted by non-formal elements, such as the particular words used to express the premises. So the symbols used to express the argument are of two types. You're already familiar with the first type; they're the lower-case letters, or variables, you use to represent propositions. For example, p, q, or p. (There's no particular distinction in the letters p and q; any letters will do, as long as you use them consistently. That is, once you've chosen p to represent, say, "Alice rode her bike," p must consistently represent that same statement throughout the argument.) The second type is the symbols for the logical connectives that indicate relationships between statements. The following table presents the symbols for, and the meaning of, four logical connectives: Symbol Meaning Example & Conjunction (and) p&q Alice rode her bike and John walked. ∨ Disjunction (or) p∨q Either Alice rode her bike or John walked. ∼ Negation (not) ∼p Alice did not ride her bike. It is not the case that Alice rode her bike. → Conditional (if–then) p → q If Alice rode her bike, then John walked. 7 | Deductive Reasoning: Propositional Logic These connectives are used in compound statements such as "The air is clean, and the sky is blue" or "If you stay up late, you will sleep in tomorrow." Remember that a statement (or claim) is an assertion that something is or is not the case. In other words, it is the kind of thing that can be either true or false. A simple statement is one that does not contain any other statements as constituents; a compound statement is composed of at least two simple statements. Every statement has a truth value. That is, a statement is either true or false. Or, to be more precise, a true statement has a truth value of true, and a false statement has a truth value of false. In contrast, questions and exclamations don't have truth values: they are neither true nor false. Since statements can be put into symbolic form, and since arguments are made up of statements, we are able to express entire arguments symbolically. Now let's say that we have converted an argument into its symbolic form, and we list all the possible truth values of the argument's variables (statements). In other words, we list all circumstances in which each statement could be true or false. We could then determine whether, because of the influence of the logical connectives, the argument is valid or invalid. How would this information help us? It could help us to quickly uncover the validity or invalidity of the whole argument. Given the possible truth values of some statements in the argument, and given the relationships of the statements as set out by the logical connectives, we could infer the possible truth values of all of the other statements. Then we would have to answer just one question: Is there a combination of truth values in the argument such that the premises could be true and the conclusion false? If the answer is yes, then the argument is invalid. If there's no such circumstance, the argument is valid. If you're a little fuzzy on all this, don't worry. It will become clearer as you digest the following examples and learn more about the dance between connectives and truth values. Let's look next at each of the four logical connectives introduced above. 251 statement (claim) An assertion that something is or is not the case. simple statement A statement that doesn't contain any other statements as constituents. compound statement A statement composed of at least two constituent simple statements. Conjunction Two simple statements joined by a connective to form a compound statement are known as a conjunction. Each of the component statements is called a conjunct. For example, the simple statement "Julio is here" and the simple statement "Juan is here" combine to form a compound statement, in which each component claim is the conjunction of two simple claims. It states that Julio is here, and it also claims that Juan is here. We symbolize it like this: p&q The grammatical conjunction and is one of several terms that can express logical conjunction. Some others are but, yet, nevertheless, while, also, and moreover. These are all logically equivalent; they are therefore properly symbolized by the ampersand (&). Caution: make sure the connective conjunction Two simple statements joined by a connective to form a compound statement. conjunct One of two simple statements joined by a connective to form a compound statement. 252 Part Three | Arguments really is conjoining two distinct statements and is not a set of compound nouns as in "We went to Jack's bar and grill" or "Céline and Marie were a couple." The truth value of a conjunction is determined by the truth values of its parts— that is, by the truth value of its conjuncts. For example, look at this conjunction: Last night I had a Coke, and I also had an order of poutine. truth table A table that specifies the truth values for claim variables and combinations of claim variables in symbolized statements or arguments. That conjunction is true if, and only if, it's true both that I had a Coke last night and that I had poutine last night. Maybe you did have Coke last night, but maybe you didn't. Maybe you had poutine last night, and maybe you didn't. But if you indeed had both of them, then the conjunction—the whole statement—is true. To identify and keep track of all the possible truth values of a conjunction, we can create a truth table, which is just a graphic way of displaying all the possibilities. Here's the truth table for the conjunction p & q: p q p&q T T T T F F F T F F F F At the top of the table, you see a column heading for each of the component statements (in this case, one for p and one for q) and one for the conjunction (p & q) as a whole. The Ts and Fs below the line are abbreviations for true and false. The first two columns of Ts and Fs represent the four possible sets of truth values for the p and q variables. Either p is true and q is true, or p is true and q is false, or p is false and q is true, or p is false and q is also false. These are the only four combinations possible for any conjunction (or any other two-variable compound). The last column of Ts and Fs (under p & q) shows the possible truth values for the conjunction as a whole, given the four possible combinations of truth values for the pair of variables p and q. Reading down the table, they are: T T, T F, F T, and F F. These are the only combinations possible. The table shows, in other words, that with these four possible pairs of truth values, the conjunction will only ever have these four truth values: T, F, F, and F. In other words, this is what each of the rows is saying: Row 1: When p is true and q is true, p & q is true. Row 2: When p is true and q is false, p & q is false. Row 3: When p is false and q is true, p & q is false. Row 4: When p is false and q is false, p & q is false. (Think this through for yourself, using the example given above. If it's true that I had Coke last night and also true that I had poutine last night, then the conjunction "I had Coke and had poutine last night" is clearly true. But if it's true that I had Coke last night but false that I had poutine last night, then "I had Coke and had poutine last night" is, as a whole, false. And so on.) Considering this truth table, maybe you've already guessed an important fact about the truth value of a conjunction. If just one statement in the conjunction is false, the whole conjunction is false. Only if both conjuncts are true is the whole conjunction true. In the truth table, you can see that p & q is true only in the row in which p is true and q is true (in the first row)—and that p & q is false whenever even one of the component statements is false (that is, in the other three rows). This should make perfect sense to you because in everyday speech, if one-half of a conjunction is false, we would normally regard the whole conjunction as false. For example, if someone says that they went to a movie with Sahar and bumped into Hilary but you know for a fact that Hilary was home alone all night, it makes perfect sense for you to say, "No, your story isn't true," even though one half of the story is true. It's a good idea to remember the exact sequence of Ts and Fs in the first two columns of the previous truth table. That way you won't have to guess to make sure you include every possible combination of truth values. The first few columns in any truth table are usually entered automatically as guides. 253 Heritage Image Partnership Ltd/Alamy Stock Photo 7 | Deductive Reasoning: Propositional Logic Alan Turing (1912–1954) was a mathematician and logician and is considered the father of modern computer science. How do computers use propositional logic? Disjunction We saw earlier that in a conjunction, we assert that p and q are both true and that if just one conjunct is false, the whole conjunction is false. But in a disjunction, we assert that either p or q is true (though both might be) and that even if one of the disjuncts is false, the whole disjunction could still be true. Each statement in a disjunction is called a disjunct. For example, here is a disjunction: Either Joan is home or Ann is lonely. We symbolize it as p∨q or Either Laura or Matthew will row the boat. which we also symbolize as p∨q disjunct A simple statement that is a component of a disjunction. disjunction A compound statement of the form "Either p or q." A disjunction is true even if only one disjunct is true and false only if both disjuncts are false. 254 Part Three | Arguments Food For Thought Computers and Logic Just imagine what your life would be like if there were no such thing as propositional logic. For starters, you would have no laptops, no iPads, no game consoles. In fact, without logic we would have to do without all devices that run on microchips (or "integrated circuits"), including mobile phones, calculators, and even microwave ovens. The ability to formalize statements in the way that propositional logic does is what allows computers to do their work. In fact, the fundamental operations of all computers are based on roughly the same set of logical operators that you are learning about in this chapter. In computers, "logic gates" are the basis for all circuitry. A logic gate is a physical device that implements a logical function such as negation (a "NOT gate") or conjunction (an "AND gate"). As you already know, the fundamental language of all computers is called "binary," a language that represents all information with strings of 1s and 0s. In logical terms, the 1s and 0s of binary code work exactly like the Ts and Fs in our truth tables. In fact, look at how similar a computer scientist's "AND gate" (on the left, below) is to the truth table for conjunction! Input A Output Y Input B A B Y 0 0 0 0 1 0 1 0 0 1 1 1 The symbol for disjunction (∨) is called a "wedge," which is roughly equivalent to the word "or." The word unless is also sometimes used in place of or to form a disjunction, as in "I will go to the movies unless I stay home," which is the same as saying, "Either I will go to the movies, or I will stay home." The words either and neither usually signal the beginning of a disjunction. The truth table for a disjunction looks like this: p q p∨q T T T T F T F T T F F F This truth table shows that p ∨ q is true in every possible combination of Ts and Fs except one, where both p and q are false (in the last row). This situation just reflects the fact that for a disjunction to be true, only one of the disjuncts must be true. 7 | Deductive Reasoning: Propositional Logic 255 The disjunction here, for example, is true if either (1) Joan is home or (2) Ann is lonely or (3) Joan is home and Ann is lonely. An important point to keep in mind is that, in English, the word or can have two different meanings. It can mean "one or the other, or both," which is called the inclusive sense. In this sense, p ∨ q means "p or q or both" ("If he's sick or tired, he won't go jogging"). But or can also mean "either but not both," which is called the exclusive sense. In the exclusive sense, p ∨ q means "p or q but not both" ("You can have either the chicken or the fish as your in-flight meal"). Standard practice in logic is to assume the inclusive sense when dealing with disjunctions. This approach is reflected in the truth table for a disjunction, and it has no effect on our evaluation of disjunctive syllogisms (discussed in Chapter 3); the way we will use it here. Food for Thought Arguments We Have Known and Loved Virtually every field has its share of well-worn arguments that are used to establish this theory or that proposition. But the discipline of philosophy—because it's, well, philosophy—is studded from end to end with influential arguments, including some especially famous ones. If all that exists exists in motion, then there are no disembodied spirits. All that exists is matter in motion. Therefore, there are no disembodied spirits. Whatever begins to exist has a cause. The universe began to exist. Therefore, the universe had a cause, namely, God. There is unnecessary evil in the world. If there were an all-powerful, all-knowing, all-good being, there would be no unnecessary evil in the world. Therefore, there is no all-powerful, all-knowing, all-good being. If it's true that all our actions are determined by an indefinitely long chain of prior events, then people cannot perform free actions. It's true that all our actions are determined by an indefinitely long chain of prior events. Therefore, people cannot perform free actions. We can't be certain that we are not dreaming. If we can't be certain that we are not dreaming, we cannot be certain that what we sense is real. If we cannot be certain that what we sense is real, we cannot acquire knowledge through sense experience. Therefore, we cannot acquire knowledge through sense experience. 256 Part Three | Arguments valid forms regardless of whether the disjunction was construed as inclusive or exclusive. Look: "Logic is not a body of doctrine, but a mirrorimage of the world. Logic is transcendental." —Ludwig Wittgenstein (philosopher, 1889–1951) Either p or q. Not p. Therefore, q. In the disjunctive syllogism, one of the disjuncts is denied, so the argument is valid in any case. But if one of the disjuncts is affirmed, the argument is invalid when the disjunction is inclusive: Either p or q. p. Therefore, not q. Obviously, if the disjunction means "p or q or both," then by affirming p we cannot conclude not q. If we know that the disjuncts in a disjunctive premise really are exclusive options ("either a boy or a girl"), then we can safely assume the exclusive meaning of or and examine the argument accordingly. Otherwise it's safest to stick to the inclusive sense. Negation A negation is the denial of a statement, which we indicate with the word not or some other term that means the same thing. For example, the negation of the statement "The price of eggs in China is very high" is as follows: The price of eggs in China is not very high. or It is not the case that the price of eggs in China is very high. or It is false that the price of eggs in China is very high. Assuming that we use p to represent the foregoing statement, here's how we would symbolize its negation: ∼p The symbol ∼ is called a "tilde," and when we say ∼p aloud, we say "not p." When a tilde appears in front of a statement, it indicates the reversal of the statement's truth value. A true statement becomes false; a false statement becomes true. One interesting consequence of this reversal is that a double negation is the same thing as no negation. For example, take the foregoing negation ("The price of eggs in China is not very high"). If you negate this negation ("It is not the case 7 | Deductive Reasoning: Propositional Logic 257 p ∼p T F F T Conditional Remember conditional statements? We looked at them in Chapter 3 when we discussed valid and invalid argument forms (modus ponens, denying the antecedent, etc.). The basic form of a conditional is "If . . . then . . . ." For example: "If the cat is on the mat, then the rat will The logic of conditional arguments has many applications in real estate home." Symbolized, a conditional life. What are some other examples from law and commerce? looks like this: p → q, where an arrow represents the connective. Recall also that in a conditional, the first part (p) is the antecedent and the second part (q) is the consequent. Notice that a conditional asserts only that if one thing is true, something else is true. It doesn't state that the antecedent is actually true or that the consequent is actually true but only that, under specified conditions, a certain state of affairs will be true. At first, you may find that the truth table for conditionals seems a little odd. But it makes good sense when you think about it: p q p→q T T T T F F F T T F F T The table shows that a conditional is known to be false in only one situation— when the antecedent is true and the consequent is false. Put more precisely, a conditional is false if and only if its antecedent is true and its consequent is false. Mike Baldwin/www.CartoonStock.com that the price of eggs in China is not very high"), you end up with something logically equivalent to the positive statement, "The price of eggs in China is very high." The truth table for a negation explains why such reversals can happen: 258 Part Three | Arguments "The art of reasoning becomes of first importance. In this line antiquity has left us the finest models for imitation." —Thomas Jefferson (US president, 1801–9, praising the understanding of logic passed down to us from the Ancient Greek philosophers) In all other possible combinations of truth values, a conditional is true—and this is where the part that may strike you as odd. Let's take each of the four combinations in turn and see how they work in this conditional statement: "If Mark is paid a dollar, then he'll eat a bug." The question we can ask is this: "Under what circumstances is the conditional statement (the whole statement, antecedent, and consequent considered together) false?" Well, it should be clear that if Mark is indeed paid a dollar and then he does eat a bug, the whole conditional will be true. This situation is represented in the first row of the truth table. What about the last row—what if the antecedent is false and the consequent is false? If it is false that Mark is paid a dollar, and it is false that he eats a bug, then there is no reason to think that the conditional itself is false. Mark could reasonably assert that the conditional statement isn't false if he isn't paid a dollar and doesn't eat a bug. Mark could also reasonably assert that a conditional isn't false even when the antecedent is false and the consequent is true (the situation in the third row). If Mark isn't paid a dollar and he still eats a bug, that doesn't prove that the conditional is false—it just proves that there are other conditions under which Mark will eat a bug! This path brings us back to the fact that a conditional is false only when the antecedent is true and the consequent is false. That's the situation implied by the second row of our table above. Everyday Problems and Decisions Propositional Logic and Bad Choices A poor command of propositional logic can lead to bad choices in real life! Consider the following argument about a very important life decision: If Bill Gates dropped out of university and became a billionaire, then any person who drops out of university will become a billionaire. Bill Gates dropped out of university. So, surely a genius like Bill Gates would know that you don't need to finish university. And guess what? Bill Gates didn't bother to finish university. So university is generally a bad idea. I might as well drop out now. Did you recognize this as an example of affirming the consequent, a fallacy first discussed in Chapter 3. In symbolic terms, the argument looks like this: p → ∼q ∼q ∴ p You don't have to use symbolic logic every time you need to make a major life decision. But developing the relevant skills will help to train your brain to recognize errors like this when you see them. The result is almost certain to be better decisions, including ones that matter a lot! 7 | Deductive Reasoning: Propositional Logic Conditional statements can be expressed in a variety of ways, each one paired with the standard-form version: 1. 2. 3. You will fall off that ladder if you're not careful. If you're not careful, you will fall off that ladder. Gregory will excel in school provided that he studies hard. If Gregory studies hard, then he will excel in school. Jenna would not have wrecked the car if she had not tried to beat that light. If Jenna had not tried to beat that light, then she would not have wrecked the car. 4. I'll ride the bus only if I'm late. If I ride the bus, then I'm late. 5. Whenever I think, I get a headache. If I think, then I get a headache. 6. I will walk the dog unless it's raining. If it's not raining, I will walk the dog. Among these patterns, pair 4 and pair 6 are likely to cause you the most trouble. In pair 4, only if is the troublesome term. Just remember that whereas if introduces the antecedent of a conditional, only if introduces the consequent of a conditional. So in "I'll ride the bus only if I'm late," "only if" indicates that the Review Notes Statements and Connectives • A simple statement, or claim, is one that does not contain any other statements as constituents. A compound statement is one composed of at least two simple statements. • Logical connectives: Conjunction (and): & If just one statement in a conjunction is false, the whole conjunction is false. Disjunction (or): ∨ A disjunction is true even if one of the disjuncts is false. Negation (not): ∼ A negation "reverses" the truth value of any statement. Conditional (if–then) → A conditional is false if and only if its antecedent is true and its consequent is false. • Words used in conditionals: if—introduces the antecedent; if p, then q = p → q only if—introduces the consequent; p only if q = p → q provided—introduces the antecedent; p provided q = q → p unless—introduces the antecedent; p unless q = ∼q → p whenever—introduces the antecedent; whenever p, q = p → q 259 260 Part Three | Arguments consequent is "I'm late." So the conditional is "If I ride the bus, then I'm late." In pair 6, unless is the sticking point. You need to understand that unless means "if not." So we have to move the form of the antecedent to put the antecedent position. In pair 6, the word unless is the sticking point. You need to understand that unless means "if not." So here "unless it's raining" becomes "if it's not raining." Because of such variations in expression, it's important to translate conditionals into standard form (using variables and symbols) before you try to assess their validity. To do that, you must identify the antecedent and consequent and put them in the proper order (antecedent before consequent). Exercise 7.1 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. Identify each of the following statements as a conjunction, disjunction, negation, or conditional; identify its component statements; and indicate the symbol used to represent the connective (if applicable). *1. The Liberals raised taxes, and the Conservatives cut programs. 2. If I can't get a discount on those plane tickets to Japan, I'll have to vacation in Paris. 3. The Maple Leafs will be in the playoffs if they win this game. 4. There's no way I'm going to eat a bug! *5. If Gol is all-powerful, then he can prevent evil in the world. 6. If Tasmania can reward you with whatever you want, then you're in trouble. 6. Either the president's comment was misleading or it was meant as a joke. *7. If God is all-powerful, then he can prevent evil in the world. 8. Listen, if that's true, then the earth is flat. 9. The company recently resigned; there had been rumours of "financial irregularities" at the company. Exercise 7.2 Translate each of the following statements into symbolic form. Use the letters in parentheses to represent each component statement. (Assume that the letters stand for positive statements so that a negated statement is indicated by putting a tilde [∼] in front of a letter.) *1. Either we leave the house now or we're going to miss our flight. (p, q) 2. If we don't start preserving the rain forests soon, many species will go extinct unless we start preserving the rainforests soon. (x, y) 7 | Deductive Reasoning: Propositional Logic *4. People die, but ideas live forever. (e, f) 5. Teasing a vicious dog is not a good idea. (r) 6. As long as he returns the money, Ron will not be prosecuted. (x, y) 7. "I've seen your daily routine. You are not busy." (Rey, in Star Wars: The Last Jedi) (p, q) *8. He will not benefit from instruction, and he will not learn anything from his mistakes. (j, k) 9. Either Black Panther wins Best Picture or Blade Runner 2049 does. (h, i) 10. If you will learn to be smart, you are not going to be in control. (r, s) 12. Our opponents either cheated or got incredibly lucky. (p, q) 13. If Socrates is a man, he is mortal. (d, e) *14. It is not the case that the zoo won't accept any more animals. (p) 15. There really isn't enough snow, but I really wanted to go skiing this weekend. (a, b) 16. Either terrorists are hiding in every shadow or someone is trying to convince us that they are! (x, y) 11. The Zika outbreak will soon spread to Canada unless we start extensive quarantine measures for people who are entering the country from infected areas. (j, k) 10. "I did not yield! And as you can see, I am not dead!" (T'Challa, in Black Panther) (y, z) 11. You will eventually master propositional logic if you keep working at it systematically. (x, y) Exercise 7.3 Say which of the following statements are true and which are false on the basis of what you know about the truth value of their components. Rely on your own background knowledge to determine the truth value of simple statements. *1. It is currently winter in Australia ∨ It is currently winter in Canada *2. Alligators are mammals & Dogs are mammals 3. The Earth revolves around the sun & ∼ The moon revolves around the Earth 4. The surface area of a circle increases → The volume increases 5. Cats have wings → Cats can fly *6. ∼ Dogs are mammals ∨ Snakes are reptiles 7. Alligators are reptiles → Alligators are mammals *8. Alligators can bark & ∼ Dogs are reptiles 9. ∼ Dogs are reptiles → ∼ Snakes are mammals 10. ∼ ∼ Dogs are mammals ∨ Snakes are reptiles Exercise 7.4 Indicate which of the following symbolized statements are true and which are false. Assume that the statements represented by the variables a, b, and c are true and that the statements represented by the variables x, y, and z are false. 261 262 Part Three | Arguments 1. a → b *2. ∼a ∨ ∼b 3. c & p 4. ∼b ∨ ∼c *5. q → b 6. ∼a & ∼q 7. b & ∼q 8. ∼b ∨ ∼p 9. a → ∼c *10. p → ∼r Exercise 7.5 Translate each of the symbolized statements in Exercise 7.4 into a logically equivalent statement in English. Assume that the letters stand for positive statements. Possible answers are provided in Appendix B for 2, 5, and 9. Exercise 7.6 Translate each of the following statements into symbolic form. Make sure that the letters you use to stand for statements stand for positive statements. 1. If you saw polar bears in Canada, then you were most likely in northern Manitoba. *2. Either Canada will become more European or Canada will become more American. 3. "You either die a hero, or you live long enough to see yourself become the villain." (Harvey Dent, The Dark Knight) 4. Sure, I'm happy to help you study, but I'm not going to do the work for you. *5. Science will never triumph over religion unless science can offer answers to the really big questions of human existence. 6. You wouldn't eat meat if you believed in animal rights. 7. Canada's oil sands are a very "dirty" source of oil, but most Canadians don't seem too concerned about it. 8. It is not the case that philosophy is dead, and it's not true that science has replaced it. *9. Provided I pass my logic course, I will be able to organize my thinking better when I write essays. 10. Canadians say they support human rights, but they certainly aren't above buying cheap products produced by foreign companies with inhumane working environments. 7 | Deductive Reasoning: Propositional Logic Checking for Validity Now you're ready to put what you've learned about truth tables to use in determining the validity of arguments. The truth table test of validity is based on a basic, but very important, fact about validity that you've already encountered: it's impossible for a valid argument to have true premises and a false conclusion. So any procedure that allows us to easily check if the premises are true and the conclusion is false will help us to test an argument for validity. Truth tables can do this. Devising truth tables for arguments, then, can reveal the underlying structure—the form—of the arguments, even those that are fairly complex. Simple Arguments Let's start by analyzing a very simple, silly argument involving a conjunction: Ducks have webbed feet. Ducks have feathers. Therefore, ducks have webbed feet and feathers. We symbolize the argument like this: p q ∴ p & q We use ∴ to separate the premises and the conclusion represented by the variables, giving us a good look at the logical form of the argument. The symbol ∴ indicates that a conclusion follows. It can be translated as "therefore." This argument is, of course, valid—a fact that you can likely see without the help of a truth table. But it makes for a simple illustration: p q p&q T T T T F F F T F F F F This truth table is a repeat of the one we looked at in the section on conjunctions. The top line of the table shows the two premises of the argument and its conclusion with their possible truth values listed below. Like all truth tables, this one shows every possible combination of truth values for the premises and conclusion. When dealing with simple arguments, the first two columns of a truth table are reference columns in which the variables, or letters, of the argument are listed, 263 Part Three | Arguments 264 "Logic takes care of itself; all we have to do is to look and see how it does it." —Ludwig Wittgenstein followed by a column for each premise and then a column for the conclusion. In this case, though, the premises (since the premises just are p and q), so we won't repeat them. Now we can ask this question: "Does the truth table show any (row of) a state of affairs in which the premises of the argument are true and the conclusion false?" If we can find even one instance of this arrangement, we will have shown that the argument is invalid. Remember that we are trying to judge the validity of an argument, which is a matter of argument form. So if we can discover that it's possible for a particular argument form to have true premises and a false conclusion, we will know that the argument form is invalid. Review Notes Common Argument Forms Symbolized Modus Ponens, Affirming the Antecedent (Valid) p→q p ∴q Hypothetical Syllogism (Valid) p→q q→r ∴p → r Denying the Antecedent (Invalid) p→q ∼p ∴∼q Modus Tollens, Denying the Consequent (Valid) p→q ∼q ∴∼p Disjunctive Syllogism (Valid) p∨q ∼p ∴q Affirming the Consequent (Invalid) p→q q ∴p 7 | Deductive Reasoning: Propositional Logic and a false conclusion, we will know without further investigation that the argument is invalid. In that case, we will know that any argument of the same pattern is invalid. Therefore, the argument is valid. Here's a slightly more complex argument: If global warming continues, coastal regions will be permanently flooded. Global warming will not continue. Therefore, coastal regions will not be permanently flooded. You should recognize this argument as an invalid argument form known as denying the antecedent. The truth table can tell us definitively whether an argument is invalid because the table includes every possible combination of truth values. If the truth table does not reveal the situation in which the premises are true and the conclusion false, then there is no row in which the premises are all true (T) and the conclusion false (F). Here is it symbolized, with negation and conditional connectives: p→q ∼p ∴ ∼q Let's construct a truth table for this argument together. We will begin by figuring out what columns we need. Generally, we need at least one column for each variable, a column for each premise, and a column for the conclusion. For a two-variable argument, we need four rows to account for the four possible combinations of T and F: T T, T F, F T, and F F. We place those values in the first two columns immediately, since they are the same for every two- variable truth table: p q p→q T T F F T F T F Premise ∼p Premise ∼q Conclusion That's the easy part. The hard part begins when we start filling in the rest of the columns. As we saw earlier, the truth value of a compound statement (like p→q) depends on the truth value of its components. That's why it's a good idea to start out with guide columns in a truth table. The truth value of these compound units in turn determines the truth value of any larger compound units. 265 266 Part Three | Arguments For example, to figure out the content for the third column in the table, we need to use our knowledge of how conditional claims work. So, to fill in the first blank in the third column, we look to the left. There we see that p is true and q is true. If both p and q are true, the conditional is true. In the second row p is true and q is false. Looking back at the truth table for conditionals, we know that when p is true and q is false, the conditional p → q is false. So we know to write "F" in that first position of the third column. We can now go ahead and fill in the rest of the column: p q p→q Premise ∼p Premise ∼q Conclusion T T T T F F F T T F F T In the truth table, the truth value of ∼p is the contradictory of p, and the truth value of ∼q is the contradictory of q. So whatever the truth value of a statement, the tilde (∼) reverses it, from true to false or false to true. (Adding the labels "premise" and "conclusion" is optional. We won't always do that here in the text. But it may prove helpful in your own work.) p q p→q Premise ∼p Premise ∼q Conclusion T T T F F T F F F T F T T T F F F T T T T You can begin checking the argument's validity in two different ways. You can first inspect all rows that have a false conclusion and then see if the premises in that row are true, indicating an invalid argument. Or you can zero in on rows showing all true premises and then check to see if any of them have false conclusions. In this case, the third row is the key: in that row, both premises are true, and the conclusion is false. So the argument is invalid, and we don't need to check any other rows. Now let's try this one: Either we fight for freedom, or we give in to tyranny. We won't give in to tyranny. Therefore, we will fight for freedom. 7 | Deductive Reasoning: Propositional Logic Symbolized, it looks like this: $p \lor q$ $\sim p$ $\therefore q$ And here is its truth table: p q p∨q Premise ~p Premise q Conclusion T T T F T T F T F F F T T T T F F F T F (Again, we've labelled the premises and conclusion in this truth table just to help you out, though it's not strictly part of the method.) Is this argument valid? To find out, we need to check the table for any row that shows true premises and a false conclusion. The third row is the only one in which both premises are true—but the conclusion is also true. So this argument is valid. Tricky Arguments Arguments can get more complicated when variables and connectives are intricately combined into larger compounds and when the number of variables increases. In both these situations, truth tables can help you to unravel the complexities. Let's examine an argument that has both of these wrinkles. We'll go right to the symbolized form: $p \to \sim(q \& r)$ p $\therefore \sim(q \& r)$ Notice in these premises the use of parentheses to group variables. The parentheses enable us to symbolize arguments more precisely and to avoid confusion. In math, there is an obvious difference between $2 \times (3 + 4)$, which equals 14, and $(2 \times 3) + 4$, which equals 10. Likewise, there is a crucial difference between $p \to \sim(q \& r)$ and $(p \to \sim q) \& r$. The former symbolization would express a conditional such as "If it rains tomorrow, then we won't go to the fair and ride the roller coaster." But the latter symbolization would represent a very different conditional, such as "If it rains tomorrow, then we won't go to the fair, and we will ride the roller coaster." Such differences, of course, can affect the truth values of a statement and require a different truth table. 267 268 Part Three | Arguments Here's a distinction involving parentheses that's worth committing to memory. Consider these two statements: $\sim(q \& r)$ It is not the case that Leo sings the blues and Fats sings the blues. $\sim q \& \sim r$ Leo does not sing the blues, and Fats does not sing the blues. The first statement asserts that it is not the case that both Leo and Fats sing the blues. That is, it's not true that Leo and Fats are concurrently in the habit of singing the blues. Maybe Leo sings the blues, and Fats doesn't, or vice versa. On the other hand, the second statement says that Leo doesn't sing the blues and neither does Fats. If we hope that at least one of these guys sings the blues, we're out of luck. Here's another distinction worth knowing. Look at these two statements: $\sim(q \lor r)$ It is not the case that either Leo sings the blues or Fats sings the blues. $\sim q \lor \sim r$ Either Leo does not sing the blues or Fats does not sing the blues. The first statement says that neither Leo nor Fats sings the blues; it could also be symbolized as $\sim q \& \sim r$. The second statement says that it is not the case that both Leo and Fats sing the blues, which could also be expressed $\sim(q \& r)$. Correctly symbolizing statements with parentheses is a straightforward business, but it requires close attention to what's being said. Your best clues to where to insert parentheses come from the words either and neither, conjunction and disjunction words such as and and or, and the punctuation in the sentences. Notice how the sentence clues in the following statements inform how the statements are symbolized: If the next prime minister is from Ontario, then neither the west nor Atlantic Canada will be happy. We can symbolize the statements with the following variables: p —The next prime minister is from Ontario. q —The west will be happy. r —Atlantic Canada will be happy. $p \to \sim(q \lor r)$ And: Either John Oliver is funny, or the show is rigged, or the network has made a bad investment. p —John Oliver is funny. q —The show is rigged. 7 | Deductive Reasoning: Propositional Logic 269 r —The network has made a bad investment. $(p \lor q) \lor r$ Arguments like these that have three variables instead of two may look scary, but they're not. The steps you use to check the validity of a three-variable argument are the same ones you apply in two-variable arguments. You devise a truth table, calculate truth values, and check for true premises with a false conclusion. The truth table, of course, has an additional guide column for the third variable, and there are more rows to accommodate the larger number of possible true–false combinations. In a two-variable table there are four rows; in a three-variable table there are eight rows and thus eight combinations of truth values. Notice how the guide columns are laid out: p q r T T T T T F T F T T F F F T T F T F F F T F F F To remember the truth values in each guide column, think of it this way: the first column is four Ts, then four Fs; the second column is alternating pairs of truth values beginning with T T; and the third column is alternating Ts and Fs starting with T. Now let's test this argument for validity: If the Flames won game one but didn't win game two, then they've only won one game. But it's not true that they won game one but didn't win game two. Therefore, it's not the case that they've only won one game. p —The Flames won game one. q —The Flames won game two. r —The Flames have only won one game. $(p \& \sim q) \to r$ $\sim(p \& \sim q)$ $\therefore \sim r$ "Reason in man is rather like God in the world." —Thomas Aquinas (philosopher and theologian, 1225–74) 270 Part Three | Arguments And here's the truth table for the argument: 1 p 2 q 3 r 4 p & ~q 5 (p & ~q) → r 6 ~(p & ~q) 7 ~r 1 T T T F T F F 2 T T F F T T T 3 T F T T T F F 4 T F F T F F T 5 F T T F T T F 6 F T F F T T T 7 F F T F T T F 8 F F F F T T T This truth table has seven columns, and you can guess why six of them are there. The first three are the guide columns, and the last three are for the two premises and the conclusion. Column 4 is there because it simplifies the assigning of truth values to columns 5, 6, and 7—it is a component of the two premises. If we wanted, we could add more columns for other components such as ~r if the additions would make it easier to create the truth table. The truth values for $(p \& \sim q)$ are, of course, determined by the truth values of its conjuncts. If just one conjunct is false, the conjunction is false (as it is in rows 1, 2, and 5 through 8). Only in rows 3 and 4 is the conjunction true. The truth value of the conditional $(p \& \sim q) \to r$ is based on the truth values of $(p \& \sim q)$ and r, with the conditional being false only when $(p \& \sim q)$ is true and r is false (row 4). In all other rows the conditional is true. The truth value of the premise $\sim(p \& \sim q)$ is the contradictory of the truth value for $(p \& \sim q)$. Likewise, the truth value of ~r is the contradictory of r. Is there any row in which the premises are true and the conclusion false? Yes, that's the situation in rows 1, 5, and 7, so the argument is invalid. Of course, you may have figured that out already, since this argument is an example of denying the antecedent. Streamlined Evaluation With truth tables, you can accurately assess the validity of any propositional argument, even some fairly complicated ones. But as the arguments get more complicated (when they have more than two or three variables, for example), you may want a more efficient technique for calculating validity. Here's a good alternative method—one that just happens to be easier to master if you already know the ins and outs of truth tables. 7 | Deductive Reasoning: Propositional Logic 271 In this approach—which we'll call the short method—we don't bother to produce a whole truth table, but we do try to construct some truth table rows (maybe only one if we're lucky). The basic strategy is based on the same fact we relied on in the truth table test: it's impossible for a valid argument to have true premises and a false conclusion. So we try to discover if there's a way to make the conclusion false and the premises true by assigning various truth values to the argument's components. That is, we try to prove that the argument is invalid. If we can do this, then we'll have the proof we need. Let's try the short method on this argument: $\sim q$ $p \to (q \lor r)$ r $\therefore p$ First we write out the argument so that the premises and conclusion are in a single row: $\sim q$ $p \to (q \lor r)$ r p Now we examine the conclusion. What truth value must we assign to it to ensure that it's false? Obviously, the answer is false—because there is only one variable in the conclusion and the conclusion must be false. So we label p with an F in the conclusion and everywhere else in the argument. Then our row looks like this: $\sim q$ $p \to (q \lor r)$ r F p F Just one caution: as you work through the short method, you must remember that the truth values you mark under the argument row apply to the variables (letters) only, not the premises. To avoid any confusion, if you want you can write the truth values for the premises above the argument row. In this way you can indicate either (1) the premise truth values that you're trying for or (2) the premise truth values that result from your truth value assignments. Review Notes The Short Method: Step by Step 1. Write out the symbolized argument in a single row. 2. Assign truth values to the variables in the conclusion to make the conclusion false. (Write the appropriate Ts or Fs below the row.) Assign these truth values to the same variables elsewhere. 3. Consistently assign truth values to variables in the premises. Assign truth values first to premises where specific truth values are "locked in." 4. Try to make assignments that yield a false conclusion and true premises. If you can, the argument is invalid. If you can't, the argument is valid. 272 Part Three | Arguments In this argument we can also tell right away that r must be true because it is a premise in the argument and we're trying to see if we can make all the premises true (and the conclusion false). Then we have: $\sim q$ $p \to (q \lor r)$ r F T T p F Now we look at the first column because it will be easy to determine its truth value. Since the first premise must be true and it's a negation, q must be false. This fills out the whole argument with truth values: ~q F $p \to (q \lor r)$ r F F T T p F We've shown then that the first and third premises are true. And we can now see that the second premise must also be true: the disjunction $(q \lor r)$ is true because one of the disjuncts is true (r). And the conditional (made up of p and the disjunction) is true because a false antecedent (p) and a true consequent $(q \lor r)$ yield a true conditional. We have thus shown that this argument can have a false conclusion and true premises—the sign of an invalid argument. Now let's try the short method on this argument: $p \to q$ $q \to r$ $\sim r$ $\therefore \sim p$ Again, we write out the argument so that the premises and conclusion are in a single row: $p \to q$ $q \to r$ $\sim r$ $\sim p$ Again, we start with the conclusion. Since the conclusion is a negation (~p), we know that there is only one way that the conclusion could be false—if p is true. We then must make p true everywhere else in the argument: $p \to q$ $q \to r$ $\sim r$ $\sim p$ T T We now turn to the first premise, a simple conditional. The antecedent (p) is true, which means that if the conditional is to be true, its consequent (q) cannot be false (a true antecedent and a false consequent yields a false conditional). So we're forced to assign these truth values: $p \to q$ T T $q \to r$ $\sim r$ $\sim p$ T T 7 | Deductive Reasoning: Propositional Logic 273 Food For Thought Propositional Logic and Essay-Writing Clarity of structure is an important element of any essay. This is especially true for argumentative essays, essays that are designed to convince the reader of some point of view. And believe it or not, a command of the basics of propositional logic can be a big help in this regard. In many cases, argumentative essays have an underlying structure that can be expressed in terms of propositional logic. Recognizing the structure of your own essay and writing it out using the methods explained in this chapter can help you to organize your thoughts and can help to ensure that the argument you are putting forward is a valid (and, you hope, sound) one. For example, imagine an essay that basically argues this: "Canada either has to increase expenditures on international aid or admit to being a second-rate player on the international scene. But we cannot accept such a low status. Therefore, we must increase spending on international aid." You probably recognize that as a simple disjunctive argument, which when translated into symbols would look like this: $p \lor q$ $\sim q$ $\therefore p$ It would be easy to demonstrate using a simple truth table that this is a valid argument. And eventually you may have such an excellent command of logic that you will recognize instinctively that this argument is valid. A short essay putting forward such a disjunctive argument would likely focus on the second premise and explain in some detail why being a second-rate player on the international scene is such a bad thing. It would also have to explain why those are the two key options facing Canada in order to avoid being accused of having put forward a false dilemma! If the dilemma is a false one, then this argument is valid but not sound. An essay might instead have a simple conditional structure. Imagine an argument that says, "If the Iraq war was justified, Iraq would be a prosperous and peaceful place now. But Iraq is not a prosperous and peaceful place now. Therefore, the Iraq war was not justified." $p \to q$ $\sim q$ $\therefore \sim p$ You may well recognize this argument structure as denying the consequent (modus tollens), a valid conditional argument structure. A full essay putting forward this argument about the Iraq war would have to justify in detail the initial conditional claim about the significance of long-lasting peace and prosperity. Is long-term peace and prosperity really essential to establishing a justification for war? If that conditional could be well supported, the argument would be a strong one, since the second premise (which states that Iraq is not a prosperous and peaceful place now) is a simple matter of fact that is widely agreed upon. Continued 274 Part Three | Arguments An essay of any substance is likely to have an underlying logical structure that is somewhat more complex than the two examples above. For example, an essay might have this slightly more complex version of a conditional structure: $p \to (q \lor r \lor s)$ $\sim q$ $\sim r$ $\sim s$ $\therefore \sim p$ An example of an essay with that type of structure might read like this: "If government intervention in that industry is warranted, then it must be either because its product is dangerous, or its ads are dishonest, or its financial reports are incomplete. But its product is not dangerous. And its ads are not dishonest. And its financial reports are not incomplete. Therefore, government intervention is not warranted." In an essay of any length, there would of course be a sub-argument establishing the truth of each of the premises. What is it, for example, that leads us to believe that the industry's products are not dangerous? If the argument for that is a propositional one, we could write it, too, in symbolic form. What is the advantage of writing out the underlying logical structure of your essay's argument? There are at least three advantages. First, if you can write the structure of your argument using the tools of propositional logic, then you thereby reassure yourself that your essay does, in fact, have a logical structure. That is, you reassure yourself that you are putting forward a structured argument rather than just subjecting your reader to a string of loosely connected ideas. Second, once you see the logical structure of your own argument, you can use the tools presented in this chapter to verify that your argument is valid. Finally, if you are able to represent your argument in terms of propositional logic, it is all the more likely that your readers, too, will be able to see that there is an underlying logic to your essay. That leaves just r to deal with. Again, we are forced to assign a truth value to it. Because the premise is a negation and it must be true, r has to be false. But if r is false, the second premise (another simple conditional) must be false (truth values for the premises are shown above the argument row): T F T F $p \to q$ $q \to r$ $\sim r$ $\sim p$ T T T F F T So we see that since there is only one way for the conclusion to be false, we are locked into truth values that prevent us from having all true premises. We simply cannot consistently assign truth values to this argument that will give us a false conclusion and true premises. Therefore, this argument is valid. In using the short method like this, your overall goal is to see if you can prove invalidity in the most efficient way possible. You want to get the job done 7 | Deductive Reasoning: Propositional Logic without a lot of unnecessary steps. The best strategy for doing this is to look for truth value assignments that cannot be any other way given the truth value assignments in the conclusion. That is, focus on premises with assignments that are "locked into" the argument by the truth values you've given the conclusion. Make assignments in those premises first, regardless of which premise you start with. In the foregoing arguments, the conclusions could be made false in only one way, and that made the rest of the work easier. But sometimes a conclusion can be made false in more than one way. In such cases, your strategy should be to try each possibility—each way that the conclusion can be false—until you get what you're after: an argument with true premises and a false conclusion. As soon as you get it, stop. You've proven that the argument form is invalid, and there's no reason to continue making assignments. If you try all the possibilities and still can't prove invalidity, the argument is valid. Let's take a look at one of these multiple-possibility arguments: $p \to q$ $q \lor r$ $\sim q$ $\therefore p \& r$ $p \to q$ $q \lor r$ $\sim q$ $p \& r$ In this argument, the conclusion is a conjunction, and that means it can be made false by any one of these combinations of truth values: F–T, T–F, and F–F. If we make separate rows for each of these possibilities, they look like this: 1 $p \to q$ F $q \lor r$ $\sim q$ T p&r F T 2 $p \to q$ T $q \lor r$ $\sim q$ F p&r T F 3 $p \to q$ F $q \lor r$ $\sim q$ F p&r F F So can we consistently assign truth values to make the premises true and the conclusion false in any of these rows? We can forget about row 2 because in the first premise, q must be true (to avoid making the conditional false). And if q is true, the third premise would be false. Likewise, we must throw out row 3 because q again must be true (to ensure that the disjunction is true). And if q is true, we run into the same problem we have in row 2—the third premise must be false. Row 1, though, works. To make the third premise true, we must make q false. And when we assign a truth value of false to q in the rest of the argument, we make the premises true and the conclusion false. Therefore, the argument is invalid. 275 276 Part Three | Arguments Summary In propositional logic we use symbols to stand for the relationships between statements—that is, to indicate the form of an argument. These relationships are made possible by logical connectives such as conjunction (and), disjunction (or), negation (not), and conditional (If . . . then . . .). Connectives are used in compound statements, each of which is composed of at least two simple statements. A statement is a sentence that can be either true or false. To indicate the possible truth values of statements and arguments, we can construct truth tables, a graphic way of displaying all the truth value possibilities. A conjunction is false if at least one of its statement components (conjuncts) is false. A disjunction is still true even if one of its component statements (disjuncts) is false. A negation is the denial of a statement. The negation of any statement changes the statement's truth value to its contradictory (false to true and true to false). A conditional statement is false in only one situation—when the antecedent is true and the consequent is false. The use of truth tables to determine the validity of an argument is based on the fact that it's impossible for a valid argument to have true premises and a false conclusion. A basic truth table consists of two or more guide columns listing all the truth value possibilities, followed by a column for each premise and the conclusion. We can add other columns to help us determine the truth values of components of the argument. Some arguments are complex when variables and connectives are combined into larger compounds and when the number of variables increases. To prevent confusion, we can use parentheses in symbolized arguments to show how statement or premise components go together. You can check the validity of arguments not only with truth tables but also with the short method. In this procedure we try to discover if there is a way to make the conclusion false and the premises true by assigning various truth values to the argument's components. Exercise 7.7 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. Construct a truth table for each of the statements in Exercise 7.3 on page 261. Answers are provided in Appendix B for 2, 6, and 8. Exercise 7.8 Construct a truth table for each of the following arguments, and show whether the argument is valid or invalid. 7 | Deductive Reasoning: Propositional Logic *1. $p \to q$ p $\therefore q$ 2. $a \& b$ $\therefore b$ 3. $p \lor q$ p $\therefore \sim q$ 4. $a \& b$ $\sim a$ $\therefore b$ 5. $p \to q$ $\sim p$ $\therefore q$ 6. $p \to q$ $q \to r$ $\therefore q$ *7. $p \to q$ $\sim q \& r$ $\therefore r$ 8. $a \lor (b \& c)$ $\sim(b \& c)$ $\therefore a$ 9. $y \to z$ $x \to y$ $\therefore x \to z$ 10. $p \to q$ $\therefore p \to (p \& q)$ 11. $(a \& b) \to (b \to c)$ $(a \& b)$ $\therefore a \& (b \& c)$ 12. $(a \to \sim b) \lor \sim c$ c $\therefore \sim b$ 13. $(p \lor q) \to (p \& q)$ $p \& q$ $\therefore p \lor q$ *14. $p \to q$ $\sim(q \lor r)$ $\therefore \sim p$ 15. $(d \lor e) \to (d \& e)$ $\sim(d \lor e)$ $\therefore \sim(d \& e)$ 16. $(p \to q) \to (p \to r)$ $\sim(p \to q)$ $\sim r$ $\therefore p$ 17. $(d \lor e) \to f$ $f \to (d \& e)$ $\therefore d \to e$ 18. $\sim(d \& e)$ $e \lor f$ $\therefore \sim d \& f$ 19. $a \& \sim b$ $c \lor (a \to b)$ $\therefore a \& c$ 20. $d \lor \sim e$ $f \to e$ $\therefore d \to \sim f$ Exercise 7.9 For each of the following arguments, translate it into symbols, construct a truth table, and determine its validity. 1. If we give kidnappers the money that they demand, then further kidnappings will be encouraged. If we do not give kidnappers the money that they demand, the kidnappers will kill the hostages. We will not give kidnappers the money that they demand. Therefore, the kidnappers will kill the hostages. 2. If there's a trade war between the United States and Mexico, then Canada will be drawn into it. But Canada and Mexico have a long history of 277 278 Part Three | Arguments prosperous trade relations, so Canada will not be drawn into the trade war. So there won't be a trade war between the United States and Mexico. *3. This is either olive oil or canola oil. And it's not olive oil, so it must be canola oil. 4. "Men, it is assumed, act in economic matters only in response to pecuniary compensation or to force. Force in the modern society is largely, although by no means completely, obsolete. So only pecuniary compensation remains of importance." (John Kenneth Galbraith, The New Industrial State) 5. Joanne will go to the concert with Emilio, but only if Heather goes too. But Heather will only go to the concert if it's just her and Emilio. Joanne has stated that she'll only go if neither Emilio nor Heather do, since they're both being so annoying. Therefore, Joanne will go to the concert alone. 6. If I drink too much coffee, I won't sleep well tonight. And if I don't sleep well tonight, I'm not going to do well on tomorrow's test. I'm not going to do well on tomorrow's test! 7. UN peacekeepers will not attack the local militants, provided that the militants behave themselves. The militants will not make trouble if the UN peacekeepers don't attack. Therefore, UN peacekeepers will not attack the local militants, and the militants will not make trouble. 8. "If then, it is agreed that things are either the result of coincidence or for an end, and these cannot be the result of coincidence or spontaneity, it follows that they must be for an end." (Aristotle, Physics) 9. With true adulthood comes true responsibility. Until you are ready for both, you can have neither. I have seen that you are irresponsible, so you will not be treated like an adult. 10. Either there is evidence that crystals have healing powers or there is no such evidence. If there is no such evidence, then we have no reason to believe that crystals can heal the sick. If there is evidence, we do have reason to believe that crystals can heal the sick. There is no such evidence. Therefore, we have no reason to believe that crystals can heal the sick. *11. Either the herbal remedy alleviated the symptoms or the placebo effect alleviated the symptoms. If the placebo effect is responsible for easing the symptoms, then the herbal remedy is worthless. The herbal remedy alleviated the symptoms. So the herbal remedy is not worthless. Exercise 7.10 Use the short method to check the validity of the following arguments in Exercise 7.8: 1, 3, 5, 9, 10, 15, 16, and 18. Write the symbolized argument in one row, and assign truth values to each variable. Then, above the argument row, assign truth values to the premises and conclusion. Answers are provided in Appendix B for 3, 10, and 15. 7 | Deductive Reasoning: Propositional Logic Field Problems 1. Find two deductive arguments on the Internet or in your university newspaper. Go for variety: make sure one is a conditional argument and the other makes use of disjunction. Symbolize the arguments, and determine the validity of each one by using the truth-table method. 2. Find a deductive argument in one of your textbooks (not this one!). Translate it into symbolic form, and create a truth table to test its validity. Then devise a different argument that uses the same argument form as the one you found. 3. Think of a non-competitive activity that you enjoy participating in or watching—for example, cooking or playing solitaire or playing an instrument. Can you think of a "standard" bit of wisdom related to that activity that takes the form of a conditional statement? (For example, "If you're in situation X, you should always do Y.") Write out both valid and invalid arguments that use a conditional statement as their first premise. Self-Assessment Quiz 1. What are the four logical connectives used in this chapter? How is each one symbolized? 2. Construct the truth table for each logical connective. 3. Under what circumstances is a negation true? 4. Under what circumstances is a disjunction false? 5. Which of the following symbolized statements are true and which are false? Assume that a, b, and c are true and p, q, and r are false. $q \to c$ $c \to q$ $a \& \sim q$ $a \lor \sim q$ 6. Put the following statement into symbolic form: "Either I'm seeing things or I just saw Professor MacDonald being interviewed on TV!" 7. Put the following into symbolic form: "You're sure to hit a homerun. I mean, if you keep your eye on the ball." 8. Construct a truth table for each of the following arguments, and indicate whether the argument is valid or invalid. $p \to q$ $p \lor (q \& r)$ $r \to q$ $\sim p$ $\therefore q$ $\therefore q \& r$ 9. Translate this argument into symbols, construct its truth table, and indicate whether the argument is valid. 279 280 Part Three | Arguments If the construction company wants to make more money, it will build the office building too high. If the office building is built too high, it will have a high probability of collapsing. Either the construction company wants to make more money or it wants to go bankrupt. Since no company wants to go bankrupt, the office building will have a high probability of collapsing. 10. Translate this argument into symbols, construct its truth table, and indicate whether the argument is valid. Either Joe will go to the movie or Julia will not go to the movie. If the movie is The Imitation Game, then Julia will go to the movie. So if Joe goes to the movie, the movie is not The Imitation Game. Construct arguments in English for each of the following symbolized arguments. 11. $x \to y$ $y \to z$ $\therefore x \to z$ 12. $a \to b$ $\therefore a \to (a \& b)$ 13. $a \& b$ $\sim a$ $\therefore b$ 14. $(p \lor q) \to \sim(p \& q)$ $p \& q$ $\therefore \sim(p \lor q)$ 15. $p \to q$ $\sim p$ $\therefore q$ Use the short method to check the validity of the following arguments. Write out the argument in a single row, and assign truth values to each variable. 16. $p \to q$ q $\therefore p$ 17. $p \& q$ $q \to r$ $\sim q$ $\therefore \sim r$ 18. $p \to q$ $q \to r$ $\therefore \sim p \to \sim r$ 7 | Deductive Reasoning: Propositional Logic 19. $p \lor (q \& r)$ $\sim p$ $\sim q$ $\therefore r$ 20. $a \lor b$ $b \lor c$ $\therefore (b \& c) \lor (a \& b)$ Integrative Exercises These exercises pertain to material in Chapters 3–7. For each of the following arguments, determine whether it is deductive or inductive, valid or invalid, strong or weak. Then diagram it using the shapes-and-arrows method we learned in Chapter 3. Also state whether the argument contains any appeals to popularity or common practice. 1. "[A]s Prime Minister Justin Trudeau mulls the shortlist of candidates now before him, he has a unique opportunity to make an especially profound contribution to legal history, to the future of Canadian justice and to the relationship between Canada and First Nations. It is time the federal government put an Indigenous jurist on the Supreme Court." (Toronto Star, 23 October 2017) 2. "Encouragement of contempt for laws is more dangerous to society than occasional use of marijuana. Severe laws against marijuana do not discourage use of marijuana, but rather breed this contempt not only for drug laws, but for laws in general. Therefore, severe laws against marijuana are more dangerous to society than the activity which they are designed to prevent." (A. Blakeslee) 3. Homeopathy—the alternative "medicine" that uses infinitesimally small quantities of a substance diluted in water—is entirely bogus. If homeopathy worked, it would violate everything we know about how the human body works. In most cases, the effects people believe they experience can be chalked up to the placebo effect. And finally, scientists who have evaluated the clinical evidence agree that no one has ever proven any homeopathic remedy effective, despite many attempts to do so. 4. It is ridiculous for city council to pass a bylaw that bans smoking in all public places, including bars and private clubs. Many people enjoy smoking cigarettes and cigars, and in many cultures smoking has cultural and religious significance. A bylaw outlawing all forms of smoking is morally and legally unjustifiable. 281 282 Part Three | Arguments For each of the following arguments, name the argument pattern—modus ponens, modus tollens, affirming the consequent, denying the antecedent, or none of these. 5. For you to have failed on the test, you must not have studied sufficiently. And from what you said, your studying was nowhere near adequate. I won't be surprised if it turns out you've failed. 6. Whenever there's an earthquake, houses shake. And we didn't feel our house shake, so there must not have been an earthquake. 7. If there were structures in nature that were so complex that they could not possibly have evolved through natural selection, the theory of evolution must be false. There are such structures, however—like the human eye. Consequently, evolution cannot be the right explanation for the existence of the peculiar life forms found on Earth. Say which of the following symbolized statements are true and which are false. Assume that the statements represented by the variables a, b, and c are true and p, q, and r are false. 8. $b \lor \sim b$ 9. $a \& \sim p$ 10. $p \to a$ 11. $b \to \sim r$ For each of the following arguments, specify the conclusion and premises (including any implied premises). Symbolize the argument, and construct a truth table to determine the validity of the argument. 12. Either Hamlet was written by Shakespeare or Shakespeare simply claimed credit for someone else's work. But if experts say he wrote it, then he wrote it. And almost every top expert agrees that he wrote it. So it is highly unlikely that Shakespeare simply claimed credit for someone else's work. 13. If the solar power industry can increase the efficiency of solar cells significantly, it will become the number one source of energy in the world. But it will never be able to increase efficiency very much. So the solar power industry will not become the primary source of the world's energy. 14. The surgery will be a success if the bullet is extracted and blood loss is controlled. The surgery is a success, and the patient has spoken to the press. So blood loss must have been controlled. 15. The Mona Lisa at the Louvre is either the original painted by Leonardo da Vinci or an extremely good fake. But if experts say it's real, then it's real. The painting's authenticity has been analyzed and verified by countless experts over the years. So it is highly unlikely that the Mona Lisa at the Louvre is a fake. 7 | Deductive Reasoning: Propositional Logic Translate each of the following arguments into categorical syllogistic form (premise, premise, conclusion), symbolize the argument (using the conventional S, P, M variables), and draw a Venn diagram to test its validity. 16. Some Muslims are not Sunni Muslims, for some Muslims are Shiite Muslims and no Shiite Muslims are Sunni Muslims. 17. Professor Bertolini will not deviate from the course outline. He's a legal scholar, and legal scholars never deviate from their course outlines. 18. Some shoes are inexpensive, and all shoes that are expensive are fancy. Therefore, not all shoes are fancy. 19. Some mobile phones are not smartphones, but all iPhones are smartphones. It follows that some mobile phones are not iPhones. 20. Some contagious diseases are diseases caused by the influenza virus, and diseases caused by the influenza virus are always dangerous diseases. So some contagious diseases are dangerous diseases. Writing Assignments 1. Write a 300-word essay that gives a deductive argument for why corporations should stick to profit-seeking rather than take their social responsibilities more seriously. 2. Select an issue from the following list, and write a 500-word paper defending a claim pertaining to the issue. Use one or more deductive arguments to make your case. • Should people simply stop caring so much about privacy in light of all the ways that modern technology makes it easier for our privacy to be invaded? • Should universities ban speeches by speakers who make certain people uncomfortable? • Should Canada increase funding for amateur sports? • Should there be an international court capable of charging entire countries with crimes? 3. Outline the argument in Essay 3 ("Electronics in the Classroom") in Appendix A, indicating the premises and the conclusion. Determine whether the argument is deductive or inductive. Note 1. Annals of Improbable Research, .com/ig/winners. 283 8 Inductive Reasoning Chapter Objectives Enumerative Induction You will be able to • • • • • define enumerative induction and explain how it's used. define target population, sample, and relevant property. understand the two ways in which an enumerative induction can fail to be strong. understand the error known as hasty generalization and know how to avoid it. understand the basics of opinion polls and know the definitions of random sampling, self-selecting sample, margin of error, and confidence level. Statistical Syllogisms You will be able to • explain what a statistical syllogism is. • define individual, group, characteristic, and proportion. • understand three ways in which statistical syllogisms can fail to be strong. Analogical Induction You will be able to • formulate and evaluate an argument by analogy. • use the following criteria to evaluate arguments by analogy: relevant similarities, relevant dissimilarities, the number of instances compared, and diversity among cases. 8 | Inductive Reasoning 285 Causal Arguments You will be able to • • • • • • define causal claims and arguments. apply Mill's methods to the evaluation of causal arguments. recognize the ways in which people can make errors in causal reasoning. recognize and know how to avoid the post hoc fallacy. define necessary and sufficient conditions. distinguish between necessary and sufficient conditions in everyday contexts. Mixed Arguments You will be able to • explain what a mixed argument is and what its key components are. • evaluate a mixed argument. W e now pass from an exploration of deductive arguments to a close examination of inductive ones—a relatively small step, since both these argument types are common features of our everyday lives. Recall that a deductive argument is intended to provide logically conclusive support for its conclusion; such an argument is either valid or invalid, sound or unsound. An inductive argument, on the other hand, is intended to supply only probable support for its conclusion, earning the label of "strong" if it succeeds in providing such support and "weak" if it fails. The conclusion of an inductively strong argument is simply more likely to be true than not. If the argument's premises are true, the argument is said to be cogent. Unlike valid deductive arguments, an inductively strong argument can never guarantee that the conclusion is true—but it can render the conclusion probably true, even highly likely to be true. Inductive arguments, then, cannot give us certainty, but they can give us high levels of probability—high enough at least to help us make useful discoveries in everything from physics to birdwatching. Deductive logic is the invisible framework on which much of our reasoning hangs and is the solid bond that holds together the logical frameworks of mathematics, computer science, and other theoretical or abstract disciplines. Inductive reasoning, though, gives us most of what we know about the empirical workings of the world, allowing us—in science and in everyday life—to soar reliably from what we know to what we don't. It allows us to reason "beyond the evidence," from bits of what is already known to conclusions about what those bits suggest is probably true. Inductive arguments come in several forms. In this chapter, we will examine four of these forms, and, as in previous chapters, we will focus on how to evaluate their merits in real-life contexts. "The rules of probable inference are the most difficult part of logic, but also the most useful." —Bertrand Russell 286 Part Three | Arguments Enumerative Induction As you may have noticed in Chapter 3, sometimes an inductive argument reasons from premises about a group, or class, of things to a conclusion about a single member of the group (that is, from general to particular). For example: Almost all of the students majoring in business want to be entrepreneurs. Wei-en is majoring in business. Therefore, Wei-en probably wants to be an entrepreneur. More than three quarters of residents in this neighbourhood buy Girl Guide cookies. Sam is a resident of this neighbourhood. Therefore, Sam will probably buy Girl Guide cookies. enumerative induction An inductive argument pattern in which we reason from premises about individual members of a group to conclusions about the group as a whole. Far more inductive arguments, however, reason from premises about individual members of a group to conclusions about the group as a whole (from particular to general). In such cases we begin with observations about some members of the group and end with a generalization about all of them. This argument pattern is called enumerative induction, and it's a way of reasoning that we all find both natural and useful. Most peace activists I know are kind-hearted. So probably all peace activists are kind-hearted. Every Xphon smartphone I've bought in the last five years has had a faulty screen. Therefore, all Xphon smartphones probably have faulty screens. Forty per cent of the pickles that you've sampled from the barrel are rotten. So 40 per cent of all the pickles in the barrel are probably rotten. More formally, enumerative induction has this form: X per cent of the observed members of group A have property P. Therefore, X per cent of all members of group A probably have property P. Translated into this format, our pickle argument looks like this: target group (target population) In enumerative induction, the whole collection of individuals under study. Forty per cent of the observed pickles from the barrel are rotten. Therefore, 40 per cent of all the pickles in the barrel are probably rotten. Enumerative induction comes with some useful terminology. The group as a whole—the whole collection of individuals in question—is called the target population or target group. The observed members of the target group are 8 | Inductive Reasoning called the sample members or sample. And the property we're interested in is called the relevant property or property in question. In the foregoing example, the target group is the pickles in the barrel, the sample is the observed pickles, and the property is the quality of being rotten. Now, using this terminology we can study arguments by enumeration a little closer. Remember that an inductive argument cannot only be strong or weak; it can also vary in its strength—in the degree of support that the premises give to the conclusion. So the strength of the argument depends on the premises as well as on how much is claimed in the conclusion. Let's look at some examples. Argument 1 All the corporate executives Jacques has worked for have been corrupt. Therefore, all corporate executives are probably corrupt. The target group is corporate executives: that's who the conclusion is about. The sample is the corporate executives Jacques has worked for (they are the examples he looked at). And the relevant property—the characteristic he's interested in—is being corrupt. We don't know how many corporate executives Jacques has worked for, but we must assume from what we know about employment patterns in corporate Canada that the number is small, probably no more than a dozen. Neither do we know exactly how many corporate executives there are, but we can safely guess that there are thousands or tens of thousands. It should be obvious, then, that this enumerative inductive falls short on at least one score: the sample is just too small. We simply cannot draw reliable conclusions about all corporate executives on the basis of a mere handful of them. The argument is therefore pretty weak. With such a small sample of the target group, we can't even conclude that most corporate executives are corrupt. But we can make argument 1 strong by revising the conclusion to read, "Some corporate executives are probably corrupt." This is a much more limited generalization that requires a more limited supporting premise. We can fault this argument on another count: the sample is not representative of the target group. With thousands of corporate executives working for thousands of corporations, we must assume that corporate executives—in temperament, morality, demographics, and many other factors—are a diverse lot. It is therefore highly unlikely that Jacques's former bosses are representative of all corporate executives in their corruptness (the relevant property). Consider also that it is highly likely that most of Jacques's work experience has been within just one or two industries, and even if there are a lot of corrupt executives in those industries, those industries might not be representative of the Canadian business world more generally. And if the sample is not representative of the whole, we cannot use it to draw accurate conclusions about the whole. Argument 1 is weak for that additional reason. 287 sample (sample member) In enumerative induction, the observed members of the target group. relevant property (property in question) In enumerative induction, a property, or characteristic, that is of interest in the target group. 288 Part Three | Arguments Consider this one: Argument 2 Almost all of the blue herons that we've examined at many different sites in the nature preserve (about 200 birds) have had birth defects. Therefore, most of the blue herons in the nature preserve probably have birth defects. "The deductive method is the mode of using knowledge, and the inductive method the mode of acquiring it." —Henry Mayhew In this argument, the target group is the blue herons in the nature preserve, the sample is the 200 blue herons examined, and the relevant property is having birth defects. We would normally consider this a very strong enumerative induction. Assuming that the premise is true—that almost all of the 200 birds really did have birth defects—we would probably be surprised to discover that only a tiny minority of the target group as a whole had birth defects. Since the sample was drawn from many parts of the preserve, we would consider it representative of the target group. And because of the general uniformity of characteristics among birds in the wild, we would assume that a sample of 200 birds would be large enough to strongly support the conclusion. As it stands, argument 2 is strong. On the other hand, a conclusion asserting that literally all of the target group had birth defects would normally go beyond what the evidence in the premise would support. There could easily be at least some blue herons in the preserve (assuming it were large enough) that don't have birth defects, even if most do. So you can see that an enumerative inductive argument can fail to be strong in two major ways: its sample can be (1) too small or (2) not representative. Of course, it's possible for an enumerative induction to be perfectly strong but to have false premises, in which case the argument isn't cogent. That is, the data (or evidence) stated in the premises could have been misinterpreted, misstated, or simply mistaken. Sample Size hasty generalization The fallacy of drawing a conclusion about a target group on the basis of a sample that is too small. Let's say that you decide to conduct a survey of university students to determine their attitude toward premarital sex. So you stand around in the student centre and query the first five students who pass by. Four out of the five say that premarital sex is immoral. You conclude that 80 per cent (four-fifths) of the student body are against premarital sex. Should you send your findings to the school newspaper—or maybe even to the CBC? No way. This survey is a joke—the sample is much too small to yield any reliable information about the attitudes of the students as a whole. That verdict may seem obvious, but just about everyone at one time or another probably makes this kind of mistake, which is known as hasty generalization. We're guilty of hasty generalization whenever we draw a conclusion about a target group on the basis of a sample that is too small. People regularly make this mistake when dealing with all sorts of enumerative inductive evidence—political polls, consumer opinion 8 | Inductive Reasoning 289 surveys, scientific studies (especially medical research), qualitycontrol checks, anecdotal reports, and many others. In our everyday experience, we may casually make, hear, or read hasty generalizations like these: You're looking for a pet? Don't get a Jack Russell Terrier! My aunt had one, and it tore up her couch. One of the city counsellors in my town was arrested and charged with fraud. I guess politicians really are all just crooks. Engineers are incredibly ignorant about current events. Believe me, I know what I'm talking about. My best friend is an engineering major. What an ignorant dude! Americans are snobby and rude. Remember those two arrogant guys with really bad manners at the party? They're American. I rest my case. The food at Pappie's Restaurant is awful. I had a sandwich there once, and the bread was stale. In general, the larger the sample, the more likely it is to reliably reflect the nature of the larger group. In many cases, our common sense tells us when a sample is or is not large enough to draw reliable conclusions about a particular target group. A good rule of thumb is this: the more homogeneous a target group is in traits relevant to the property in question, the smaller the sample can be while still being reliable; the less homogeneous, the larger the sample should be. For example, if we want to determine whether cottontail rabbits have teeth, we need to survey only a tiny handful of cottontail rabbits (maybe even just one) because cottontail rabbits are fairly uniform in their physical characteristics. In this sense, if you've seen one cottontail rabbit, you've seen them all: generally, all members of an animal species are very similar with regard to significant bits of anatomy. On the other hand, if we want to know the music preferences of South Asian Canadians who live in suburbs, surveying just a few won't do. Questioning a sample of 2 or 20 or even 200 suburban South Asian Canadians will not give us a reliable read on the music preferences of the target group. In social, psychological, and cultural properties, people are too diverse to judge a large target group by just a few of its members. In biological properties, however, homo sapiens is relatively uniform. We would need to survey only one normal member of the species to find out if humans have ears. Representativeness In addition to being big enough, a sample must be a representative sample—it must resemble the target group in all the ways that matter. If it does not properly represent the target group, it's a biased sample. An enumerative inductive argument is strong only if the sample is representative of the whole. representative sample In enumerative induction, a sample that resembles the target group in all relevant ways. biased sample A sample that does not properly represent the target group. Part Three | Arguments Many arguments using unrepresentative samples are ludicrous; others are more subtle: University students are glad that the Liberal Party is in power in Ottawa. Surveys of the members of the Young Liberals club on several university campuses prove this. Most nurses in this hospital are burned out, stressed out, and overworked. My brother is a nurse who works in the emergency department. He'll tell you his co-workers are absolutely miserable. No one is happy. Almost everyone is complaining about something. Just look at the letters to the editor in any big-city newspaper. Complaints, complaints, complaints! To be truly representative, the sample must be like the target group by (1) having all the same relevant characteristics and (2) having them in the same proportions that the target group does. The "relevant characteristics" are features that could influence the property in question. For example, let's say that you want to survey adult residents of Winnipeg to determine whether they favour distributing condoms in high schools. Features of the residents that could influence whether they favour condom distribution include political party affiliation, ethnic background, and religion. So the sample of residents should have all of these features and have them in the same proportions as the target group (residents of Winnipeg). If half the adult residents of Winnipeg are Catholic, for example, then half the sample should consist of residents who are Catholic. Say that we want to determine how the 10,000 eligible voters in a small town intend to vote in an upcoming federal election. We survey 1000 of them, which should be more than enough for our purposes. But the voters we poll are almost all over 70 years old and live in nursing homes. (Perhaps we surveyed people in nursing homes just because that's an easy place to find people willing to answer our questions.) Our sample is biased because it does not reflect the makeup of the target group, most of whom are people under 45 who live in their own homes, work in factories or offices, and have school-age children. Any enumerative argument based on this survey would be weak. Brilliant Mind of Edison Lee © 2013 John Hambrock, Distributed King Features Syndicate, Inc. 290 Inductive arguments often work by bringing many individual pieces of evidence to bear in order to support a conclusion. Of course, the source of all that evidence matters a lot. How does a representative sample improve a finding or argument? 8 | Inductive Reasoning We are often guilty of biased sampling in everyday situations. One way this happens is through a phenomenon called selective attention (see Chapter 2)—that is, the tendency to observe and remember things that reinforce our beliefs and to gloss over and dismiss things that undercut those beliefs. We may tell our friends that The Walking Dead is a lousy TV series because we remember that three episodes were boring—but we conveniently forget the four other episodes that we thought were amazing. Or we may be convinced that Dr Jones is one of the legendary "absent-minded professors." But this generalization seems plausible to us only because we're on the lookout for instances in which the professor's behaviour seems to fit the stereotype and we don't notice instances that contradict the stereotype. 291 "You have to remember one thing about the will of the people: it wasn't that long ago that we were swept away by the Macarena." —Jon Stewart Opinion Polls Enumerative inductions reach a high level of sophistication in the form of opinion polls conducted by professional polling organizations. Opinion polls are used to arrive at generalizations about everything from the outcome of federal elections to public sentiments about immigration reform to the consumer's appetite for tacos. But as complex as they are, opinion polls are still essentially inductive arguments (or the basis of inductive arguments) and must be judged accordingly. So as inductive arguments, opinion polls should be conducted so that they (1) are strong and (2) have true premises. More precisely, any opinion poll worth believing must (1) use a sample that is large enough to represent the target population accurately in all the relevant population features and (2) generate accurate data (that is, the results must correctly reflect what they purport to be about). A poll can fail to meet this latter requirement through data-processing errors, botched polling interviews, poorly phrased questions, and the like. (See the Food for Thought box "How Survey Questions Go Wrong", on page 292.) In national polling, samples need not be enormous to be accurate reflections of the larger target population. Modern sampling procedures used in national polls can produce representative samples that are surprisingly small. Polling organizations such as Environics and Ipsos Reid regularly conduct polls in which the target group is Canadian adults (more than 25 million), and the representative sample consists of only 1000 to 1500 individuals. How can a sample of 1000 be representative of more than 25 million people? By using random sampling. To ensure that a sample is truly representative of the target group, the sample must be selected randomly from the target group. In a simple random selection, every member of the target group has an equal chance of being selected for the sample. Imagine that you want to select a representative sample from, say, 1000 people at a football game and you know very little about the characteristics of this target population. Your best bet for getting a representative sample of this group is to choose the sample members at random. Any non-random selection, based on preconceived notions about what characteristics are representative, will likely result in a biased sample. random sample A sample that is selected randomly from a target group in such a way as to ensure that the sample is representative. In a simple random selection, every member of the target group has an equal chance of being selected for the sample. 292 Part Three | Arguments Food For Thought How Survey Questions Go Wrong Many opinion polls are untrustworthy because of flaws in the way the questions are asked. The sample may be large enough and representative in all the right ways, but overall the poll is still dubious. Here are a few of the most common problems. Phrasing of Questions Poll results can be dramatically skewed simply by the way the questions are worded. A poll might ask, for example, "Are you in favour of Quebec tearing Canada in half by separating?" The question is apparently about Quebec's sovereignty. But the wording of the question practically guarantees that a very large percentage of respondents will answer "no." The politically and emotionally charged characterization of separation as "tearing Canada in half" would likely persuade many respondents to avoid answering "yes." More neutral wording of the question would probably elicit a very different set of responses. Biased wording is often the result of simple sloppiness on the part of pollsters. But other times it's a deliberate attempt to manipulate the poll results. The crucial test of polling questions is whether they're likely to bias responses in one direction or another. Fair questions aren't skewed this way—or are skewed as little as possible. Order of Questions The order in which questions are asked in a poll can also affect the poll results. Pollsters know that if the economy is in bad shape and they ask people about the economic mess first and then ask them how they like the prime minister, the respondents are likely to give the prime minister lower marks than if the order of the questions were reversed. Likewise, if you're asked specific questions about crimes that have been committed in your hometown, then you're asked if you feel safe from crime, you're more likely to say no than if you're asked the questions in reverse order. Restricted Choices Opinion polls frequently condense broad spectrums of opinions on issues into a few convenient choices. Some of this simplification is necessary to make the polling process manageable. But some of it is both unnecessary and manipulative and therefore seriously distorts the opinions of those polled. Daniel Goleman of the New York Times offers this example: "In one survey . . . people were asked if they felt 'the courts deal too harshly or not harshly enough with criminals.' When offered just the two options, 6 per cent said 'too harshly' and 78 per cent answered 'not harshly enough.' But when a third alternative was added— 'don't have enough information about the courts to say'—29 per cent took that option, and 60 per cent answered 'not harshly enough.'" Selecting a sample in truly random fashion is easier said than done; humans have a difficult time selecting anything in a genuinely random way. Even a simple process, such as trying to pick names arbitrarily off a list of registered voters, is not likely to be truly random. Your choices may be skewed, 8 | Inductive Reasoning 293 for example, by unconscious preferences for certain names or by boredom and fatigue. Researchers and pollsters use various techniques to help them get close to true randomization. They may, for instance, assign a number to each member of a population, then use a random-number generator to make the selections. One approach that definitely does not yield a random sample is allowing survey subjects to choose themselves. The result of this process is called a self selecting sample—a type of sample that usually tells you very little about the target population. We would get a self-selecting sample if we published a questionnaire in a magazine and asked readers to fill it out and mail it in or if during a TV or radio news broadcast, we asked people to cast their vote on a particular issue by clicking options on a website or emailing their responses. In such cases, the sample is likely to be biased in favour of subjects who, for example, just happen to be especially opinionated or passionate, who may have strong views about the topic of the survey and are eager to spout off, or who may simply like to fill out questionnaires. Magazines, newspapers, talk shows, and news programs sometimes acknowledge the use of self-selecting samples by labelling the survey in question as "unscientific." But whether or not that term is used, the media frequently tout the results of such distorted surveys as though the numbers actually proved something. Food For Thought Mean, Median, and Mode If you read enough opinion polls, you will surely encounter one of these terms: mean, median, or mode. These concepts are invaluable in expressing statistical facts, but they can be confusing. A mean is simply an average. The mean of these four numbers—6, 7, 4, and 3—is 5 (6 + 7 + 4 + 3 = 20 divided by 4 = 5). The median is the middle point of a series of values, meaning that half the values are above the point and half the values are below the point. The median of these 11 values—3, 5, 7, 13, 14, 17, 21, 23, 24, 27, 30—is 17 (the number in the middle). The mode is the most common value. The mode in this series of values—7, 13, 13, 13, 14, 17, 21, 21, 27, 30, 30—is 13 (the most frequently appearing value). The notions of mean, median, and mode are often manipulated to mislead people. For example, let's say that the dictator of Little Island Nation (population 10,433) proposes a big tax cut for everyone, declaring that the mean tax savings will be $5000 (the total tax cut divided by 1000 taxpayers). The Islanders begin to gleefully envision how they will spend their $5000. But then they learn that the mean figure has been skewed higher because of a few millionaires whose tax savings will be $100,000 or more. The tax savings for the vast majority of taxpayers is actually less than $500. The $5000 figure that the dictator tossed out is the true mean, but it is painfully misleading. To the Islanders, what is much more revealing is the median tax savings, which is just $400. The mode, the most common figure, is $300. When they get all the facts, the Islanders stage a revolt—the first one in history caused by a better understanding of statistics. Graham Harrop/Cartoon Stock 294 Part Three | Arguments So a well-conducted poll using a random sample of 1000 to 1500 people can reliably reflect the opinions of the whole adult population. Even so, if a second well-conducted poll is done in exactly the same way, the results will not be identical to that of the first poll. The reason is that every instance of sampling is only an approximation of the results that you would get if you "It is the mark of a truly intelligent person to be polled every single individual in a target group. And, by chance, each attempt moved by statistics." at sampling will yield slightly different results. If you dipped a bucket into a —George Bernard Shaw pond to get a one litre sample of water, each bucketful would be slightly different in its biological and chemical content—even if the pond's content was margin of error very uniform. The variation between the Such differences are referred to as the margin of error for a particular samvalues derived from a sample pling or poll. Competently executed opinion polls will state their results along and the true values of the with a margin of error. A poll, for example, might say that Candidate X will rewhole target group. ceive 62 per cent of the popular vote, plus or minus 3 percentage points (a common margin of error for polls). The usual way of expressing this number is 62 per cent ±3. This means that the percentage of people in the target population who will confidence level likely vote for Candidate X is between 59 and 65 per cent. In statistical theory, the probability that the sample Connected to the concept of margin of error is the notion of confidence level. will accurately represent In statistical theory, the confidence level is the probability that the sample will acthe target group within the curately represent the target group within the margin of error. A confidence level margin of error. of 95 per cent (the usual value) means that there is a 95 per cent chance that the results from polling the sample (taking into account the margin of error) will accurately reflect the results that we would get if we polled the entire target population. So if our aforementioned poll has a 95 per cent confidence level, we know that there's a 95 per cent chance that the sampling results of 62 per cent ±3 points will accurately reflect the situation in the whole target group. Of course, this confidence level also means that there's a 5 per cent chance that the poll results will not be accurate. Note that "confidence level" refers only to sampling error—that is, the probability that the sample does not accurately reflect the true values in the target population. It doesn't tell you anything about any other kinds of polling errors, such as bias, that can occur because of poorly worded questions or researchers who may consciously or unconsciously influence the kind of answers received. Sample size, margin of error, and confidence A census is essentially a demographic poll of an entire population. How can question quality affect poll results? level are all related in interesting ways. 8 | Inductive Reasoning 295 Food for Thought Polling the Clueless Sometimes polls end up surveying not the views of people with genuine opinions but what has been called "non-attitudes." This happens when respondents answer polling questions even though they have no real opinion on the subject or no idea what the questions are really about. Presumably, people (being people) would rather give a bogus answer than admit that they are clueless. In one landmark poll conducted in the United States many years ago, respondents were asked, "Some people say that the 1975 Public Affairs Act should be repealed. Do you agree or disagree with this idea?" One-third of those polled offered their opinion on the issue. Trouble was, the Public Affairs Act did not exist. The pollsters made it up. • Up to a point, the larger the sample, the smaller the margin of error because the larger the sample, the more representative it is likely to be. Generally, for national polls, a sample size of 600 yields a margin of error of 4 per cent; a sample of 1000, 3 per cent; and a sample of 1500, 2.5 per cent. But enlarging the sample substantially, to well beyond 1500, does not substantially decrease the margin of error. Enlarging the sample from 1500 to 10,000, for example, pushes the margin of error down to only 1 per cent. • The lower the confidence level, the smaller the sample size can be. If you're willing to have less confidence in your polling results, a smaller sample will do. If you can accept a confidence level of only 90 per cent (meaning there is a 10 per cent chance of getting inaccurate results), you don't need a sample size of 1500 to poll the adult population of an entire country. • The larger the margin of error, the higher the confidence level can be. With a large margin of error (20 per cent, for example), you will naturally have more confidence that your survey results will fall within this wide range. This idea is the statistical equivalent of a point made earlier: you can have more confidence in your enumerative inductive argument if you qualify, or decrease the precision of, the conclusion. • Here's a table showing roughly the relationship between sample size and margin of error for large populations (assuming a 95 per cent confidence level): Survey Sample Size Margin of Error 10,000 1.0% 2000 2.0% 1500 2.5% 1000 3.0% 500 4.5% 100 10.0% 296 Part Three | Arguments Review Notes Enumerative Induction • • • • • • • • Target group: The class of individuals about which an inductive generalization is made. Sample: The observed members of a target group. Relevant property: The property under study in a target group. Hasty generalization: The drawing of a conclusion about a target group on the basis of a sample that's too small. Biased sample: A sample that is not representative of its target group. Simple random sampling: The selecting of a sample to ensure that each member of the target group has an equal chance of being chosen. Margin of error: The variation between the values derived from a sample and the true values of the whole target group. Confidence level: The probability that the sample will accurately represent the target group within the margin of error. "There are two ways of lying. One, not telling the truth and the other, making up statistics." —Josefina Vazquez Mota To sum up, an enumerative induction, like any other inductive argument, must be strong and have true premises for us to be justified in accepting the conclusion. A strong enumerative induction must be based on a sample that is both large enough and representative. An opinion poll, as a sophisticated enumerative induction, must use a sufficiently large and representative sample and ensure that the data gathered reflect accurately what's being measured. Exercise 8.1 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. For each of the following enumerative inductions, (1) identify the target group, sample, and relevant property; (2) indicate whether the argument is strong or weak; and (3) if it's weak, say whether the problem is a sample that's too small, not representative, or both. Assume that the information provided in the premises of each argument is true. *1. A random, nationwide poll of several thousand readers of Horse & Harness magazine shows that 80 per cent of readers are against raising horses for their meat. Thus, most Canadian adults think Canada should ban the consumption of horsemeat. 2. Most people agree that injecting hormones into livestock to make them grow faster is a bad idea. A national newspaper recently went to PETA Canada's office and interviewed many of its members. They all stated that injecting hormones into livestock is painful for the animal and potentially a health hazard for the people that consume them. 8 | Inductive Reasoning 3. Most people agree that injecting hormones into livestock to make them grow faster is a fine idea. A national newspaper recently went to an agricultural fair and interviewed many of the exhibitors there. They all stated that injecting hormones into livestock is harmless to the animal and improves the efficiency of the food-production system. *4. For as long as records have been kept, Vancouver has received over 150 millimetres of rain in the month of December alone. Therefore, Vancouver is likely to get at least that much this December too. 5. Over two-thirds of the adults in Toronto say they are in favour of banning the construction of new oil pipelines. And almost 70 per cent of Montrealers are, too. This makes it perfectly clear that a large majority of people in this country are in favour of banning the construction of new oil pipelines. 6. I asked several of my university professors about free speech on campus, and all of them said that it's very important. Clearly, anyone with a decent intellect will agree that protecting freedom of speech on campus is essential. 7. Most newspaper reports of deaths involve either homicide or car crashes. Therefore, homicide and car crashes must be the leading causes of death. *8. Eighty-five per cent of dentists who suggest that their patients chew gum recommend Brand X gum. Therefore, 85 per cent of dentists recommend Brand X gum. 9. Two hundred samples of water taken from many sites all along Lake Ontario show unsafe concentrations of toxic chemicals. Obviously, the water in Lake Ontario is unsafe. 10. Clearly, there is an epidemic of child abductions in this country. In the past year alone, major network news organizations have reported five separate cases of children who were abducted by strangers. 11. The cloud is definitely not a secure way to store your data. Case in point: the iCloud was hacked in 2014, and many private photos of famous celebrities were leaked to the public. A few other cloud servers have also occasionally reported security issues that allowed unauthorized access to their stored data. *12. Most Canadians are happy with their jobs and derive a great deal of satisfaction from them. A survey of 1500 adults with an annual income of $48,000 to $60,000, employed in various occupations, supports this assertion. When these subjects were asked if they were happy and satisfied with their jobs, 82 per cent said yes. Exercise 8.2 For each of the enumerative inductions in Exercise 8.1, indicate whether the argument is strong or weak. If it's strong, explain how the sample could be modified to make the argument weak. If it's weak, explain how the sample could be modified to make the argument strong. Keep the modifications as realistic as possible. Answers are supplied in Appendix B for 1, 4, 8, and 12. 297 298 Part Three | Arguments Exercise 8.3 For each of the following opinion polls, (1) determine whether the poll results offer strong support for the pollster's conclusion, and if they don't, (2) specify the source of the problem (sample too small, unrepresentative sample, or non-random sampling). Assume that the conducting of each survey is free of technical errors, such as mistakes in data processing or improper polling interviews. *1. Lisa carried out a survey to determine if Canadians are willing to support the arts by contributing money directly to local theatre groups. One night she and her assistants interview 200 people who are attending an exhibition of sculpture at the city's biggest art gallery. To help ensure random selection, they purposely select every third patron they encounter for interviewing. There is only one interview question: "Are you willing to support the arts by giving money to local theatre groups?" Seventy-six per cent of the interviewees answer yes. Lisa later reports that a majority of Canadians are willing to support the arts by giving money to local theatre groups. 2. A national polling organization surveys 1500 nurses chosen randomly from a national registry of this profession. The survey question is whether nurses are paid well enough for the difficult work they do. Ninety-four per cent of those surveyed say no. The pollsters conclude that there is a serious problem with how health care is funded in this country because most nurses are underpaid. 3. The local police department wants to find out how prevalent bullying is within the schools in their town. They visit a number of classrooms and engage students in a group discussion about the topic. When asked, no children raised their hands to indicate that they had been bullied. Using this information, the police department concluded that bullying is not a big problem in the community. 4. The Winnipeg Free Press website invites visitors to "speak out" by participating in "Today's Poll." One day, the question is

“Should Canada be willing to negotiate with terrorists, as one Liberal MP has suggested?” That day, 3201 people visit the website and give their answers. Of those, 2204 answer “no.” I therefore conclude that 69 per cent of Winnipeggers oppose the idea of Canada negotiating with terrorists. 5. As part of the #MeToo movement, a national women’s magazine publishes a questionnaire on sexual harassment in the workplace. Respondents are asked to complete the questionnaire and mail it in to the magazine. The magazine receives over 20,000 completed questionnaires in the mail. Sixtytwo per cent of the respondents say that they’ve been sexually harassed at work. The magazine reports that most women have been sexually harassed at work. 8 | Inductive Reasoning Exercise 8.4 For each of the following arguments, state which conclusions from the accompanying list would be strongly supported by the premise given. Assume that all premises are true. *1. Five out of six vegetarians admit that they don’t really like tofu. a. Eighty-three per cent of vegetarians don’t really like tofu. b. Most vegetarians don’t like tofu. c. Most vegetarians and vegans don’t like tofu. d. Vegetarians actually hate tofu. 2. By listening to music, four out of nine (44.4 per cent) arthritis patients at the John Bruce Clinic experienced a decrease in pain in their knee and finger joints. a. By listening to music, 44.4 per cent of arthritis patients can experience a decrease in pain in their knee and finger joints. b. By listening to music, some arthritis patients can experience a decrease in pain in their knee and finger joints. c. By listening to music, some arthritis patients at the John Bruce Clinic can experience a decrease in pain in their knee and finger joints. d. Music is good for reducing pain. 3. Approximately 68 per cent of the 124 university students who responded to a questionnaire published in the campus newspaper are opposed to the federal government’s support for oil pipeline construction. a. Sixty-eight per cent of the readers of the campus newspaper are opposed to the federal government’s support for pipeline construction. b. Sixty-eight per cent of the students attending this school are opposed to the federal government’s energy policies. c. Some students attending this school are opposed to the federal government’s support for pipeline construction. d. Most readers of the campus newspaper are opposed to the federal government’s support for pipeline construction. e. Some students don’t understand why pipeline construction is environmentally dangerous. 4. Nayaab told me that most of her friends—all visible minorities—have been selected (supposedly “randomly”) for extra searches while going through security at Canadian airports. a. Visible minorities are being singled out for additional scrutiny at Canadian airports. b. Visible minorities are always singled out for additional scrutiny at Canadian airports. c. Some visible minorities are being singled out for additional scrutiny at Canadian airports. d. Some Canada Border Services agents are racist. e. The Canada Border Services Agency is racist. 299 300 Part Three | Arguments 5. Seventy-seven per cent of adults interviewed in three Edmonton shopping malls (650 people) say they will vote Conservative in the next federal election. a. Most people will vote Conservative in the next federal election. b. Seventy-seven per cent of adult residents of Edmonton will vote Conservative in the next federal election. c. Many people in Edmonton will vote Conservative in the next federal election. d. A substantial percentage of people who shop at malls in Edmonton will vote Conservative in the next federal election. Exercise 8.5 The following statements suggest modifications to each of the opinion polls in Exercise 8.3. In each case, determine whether the modification (and any associated change in poll results) would make the pollster’s conclusion more likely to be true or not more likely to be true. *1. Lisa supplements her research by conducting phone interviews of a random sample of 700 adult residents of her city (population 2 million), asking a slightly modified question: “Are you willing to support the arts by giving money to local theatre groups?” She conducts a similar poll in another large Canadian city. In both polls, at least 65 per cent of respondents say yes. 2. The national polling organization surveys 1500 health professionals (physicians, nurses, pharmacists, and others) randomly from various national registries. Ninety-five per cent of the respondents say that nurses are underpaid. 3. The police officers visiting the schools interviewed a large number of children privately, with parents’ permission, and assured the kids that whatever they said would be kept confidential. Only a tiny proportion of students— fewer than 2 per cent—said they had experienced bullying. 4. Seven thousand people visit the website on the day that the poll is taken (instead of 3201), and of those, 6000 answer “no” to the question (instead of 2204). 5. The magazine receives over 25,000 completed questionnaires in the mail (instead of 20,000). Fifty-five per cent of the respondents say that they’ve been sexually harassed at work. Statistical Syllogisms Very often we have incomplete, but reasonably reliable, information about a group or category of things, and on the basis of that knowledge, we can reach conclusions about particular members of that group or category. Will it be cold in Winnipeg on 12 January of next year? We don’t know for sure, but we know that most January days in Winnipeg are cold, so we can reason inductively to a pretty firm conclusion. 8 | Inductive Reasoning Will my flight from Halifax to Vancouver get there safely? Well, virtually all commercial air flights in Canada—hundreds of them every day—land perfectly safely. So we can assert pretty confidently that, yes, your flight will get to Vancouver just fine. Is that conclusion a deductive certainty? No, but it’s still very, very reliable. In Chapter 6, we dealt with categorical syllogisms, which were deductive arguments consisting of three elements: two categorical premises and a categorical conclusion. But there are also statistical syllogisms, which are inductive arguments that apply a statistical generalization—a claim about what is true of most members of a group or category—to a specific member of that group or category. Here are a few examples: Argument 1 Premise 1: Nearly 85 per cent of Canadians live in cities. Premise 2: You’re a Canadian. Conclusion: So you live in a city. Argument 2 Premise 1: Most professional basketball players are well over six feet tall. Premise 2: Paul plays for the Raptors. Conclusion: Paul is over six feet tall. Argument 3 Premise 1: Almost all countries in Africa are very poor. Premise 2: Zimbabwe is in Africa Conclusion: Zimbabwe is very poor. Here is the pattern that all statistical syllogisms follow, when spelled out fully: Premise 1: A proportion X of the group M has characteristic P. Premise 2: Individual S is member of group M. Conclusion: Individual S has characteristic P. It is important, in analyzing a statistical syllogism, to be able to identify: • • • • The individual being examined. The group to which that individual is said to belong. The characteristic being attributed. The proportion of the group said to have that characteristic. Sometimes the proportion will take the form of an actual statistic—that’s where the term statistical syllogism comes from. It might be stated as a percentage (as in argument 1, above) or it could also be a fraction (such as 9/10). Sometimes specific numbers aren’t available, and an arguer will use a word like “most” or “almost all” or “most of the time.” The point is that the first premise is a generalization—a statement (usually rooted in some evidence) about the members of a group or class. (In fact, very often the first premise of a statistical syllogism will be arrived at by—that is, it will be the conclusion of—an argument using enumerative induction. We’ll return to this point shortly.) 301 302 Part Three | Arguments Because they are a type of inductive argument, statistical syllogisms—even good ones, with acceptable premises—cannot guarantee their conclusions. So sometimes they can lead us astray. For example, imagine you’re in southern Ontario and a friend points out a scary-looking spider in a woodpile. “It’s OK,” you say. “Spiders in Canada are generally harmless. So I’m sure it can’t hurt you.” That’s a statistical syllogism. But is the conclusion true? Here’s that same argument with its premises and conclusion spelled out: Premise 1: In general, the spiders that live in Canada are harmless. Premise 2 (unstated): That spider there is in Canada. Conclusion: That spider is harmless. If the spider in question is a black widow spider (a spider whose natural habitat includes parts of southern Ontario and whose bite is relatively dangerous), your conclusion would be false—reasonable, but false! Evaluating Statistical Syllogisms Since statistical syllogisms, though very useful, are never airtight, we need a method for evaluating them. Acceptable Premises The first thing to consider, of course, is whether we have good reason to believe the premises. How is it that the generalization expressed in the first premise was arrived at? Is it common knowledge (such as “Most birds can fly” or “Most water on Earth is saltwater”)? Is it based on a careful survey, one with a large enough, randomly selected sample? Here we can apply all the tools learned in the previous section on enumerative induction. If the grounding of the generalization is weak, then the argument is weak. Statistical Strength Second, and perhaps most obviously, we should ask ourselves: just how strong is the generalization being offered? Clearly, if our argument (about some member of the class M) is based on the claim that, say, “65 per cent of M are P,” that’s not nearly as strong as if that same argument were based on the claim that “99 per cent of M are P.” We should clearly ask questions, then, when vague words such as most or lots of are used in statistical syllogisms. Most might just mean “more than half” or even “51 per cent of,” and that’s a pretty weak basis for a conclusion about any particular member of that group. Typical or Randomly Selected Statistical syllogisms take a generalization about a group or class and apply that generalization to a specific, individual member of that group or class. This will make most sense for members that we have reason to believe are typical of that 8 | Inductive Reasoning group or class. It is most reasonable to assume that the individual is typical when he, she, or it is selected randomly from the population. If you know, for example, that “85 per cent of Canadians don’t know CPR ,” then it’s reasonable to suspect, of any randomly selected Canadian, that he or she doesn’t know CPR . But if you’re talking to someone wearing a white coat at a hospital or working at a fire station, it’s much less reasonable to assume that that person is part of the 85 per cent of Canadians who don’t know CPR . That person, in fact, is highly likely to be part of the other 15 per cent. Or how about this: if I ask you, “How much do you think this stamp is worth?” you might respond, “Well, most stamps are worth the value printed on them, and that one says ‘42 cents,’ so it’s worth 42 cents.” In most circumstances, that might be a strong argument. But what if you have reason to believe that this particular stamp isn’t a typical stamp? What if you happen to know that I’m a collector of rare and valuable stamps? In that situation, it’s much more likely that the stamp I’m showing you is not a random or typical stamp, and so it would be unwise to jump too quickly to the conclusion that it’s not worth much. Thus, we should always consider whether the individual person or item under consideration is likely to be a typical member of the group or whether you have reason to believe that he, she, or it is an exception to the rule. Exercise 8.6 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. For each of the following statistical syllogisms, identify (1) the individual being examined; (2) the group to which that individual is said to belong; (3) the characteristic being attributed to that group and individual; and (4) the proportion of the group that is said to have that characteristic. You may need to supply missing parts. *1. Barb rides recklessly. She rides her bike to work, and almost all people who ride their bikes to work ride recklessly. 2. Jerry has recently read a financial report that stated that only 1 per cent of Canada’s population makes an annual net income of more than $191,000. For this reason, he doubts his friend Jessica’s claim that she makes more than $191,000. 3. There is only a 1 in 10 chance that any one of your friends will see any one of your Facebook posts. So even though Gigi checked Facebook several times today, she probably didn’t see your posting about Beyoncé’s new album. *4. Almost every meal I’ve eaten at the Poolhouse Café has been wonderful. I’m sure the next one will be too. *5. That car of yours will never make it to Saskatoon. Most Fords are pieces of junk! 303 304 Part Three | Arguments Exercise 8.7 Determine the most likely source of weakness for the following statistical syllogisms. (State whether the most likely problem is an unacceptable premise, a statistical weakness, or a non-typical individual. Give a few words of explanation for why you think the argument is weak in that particular way.) *1. I’ve met plenty of professional hockey players, and they all have inflated egos. Your boyfriend is a hockey player, eh? He must have a huge ego, too! *2. Professor Norman grew up in a small mining town. Most people who grow up in small mining towns have never read Plato. So Professor Norman has never read Plato. 3. The success rate among new restaurants is very high. So I’m sure my cousin’s new restaurant idea would be a good investment. *4. Most people in this town who voted—53 per cent of voters—voted for Mayor Doran. You voted. So you supported Mayor Doran. 5. Only 2 per cent of women-owned businesses ever exceed $1 million in annual revenue. So it’s highly unlikely that Oprah Winfrey’s business makes more than $1 million per year as you claim it does. Analogical Induction analogy A comparison of two or more things alike in specific respects. An analogy is a comparison of two or more things alike in specific respects. In literature, science, and everyday life, analogies are used to explain or describe something. Analogies (often in the form of similes) can be powerful literary devices, both unforgettable and moving: It has been well said that an author who expects results from a first novel is in a position similar to that of a man who drops a rose petal down the Grand Canyon of Arizona and listens for the echo. (P.G. Wodehouse) Just as the planets are connected to the sun and to each other, so are people connected to kings and to each other. (Epistles of the Brethren of Sincerity) . . . Out, out brief candle! Life’s but a walking shadow, a poor player That struts and frets his hour upon the stage And then is heard no more. It is a tale Told by an idiot, full of sound and fury, Signifying nothing. (Macbeth, Act V) 8 | Inductive Reasoning But an analogy can also be used to argue inductively for a conclusion. Such an argument is known as an analogical induction, or simply an argument by analogy. An analogical induction reasons this way: because two or more things are similar in several respects, they must be similar in some further respect. For example: Humans can move about, solve mathematical equations, win chess games, and feel pain. Robots are like humans in that they can move about, solve mathematical equations, and win chess games. Therefore, it’s probable that robots can also feel pain. This argument says that because robots are like humans in several ways (ways that are already known or agreed on), they must be like humans in yet another way (a way that the argument is meant to establish). So analogical induction has this pattern: Thing A has properties P1, P2 , and P3 plus the property P4. Thing B has properties P1, P2 , and P3. Therefore, thing B probably has property P4. Argument by analogy, like all inductive reasoning, can establish conclusions only with a degree of probability. The greater the degree of similarity between the two things being compared, the more probable the conclusion is. Recall that enumerative inductive has this form: X per cent of the observed members of group A have property P. Therefore, X per cent of all members of group A probably have property P. Thus, the most blatant difference between these two forms of induction is that enumerative induction argues from some members of a group to the group as a whole, but analogical induction reasons from some (one or more) individuals to one further individual. In other words, enumerative induction argues from the properties of a sample to the properties of the whole group; analogical induction reasons from the properties of one or more individuals to the properties of another individual. Arguments by analogy are probably used (and misused) in every area of human endeavour—but especially in law, science, medicine, ethics, archaeology, and forensics. Here are a few examples: Argument 4: Medical Science Mice are mammals, have a mammalian circulatory system, have typical mammalian biochemical reactions, respond readily to highblood-pressure drugs, and experience a reduction in blood cholesterol when given the new Drug Z. Humans are mammals, have a mammalian circulatory system, have typical mammalian biochemical reactions, and respond readily to high-blood-pressure drugs. Therefore, humans will also experience a reduction in blood cholesterol when given the new Drug Z. 305 argument by analogy (analogical induction) An argument making use of analogy by reasoning that because two or more things are similar in several respects, they must be similar in some further respect. “All perception of truth is the detection of an analogy.” —Henry David Thoreau 306 Part Three | Arguments Argument 5: Religion A watch is a mechanism of exquisite complexity with numerous parts precisely arranged and accurately adjusted to achieve a purpose—a purpose imposed by the watch’s designer. Likewise, the universe has exquisite complexity with countless parts—from atoms to asteroids—that fit together precisely and accurately to produce certain effects as though arranged by plan. Therefore, the universe must also have a designer. Argument 6: Law The case before the court involves a search by the city police of a homeless man’s cardboard shelter. At issue is whether it was improper for the police to enter the man’s shelter without either permission or a warrant to search for evidence of a crime. A similar case—a relevant precedent—involved a search by the RCMP of an equipment trailer in which a man was living. In that case, the court ruled that the RCMP had violated section 8 of the Canadian Charter of Rights and Freedoms (the section that says, “Everyone has the right to be secure against unreasonable search or seizure”). Therefore, the court should also rule that the search by the city police of the homeless man’s shelter violated section 8 of the Charter. Argument 7: Forensics Whenever we have observed this pattern in the spatter of blood, we have subsequently learned that the gunshot victim was about four feet from the gun when it was fired and was facing away from the assailant. In this crime scene, we have exactly the same pattern of blood spatter. Therefore, the victim was about four feet from the gun when it was fired and was facing away from the assailant. Arguments by analogy are easy to formulate—perhaps too easy. To use an analogy to support a particular conclusion, all you have to do is find two things with some similarities and then reason that the two things are similar in yet another way. You could easily reach some very silly conclusions. You could argue this, for instance: birds have two legs, two eyes, breathe air, and fly; humans have two legs, two eyes, and breathe air; therefore, humans can also fly. So the question is, how do we sort out the good analogical inductions from the bad (or really wacky)? How do we judge which ones have conclusions worth accepting and which ones don’t? Fortunately, there are some criteria we can use to judge the strength of arguments by analogy: 1. 2. 3. 4. Relevant similarities Relevant dissimilarities The number of instances compared Diversity among cases If you find yourself thinking that they make perfect sense, that’s probably because you already use these criteria in your own arguments by analogy. 8 | Inductive Reasoning 307 Food For Thought Analogical Induction in Ethical Reasoning In Chapter 11, you will study in detail the uses of argument and critical thinking in ethical reasoning. For now, it’s sufficient to know this: when we try to show that a particular action is right or wrong, we often rely on argument by analogy. We argue that, since an action is relevantly similar to another action, and the former action is clearly right (or wrong), then we should regard the latter action in the same way. For example, we might propose an argument like this: Premise 1: Caring more for the members of one’s own family than outsiders is ethically permissible. Premise 2: Canada’s policy of giving more aid to its own citizens than to those of other countries is relevantly similar to caring more for the members of one’s own family than outsiders. Conclusion: Therefore, Canada’s policy of giving more aid to its own citizens than to those of other countries is probably ethically permissible. Here, as in any argument by analogy, the conclusion can be established only with a degree of probability. And we would evaluate its strength in the same way we would any other analogical argument. Relevant Similarities The more relevant similarities there are between the things being compared, the more probable the conclusion. Consider this argument: In the Vietnam War, the United States had not articulated a clear rationale for fighting there, and the United States lost. Likewise, in the present war the United States has not articulated a clear rationale for fighting. Therefore, the United States will lose this war too. There is just one relevant similarity noted here (the lack of rationale). As it stands, this argument is weak; the two wars are only dimly analogous. A single similarity between two wars in different eras is not enough to strongly support the conclusion. But watch what happens when we add more similarities: In the Vietnam War, the United States had not articulated a clear rationale for fighting, there was no plan for ending the involvement of US forces (no exit strategy), US military tactics were inconsistent, and the military’s view of enemy strength was unrealistic. The United States lost the Vietnam War. Likewise, in the present war, the United States has not articulated a clear rationale for fighting, there is no exit strategy, US tactics are inconsistent, and the military’s view of enemy strength is naive. Therefore, the United States will also lose this war. 308 Part Three | Arguments With these additional similarities between the Vietnam War and the current conflict, the argument is considerably stronger. (The premises, of course, may be false, rendering the argument not cogent, even if the inference were strong.) Arguments 4–7 (medical science, religion, law, and forensics) can also be strengthened by citing additional relevant similarities between the things compared. Notice that this first criterion involves relevant similarities. The similarities cited in an analogical induction can’t strengthen the argument at all if they have nothing to do with the conclusion. A similarity (or dissimilarity) is relevant to an argument by analogy if it has an effect on whether the conclusion is probably true. The argument on war that was just given mentions four different similarities between the Vietnam War and the present war, and each similarity is relevant because it has some bearing on the probability of the conclusion. But what if we added these similarities? 1. In both wars, some combatants have green eyes. 2. In both wars, some soldiers were left-handed. 3. During both wars, ticket sales to movies in the United States increased. These factors would make no difference to the probability of the conclusion. They’re irrelevant and can neither strengthen nor weaken the argument. Of course, it’s not always obvious what counts as a relevant similarity. To be relevant, a similarity cited as part of an analogical argument clearly has to be connected in some significant way to the conclusion being argued for. There’s no plausible connection, for example, between the colour of soldiers’ eyes and their success in war. So that factor isn’t relevant. In some cases, an explanation may be required to show why a particular similarity is actually relevant. In this regard, the burden of proof (as discussed in Chapter 5) is on the person putting forward the argument. Dan Reynolds/www.CartoonStock.com Relevant Dissimilarities Well, that’s one explanation. But it’s probably not the best one. When does an observation count as a relevant similarity? Generally, the more relevant dissimilarities—or disanalogies— there are between the things being compared, the less probable the conclusion is. Dissimilarities weaken arguments by analogy. Consider argument 4 (regarding Drug Z). What if we discover that blood-pressure-lowering drugs that work in mice almost never work in humans? This one dissimilarity would severely weaken the argument and make the conclusion much less probable. Pointing out dissimilarities in an analogical induction is a common way to undermine the argument. Sometimes finding one relevant dissimilarity is enough to show that the argument should be rejected. A familiar response to argument 5 (the watch argument) is to point out a crucial dissimilarity between a watch 8 | Inductive Reasoning and the universe: the universe may resemble a watch (or mechanism) in some ways, but it also resembles a living thing, which a watch does not. The Number of Instances Compared The greater the number of instances, or cases, that show relevant similarities, the stronger the argument. In the war argument, for example, there is only one instance that has all the relevant similarities: the Vietnam War. But what if there were five additional instances—five different wars that have the relevant similarities to the present war? The argument would be strengthened. The Vietnam War, though it is relevantly similar to the present war, may be an anomaly, a war with a unique set of properties. But citing other cases that are relevantly similar to the present war shows that the relevant set of similarities is no fluke. Argument 7 (the forensics induction) is an especially strong argument, in part because it cites numerous cases. It implies the existence of such instances when it says “Whenever we have observed this pattern. . . .” Diversity among Cases As we’ve seen, dissimilarities between the things being compared weaken an argument by analogy. Such dissimilarities suggest that the things being compared are not strongly analogous. And we’ve noted that several cases (instead of just one) that exhibit the similarities can strengthen the argument. In applying this criterion, however, we focus on a very different point: the greater the diversity among the cases that exhibit the relevant similarities, the stronger the argument. Take a look at the following argument: (1) In my first year of university, one of my courses was taught by a young philosophy professor who handed out a very clear syllabus, explained his expectations, and demonstrated early on that he was always willing to answer any question, and the course ended up being a very good course. (2) In my second year of university, one of my courses was taught by a middle-aged sociology professor who handed out a very clear syllabus, explained his expectations, and demonstrated early on that he was always willing to answer any question, and the course ended up being a very good course. (3) In my third year of university, one of my courses was taught by a very old English professor who handed out a very clear syllabus, explained his expectations, and demonstrated early on that he was always willing to answer any question, and the course ended up being a very good course. (4) Now I’m in my fourth year, and I’ve got a middle-aged philosophy professor who has handed out a very clear syllabus, has explained his expectations, and has demonstrated early on that he is willing to answer any question. (5) Therefore, this new course will be a good course, too. 309 310 Part Three | Arguments Review Notes Analogical Induction Analogical Argument Pattern Thing A has properties P1, P2, and P3, plus the property P4. Thing B has properties P1, P2, and P3. Therefore, thing B probably has property P4. Criteria for Judging Arguments by Analogy 1. 2. 3. 4. The number of relevant similarities. The number of relevant dissimilarities. The number of instances compared. The diversity among cases. Here we have several similarities in question, and they exist between the new professor situation (described in premise 4) and three other professors (detailed in premises 1–3). But what makes this argument especially strong is that the cases are diverse despite the handful of similarities—one case involves a young philosophy professor, another a middle-aged sociology professor, and finally a very old English professor. This state of affairs suggests that the similarities are not coincidental or made up but are strongly linked even in a variety of situations. As you know, an inductive argument cannot guarantee the truth of the conclusion, and analogical inductions are no exception. But by carefully applying the foregoing criteria, we can increase our chances of arriving at well-supported conclusions (or of identifying those conclusions that are not). This is a good thing— even though there is no magic formula for using the criteria in real-life situations. Exercise 8.8 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. Evaluate each of the following passages, and indicate whether it contains (1) an argument by analogy, (2) a literary analogy, or (3) an enumerative induction. If the passage contains an argument by analogy, indicate the total number of things (instances) being compared, the relevant similarities mentioned or implied, the conclusion, and whether the argument is strong or weak. 1. “People are like stained-glass windows. They sparkle and shine when the sun is out, but when the darkness sets in, their true beauty is revealed only if there is a light from within.” (Elisabeth Kübler-Ross) *2. “Duct tape is like the force. It has a light side, a dark side, and it holds the universe together.” (Carl Zwanzig) 8 | Inductive Reasoning 3. Interracial marriage is a bad idea. If a bird and a fish got married, where would they live? 4. “People are like cities: we all have alleys and gardens and secret rooftops and places where daisies sprout between the sidewalk cracks, but most of the time all we let each other see is a postcard glimpse of a skyline or a polished square. Love lets you find those hidden places in another person, even the ones they didn’t know were there, even the ones they wouldn’t have thought to call beautiful themselves.” (Hilary T. Smith, Wild Awake) *5. My brother was always good at arithmetic, so he’ll be a whiz at algebra. 6. Tolerating a vicious dictator is like tolerating a bully on the block. If you let the bully push you around, sooner or later he will beat you up and take everything you have. If you let a dictator have his way, he will abuse his people and rob them of life and liberty. If you stand up to the bully just once or—better yet—knock him senseless with a stick, he will never bother you again. Likewise, if you refuse to be coerced by a dictator or if you attack him, his reign will be over. Therefore, the best course of action for people oppressed by a dictator is to resist and attack. *7. I like hamburger, and I like steak, and I like roast beef. So I will like tongue. 8. “Cutting the deficit by gutting our investments in innovation and education is like lightening an overloaded airplane by removing its engine. It may make you feel like you’re flying high at first, but it won’t take long before you feel the impact.” (Barack Obama) 9. John S. Chen, the CEO of BlackBerry, has been in the tech business for over 30 years. Referred to by some as “a doctor for businesses,” he has a proven track record of helping failing tech companies get back on track. He’ll be able to drag BlackBerry back to the top of the industry in no time. 10. Reading a lot is like shooting arrows at a target. The more arrows you shoot (the more books you read), the more likely you are to hit your target. *11. “Character is the foundation stone upon which one must build to win respect. Just as no worthy building can be erected on a weak foundation, so no lasting reputation worthy of respect can be built on a weak character.” (R.C. Samsel) Exercise 8.9 Evaluate each of the following arguments by analogy, indicating (1) the things (instances) being compared, (2) the relevant similarities mentioned or implied, (3) whether diversity among multiple cases is a significant factor, (4) the conclusion, and (5) whether the argument is strong or weak. *1. Like newlyweds, the countries of Europe have linked their economies together. Like newlyweds, they started out starry-eyed and optimistic about it all. And like newlyweds, the countries of Europe see clearly the benefits of this linking. But also like newlyweds, they are almost guaranteed to go 311 312 Part Three | Arguments 2. 3. 4. *5. 6. 7. through some tough times together. And eventually, like so many newlyweds, they may well end up regretting the whole idea. I studied for just a couple of hours for my biology exam and ended up doing badly on it. Then I studied for just one evening for my French exam and totally bombed it. Then I studied for just a few hours before my English exam, and got a D on it. I’ve only got a few hours tonight to study for my Philosophy exam, so I’m pretty sure this one will go badly. “If a single cell, under appropriate conditions, becomes a person in the space of a few years, there can surely be no difficulty in understanding how, under appropriate conditions, a cell may, in the course of untold millions of years, give origin to the human race.” (Herbert Spencer) A manufacturing plant built in Halifax will provide huge economic benefits, without significant disadvantages. Several new, modern manufacturing plants in the Toronto area have brought jobs to that area as well as improving the city’s tax base, without causing significant amounts of pollution or noise or disrupting traffic. The same can be said for two new plants that have opened up on the outskirts of Montreal as well as plants in Calgary and Vancouver. Some people think suicide is immoral. But a well-established moral principle is that one is morally justified in using deadly force in self-defence when one is threatened with death or great pain from an assailant. A disease, such as terminal cancer, can also threaten one with death or great pain. So suicide—a use of deadly force—must sometimes be morally justified when it is an act of self-defence against an assailant (terminal disease) that threatens death or great pain. We are justified in using deadly force to avoid great pain, even when that deadly force is used against ourselves. “If we survey the universe, so far as it falls under our knowledge, it bears a great resemblance to an animal or organized body, and seems actuated with a like principle of life and motion. A continual circulation of matter in it produces no disorder: a continual waste in every part is incessantly repaired: The closest sympathy is perceived throughout the whole system. And each part or member, in performing its proper offices, operates both to its own preservation and to that of the whole. The world, therefore, I infer, is an animal, and the Deity is the soul of the world, activating it and activated by it.” (Philo, in Hume’s Dialogues Concerning Natural Religion) In her moral philosophy paper “A Defense of Abortion,” Judith Jarvis Thomson writes, “[Imagine] you wake up in the morning and find yourself back to back in bed with an unconscious violinist. A famous unconscious violinist. He has been found to have a fatal kidney ailment, and the Society of Music Lovers has canvassed all the available medical records and found that you alone have the right blood type to help. They have therefore kidnapped you, and last night the violinist’s circulatory system was plugged into yours, so that your kidneys can be used to extract poisons from his blood as well as 8 | Inductive Reasoning 313 your own. [If he is unplugged from you now, he will die, but] in nine months he will have recovered from his ailment, and can safely be unplugged from you.” Since most people would agree that you would be morally justified in unplugging yourself from the violinist, it also follows that it would be morally justified for a woman to abort (i.e., unplug herself from) her baby. Causal Arguments Our world is a shifting, multi-stranded, complicated web of causes and effects— and that’s an oversimplification. Incredibly, the normal human response to the apparent causal chaos is to jump in and ask what causes what. What causes breast cancer? What made Malcolm steal the car? What produced that rash on Norah’s arm? What brought the universe into existence? Why have the New Democrats never won a federal election? When we answer such questions (or try to), we make a causal claim—a statement about the causes of things. And when we try to prove or support a causal claim, we make a causal argument—an inductive argument whose conclusion contains a causal claim. Causal arguments, being inductive, can give us only probable conclusions. If the premises of a strong causal argument are true, then the conclusion is only probably true, with the probability varying from merely likely to highly probable. The probabilistic nature of causal arguments, however, should not be thought of as a failing or weakness. Causal reasoning is simply different from deductive reasoning, and it is our primary method of acquiring knowledge about the workings of the world. The great human enterprise known as science is concerned mainly with causal processes and causal arguments, and few people would consider this work inferior or unreliable because it was not deductively unshakeable. We now have very strong inductive arguments, for example, in favour of the claim that cigarettes cause cancer, that the HIV virus causes AIDS, and that chlorofluorocarbons contribute to the depletion of Earth’s ozone layer. Each of these causal conclusions is very reliable and constitutes a firm basis for guiding individual and collective behaviour. Causal arguments can come in several inductive forms, some of which you already know about. For example, we sometimes reason about cause and effect by using enumerative induction: One time, when I made an aluminum rod come in contact with the rotating circular-saw blade, sparks flew. Another time, when I made a steel nail come in contact with the rotating circular-saw blade, sparks flew. Many other times, when I made a brass key come in contact with the rotating circular-saw blade, sparks flew. Therefore, making a metal object come in contact with the rotating circular-saw blade always causes sparks to fly. causal claim A statement about the causes of things. causal argument An inductive argument whose conclusion contains a causal claim. 314 Part Three | Arguments “I would rather discover a single causal connection than win the throne of Persia.” —Democritus inference to the best explanation A form of inductive reasoning in which we reason from premises about a state of affairs to an explanation for that state of affairs: Phenomenon Q E provides the best explanation for Q. Therefore, it is probable that E is true. Occasionally, we may argue to a causal conclusion by using analogical induction: Ten years ago, a massive surge in worldwide oil prices caused a recession. Five years ago, a massive surge in worldwide oil prices caused a recession. Therefore, the current massive surge in worldwide oil prices will cause a recession. Most often, though, we use another type of induction in which we reason to a causal conclusion by pinpointing the best explanation for a particular effect. Let’s say that, after a hail storm, you discover that the roof of your car, which you had left parked outside in the driveway, has a hundred tiny dents in it. You might reason like this: the dents could have been caused by the mischievous kids next door, by a flock of deranged woodpeckers, or by the hail storm. After considering these options (and a few others), you decide that the best explanation (or hypothesis) for the dents is the hail storm. So you conclude that the hail storm caused the dents in your car’s roof. This is a very powerful and versatile form of inductive reasoning called inference to the best explanation. It’s the essence of scientific thinking and a key part of our everyday problem-solving and knowledge acquisition (whether causal or non-causal). Because of the importance and usefulness of such reasoning, this book devotes three chapters to it in Part 4. So we won’t try to cover the same ground here. Instead, we’ll concentrate on some other inductive patterns of reasoning that have traditionally been used to assess causal connections. Testing for Causes The English philosopher John Stuart Mill (1806–73) noted several ways of evaluating causal arguments and formulated them into what are now known as “Mill’s methods” of inductive inference. Despite their fancy name, however, the methods are basically common-sense and are used by just about everyone. They also happen to be the basis of a great deal of scientific testing. Let’s look at a few of the more important ones. Agreement or Difference A modified version of Mill’s Method of Agreement says that if two or more occurrences of a phenomenon have only one relevant factor in common, that factor must be the cause. Imagine that dozens of people stop into Elmo’s corner bar after work as they usually do and that 10 of them come down with an intestinal illness one hour after leaving the premises. What caused them to become ill? There are a lot of possibilities. Maybe a waiter who had a flu-like illness sneezed into their drinks, 8 | Inductive Reasoning 315 Food For Thought Semmelweis, Clean Hands, and Childbed Fever © iStock.com/kali9 One of the most famous cases of successful causal reasoning in the history of science is the case of nineteenth-century Hungarian physician Ignaz Semmelweis. Semmelweis worked in the maternity section of the Vienna General Hospital in Austria. During that time period, childbirth was quite dangerous; in fact, many women died in the process. Semmelweis noticed a pattern, however. He noticed that women in one of the hospital’s two maternity wards were several times more likely to die of a disease now known as “ puerperal fever” (also known as “childbed fever”) than were women in the other. He also noticed that women in the safer ward were cared for by midwives; women in the more dangerous ward were cared for by physicians, who often examined their patients directly after performing autopsies. Could there be a connection? Could the physicians be transferring something from the cadavers to their pregnant patients? Semmelweis believed so (even though scientists had not yet discovered the role of germs in producing disease). He instituted a policy under which Causal reasoning saves lives every day. all medical personnel were required to wash their hands Can you think of some other important, with a chlorine solution after performing autopsies. In real-world applications for causal reasoning? the months that followed, the death rate among women in the previously dangerous ward dropped from 10 per cent to about 3 per cent. Semmelweis’s careful causal reasoning saved lives. or the free tacos had gone bad, or another patron had a viral infection and passed it along via a handshake. But let’s say that there is only one relevant factor that’s common to all 10 people who got sick: they all had a drink from the same beer tap. We could then plausibly conclude that something in the beer probably caused the illness. Public health officials often use the Method of Agreement, especially when they’re trying to determine the cause of an unusual illness in a population of several thousand people. They might be puzzled, say, by an unusually large number of cases of rare liver disease in a city. If they discover that all the people affected have the same toxin in their bloodstreams—and this is the only common relevant factor— they have reason to believe that the toxin is the cause of the liver disease. In such situations, the poison may turn out to have an industrial or agricultural source. 316 Part Three | Arguments Here’s a schematic of an argument based on the Method of Agreement: Instance 1: Factors a, b, and c are followed by E. Instance 2: Factors a, c, and d are followed by E. Instance 3: Factors b and c are followed by E. Instance 4: Factors c and d are followed by E. Therefore, factor c is probably the cause of E. There’s only one factor—factor c—that consistently accompanies effect E. The other factors are sometimes present and sometimes not. We conclude, then, that factor c brings about E. Mill’s (modified) Method of Difference says that the relevant factor that is present when a phenomenon occurs and that is absent when the phenomenon does not occur must be the cause. Here we look not for factors that the instances of the phenomenon have in common but for factors that are points of difference among the instances. Suppose that the performance of football players on a CFL team has been consistently excellent except for six players who have recently been playing the worst games of their careers. The only relevant difference between the high- and low-performing players is that the latter have been taking daily doses of Brand X herbal supplements. If the supplement dosing is really the only relevant difference, we could plausibly conclude that the supplements are causing the lousy performance. (Finding out if the supplements are indeed the only relevant difference, of course, is easier said than done.) So arguments based on the Method of Difference have this form: Instance 1: Factors a, b, and c are followed by E. Instance 2: Factors a and b are not followed by E. Therefore, factor c is probably the cause of E. Both Agreement and Difference If we combine these two reasoning patterns, we get a modified version of what Mill called the “Joint Method of Agreement and Difference.” Using this joint method is, obviously, just a matter of applying both methods simultaneously—a procedure that generally increases the probability that the conclusion is true. This combined method, then, says that the likely cause is the one isolated when you (1) identify the relevant factors common to occurrences of the phenomenon (the Method of Agreement) and (2) discard any of these that are present even when there are no occurrences (the Method of Difference). Let’s apply this combined method to the mystery illness at Elmo’s bar. Say that among the 10 patrons who become ill, the common factors are that they all drank from the same beer tap and they all had the free tacos. So we reason that the likely cause is either the beer or the tacos. After further investigation, though, we find that other patrons who ate the tacos did not become ill. We conclude that the beer is the culprit. 8 | Inductive Reasoning The schematic for arguments based on the Joint Method of Agreement and Difference is: Instance 1: Factors a, b, and c are followed by E. Instance 2: Factors a, b, and d are followed by E. Instance 3: Factors b and c are not followed by E. Instance 4: Factors b and d are not followed by E. Therefore, factor a is probably the cause of E. Factors a and b are the only relevant factors that are accompanied by E. But we can eliminate b as a possibility because when it’s present, E doesn’t occur. So b can’t be the cause of E; a is most likely the cause. You can see the Joint Method of Agreement and Difference at work in modern “controlled trials” used to test the effectiveness of medical treatments. In these experiments, there are two groups of subjects—one known as the experimental group, the other the control group. The experimental group receives the treatment being tested, usually a new drug. The control group receives a bogus, or inactive, treatment (referred to as a placebo). This setup helps to ensure that the two groups are as similar as possible and that they differ in only one respect—the use of the genuine treatment. A controlled trial, then, reveals the relevant factor common to the occurrence of the effect, which is the subjects’ response to the treatment (Method of Agreement). And it shows the only important difference between the occurrence and non-occurrence of the effect: the use of the treatment being tested. Correlation In many cases, relevant factors aren’t merely entirely present or entirely absent during occurrences of the phenomenon—they are closely correlated with the occurrences. The cause of an occurrence varies as the occurrence (effect) does. For such situations, Mill formulated the Method of Concomitant Variation. This method says that when two events are correlated—when one varies in close connection with the other—they are probably causally related. For instance, if you observe that the longer you boil eggs, the harder they get (and no other relevant factors complicate this relationship), you can safely conclude that this correlation between boiling and hardening is a causal connection. You have good evidence that the boiling causes the hardening. In medical science, such correlations are highly prized because direct evidence of cause and effect is so hard to come by. We don’t see causation directly. Correlations are often indirect evidence of one thing causing another. In exploring the link between cigarette smoking and lung cancer, for example, researchers discovered first that people who smoke cigarettes are more likely to get lung cancer than those who don’t smoke. But later research also showed that the more cigarettes people smoke, the higher their risk of lung cancer. Medical scientists call such a correlation a dose–response relationship. The higher the dose of the 317 Part Three | Arguments xkcd.com 318 Good statistical reasoning—and good critical thinking—might be correlated with taking stats. But is it caused by it? element in question (smoking), the higher the response (the more cases of lung cancer). This dose–response relationship between cigarette smoking and lung cancer is, when combined with other data, strong evidence that smoking causes lung cancer. Food For Thought Is It Causal Confusion or ESP? For over two decades, scientist-writer Susan Blackmore (with degrees in psychology, physiology, and parapsychology) has been investigating the psychology of “psychic,” or paranormal, experience. Her central hypothesis has been that people’s supposed experience of extrasensory perception, or ESP (telepathy, clairvoyance, and precognition), is the result of errors in causal thinking. Specifically, people tend to mistake coincidence for causal connection. She writes: My hypothesis is that psychic experiences are comparable to visual illusions. The experience is real enough, but its origin lies in internal processes, not peculiarities in the observable world. Like visual illusions they arise from cognitive processes that are usually appropriate but under certain circumstances give rise to the wrong answer. In other words, they are a price we pay for using efficient heuristics. In the case of vision, illusions arise when, for example, depth is seen in two-dimensional figures and constancy mechanisms give the answer that would be correct for real depth. The equivalent in the case of psychic experiences may be the illusion that a cause is operating and an explanation is required when in fact none is. In other words, psychic experiences are illusions of causality. . . . Experiences of telepathy, clairvoyance, and precognition imply a coincidence that is “too good to be just chance.” This is so whether the experience involves dreaming about a person’s death and that person dies within a few hours, feeling the urge to pick up one’s partner from the station and in fact he was stranded and needed help, or betting on a horse that later wins a race. 8 | Inductive Reasoning Some people’s response to such events is to say, “That was just a chance coincidence”; while others’ is to say, “That cannot be chance.” In the latter case the person will then look for a causal explanation for the coincidence. If none can be found, a “cause,” such as ESP, may be invoked. Alternatively, some kind of noncausal but meaningful connection may be sought, such as Jung’s “acausal connecting principle.” There are two possible types of error that may be made here. First, people may treat connected events as chance coincidences, thereby missing real connections between events and failing to look for explanations. Second, they may treat chance events as connected and seek for explanations where none is required. In the real world of inadequate information and complex interactions one would expect errors of both types to occur. It is the latter type that, I suggest, gives rise to experiences of ESP. . . . One prediction of this approach is that those people who more frequently look for explanations of chance coincidences are more likely to have psychic experiences. Therefore, sheep [believers in ESP] should be those who underestimate the probability of chance coincidences. It has long been known that probability judgments can be extremely inaccurate. Kahneman and Tversky (1973) have explored some of the heuristics, such as “representativeness” and “availability,” that people [are subject to]. [Other researchers (Fall 1982; Falk & MacGregor 1983) found that adding] specific but superfluous detail can make coincidences seem more surprising, and things that happen to subjects themselves seem more surprising to them than the same things happening to other people. . . . There is, however, little research relating these misjudgments to belief in the paranormal or to having psychic experiences. Blackmore and Troscianko (1985) found that sheep performed worse than goats [skeptics about ESP] on a variety of probability tasks. For example, in questions testing for responsiveness to sample size, sheep did significantly worse than goats. The well-known birthday question was asked: how many people would you need to have at a party to have a 50:50 chance that two have the same birthday? . . . As predicted, goats got the answer right significantly more often than sheep. Subjects also played a coin-tossing computer game and were asked to guess how many hits they would be likely to get by chance. The correct answer, 10 hits in 20 trials, seems to be rather obvious. However, the sheep gave a significantly lower mean estimate of only 7.9, while goats gave a more accurate estimate of 9.6.1 We can represent arguments based on the Method of Concomitant Variation like this: Instance 1: Factors a, b, and c are correlated with E being present. Instance 2: Factors a, b, and increased-c are correlated with increased E. Instance 3: Factors a, b, and decreased-c are correlated with decreased E. Therefore, factor c is causally connected with E. 319 320 Part Three | Arguments An important cautionary note must accompany this discussion of correlation: correlation, of course, does not always mean that a causal relationship is present. A correlation could just be a coincidence (as we will discuss in the next section of this chapter). From 2000 to 2009, consumption of cheese in the United States was strongly correlated with the number of people who died by falling down the stairs, but this doesn’t mean that one was in any way causally linked with the other.2 Causal Confusions Mill’s methods and other forms of causal reasoning may be common sense, and useful, but they’re not foolproof. No inductive procedure can guarantee the truth of the conclusion. More to the point, it’s easy to commit errors in cause-and-effect reasoning—regardless of the method used—by failing to take into account pertinent aspects of the situation. This section describes some of the more common causal blunders to which we’re all prey. Misidentifying Relevant Factors A key issue in any type of causal reasoning is whether the factors preceding an effect are truly relevant to that effect. In using the Method of Agreement, for example, it’s easy to find a preceding factor common to all occurrences of a phenomenon. But that factor may actually be irrelevant. In the case of Elmo’s bar, what if all those who became ill had black hair? So what? We know that hair colour is very unlikely to be related to intestinal illness. Relevant factors include only those things that could possibly be causally connected to the occurrence of the phenomenon being studied. We could reasonably judge that factors relevant to the intestinal illness would include all the conditions that might help transmit bacteria or viruses. Your ability to identify relevant factors depends mostly on your background knowledge—what you know about the kinds of conditions that could produce the occurrences in which you’re interested. Lack of background knowledge might lead you to dismiss or ignore relevant factors or to assume that irrelevant factors must play a role. The only cure for this inadequacy is deeper study of the causal possibilities in question. Mishandling Multiple Factors Most of the time, the biggest difficulty in evaluating causal connections is not that there are so few relevant factors to consider—but that there are so many. Too often, the Method of Agreement and the Method of Difference are rendered useless because they cannot, by themselves, narrow the possibilities to just one. At the same time, ordinary causal reasoning is often flawed because of the failure to consider all the relevant antecedent factors. (Later chapters will refer to this 8 | Inductive Reasoning 321 problem as the failure to consider alternative explanations.) Sometimes this kind of oversight happens because we simply don’t look hard enough for possible causes. At other times, we miss relevant factors because we don’t know enough about the causal processes involved. This again is a function of skimpy background knowledge. Either way, there is no countermeasure better than your own determination to dig out the whole truth. Being Misled by Coincidence Sometimes ordinary events are paired in unusual or interesting ways. You think of Quebec, then suddenly a TV ad announces low-cost fares to Montreal; you receive some email just as your doorbell and the phone both ring; or you stand in the lobby of a hotel thinking of an old friend and then see her walk in. Plenty of interesting pairings can also show up in scientific research. Scientists might find, for example, that men with the highest rates of heart disease may also have a higher daily intake of water. Or women with the lowest risk of breast cancer may own Toyotas. Such pairings are very probably just coincidence, merely surprising correlations of events. A problem arises, though, when we think that there nevertheless must be a causal connection involved. Food For Thought Spurious Correlations Number of people who drowned by falling into a pool correlates with Films Nicolas Cage appeared in Correlation: 66.6% (r=0.666004) 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 6 films 120 drownings 4 films 100 drownings 2 films 80 drownings 0 films 1999 2000 2001 2002 2003 Nicholas Cage 2004 2005 2006 2007 Swimming pool drownings 2008 2009 Nicholas cage Swimming pool drownings 1999 140 drownings Creative Commons License: Attribution 4.0 International (CC BY 4.0) If you look at enough data, about enough topics, you’re bound to find something correlated with something. To illustrate this point, author and data nerd Tyler Vigen put together an entire website dedicated to graphs of “spurious correlations”—correlations that are almost certainly entirely coincidental and empty of causal meaning. See for yourself! Continued Part Three | Arguments Per capita cheese consumption correlates with Number of people who died by becoming tangled in their bedsheets Correlation: 94.71% (r=0.947091) Cheese consumed 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 33 lbs 800 deaths 31.5 lbs 600 deaths 30 lbs 400 deaths 28.5 lbs 200 deaths 2000 2001 2002 2003 2004 Bedsheet tanglings 2005 2006 2007 2008 Bedsheet tanglings Creative Commons License: Attribution 4.0 International (CC BY 4.0) 322 2009 Cheese consumed Graphs like these serve as a warning: when you spot a correlation, you need to think carefully (perhaps using the skills you’ve learned in this chapter) about whether the correlation is a meaningful one. For several reasons, we may very much want a coincidence to be the result of a cause-and-effect relationship, so we come to believe that the pairing is causal. Just as often, we may mistake causes for coincidences because we’re impressed or excited about the conjunction of events. Since the pairing of events may seem “too much of a coincidence” to be coincidence, we conclude that one event must have caused the other. You may be thinking about how nice it would be for your sister to call you from her home in the Yukon—then the phone rings, and it’s her! You’re tempted to conclude that your wishing caused her to call. But such an event, though intriguing and seemingly improbable, is not really so extraordinary. Given the ordinary laws of statistics, seemingly incredible coincidences are common and must occur. Any event, even one that seems shockingly improbable, is actually very probable over the long haul. Given enough opportunities to occur, events like this surprising phone call are virtually certain to happen to someone. People are especially prone to think, “it can’t be just coincidence” because, for several psychological reasons, they misjudge the probabilities involved. They may think, for example, that a phone call from someone at the moment they’re thinking of that person is incredible—but only because they’ve forgotten about all the times they’ve thought of that person and the phone didn’t ring. Such probability misjudgments are a major source of beliefs about the paranormal or supernatural, topics that we address in Chapter 10. (See also the Food for Thought box “Is It Causal Confusion or ESP?” on page 318.) Unfortunately, there is no foolproof way to distinguish coincidence from cause and effect. But this rule of thumb can help: Don’t assume that a causal connection exists unless you have good reason for doing so. 8 | Inductive Reasoning 323 Generally, you have a good reason for suspecting that a causal connection exists if the connection passes one or more standard causal tests (such as the ones we’ve been discussing)—and if you can rule out any relevant factors that might undermine the verdict of those tests. Usually, when a cause-and-effect connection is uncertain, only further evaluation or research can clear things up. Confusing Cause with Temporal Order A particularly common type of misjudgment about coincidences is the logical fallacy known as post hoc, ergo propter hoc (“after that, therefore because of that”). It is true that a cause must precede its effect. But the fact that one event precedes another doesn’t mean that the earlier one caused the later. To think so is to be taken in by this fallacy. Outrageous examples of post hoc arguments include “The rooster crowed, then the sun came up, so the rooster’s crowing caused the sunrise!” and “Jasmine left her umbrella at home on Monday, and that caused it to rain.” You can clearly see the error in such cases, but consider these arguments: Argument 8 After the training for police officers was enhanced, violent crime in the city decreased by 10 per cent. So enhanced training caused the decline in violent crime. Argument 9 An hour after Julio drank the cola, his headache went away. The cola cured his headache. Argument 10 As soon as Smith took office and implemented policies that reflected his conservative theory of economics, the economy went into a downward slide characterized by slow growth and high unemployment. Therefore, the Smith policies caused the current economic doldrums. Argument 11 I wore my black shirt on Tuesday and got an F on a math quiz. I wore the same shirt the next day and flunked my psych exam. That shirt’s bad luck. The conclusion of argument 8 is based on nothing more than the fact that the enhanced training preceded the reduction in violent crime. But crime rates can decrease for many reasons, and the enhanced training may have had nothing to do with the decline in crime. For the argument to be strong, other considerations besides temporal order would have to apply—for example, that other possible causes or antecedent factors had been ruled out; that there was a close correlation between amount of training and decline in crime rates; or that in previous years post hoc, ergo propter hoc (“after that, therefore because of that”) The fallacy of reasoning that just because B followed A, A must have caused B. 324 Part Three | Arguments (or in comparable cities) enhanced training was always followed by a decline in violent crime (or no change in training was always followed by steady crime rates). Argument 9 is also purely post hoc. Such reasoning is extremely common and underlies almost all folk remedies and a great deal of quackery and bogus self-cures. You take a vitamin E capsule, and four hours later your headache is gone. But was it really the vitamin E that did the trick? Or was it some other overlooked factor, such as something you ate, the medication you took (or didn’t take), the nap you had, the change in environment (from, say, indoors to outdoors), or the stress reduction you felt when you had pleasant thoughts? Would your headache have gone away on its own anyway? Was it the placebo effect—the tendency for people to feel better when treated even when the treatment is fake or inactive? A chief function of controlled medical testing is to evaluate causeand-effect relationships by systematically ruling out post hoc thinking and irrelevant factors. Argument 10 is typical post hoc reasoning from the political sphere. Unless there are other good reasons for thinking that the economic policy is causally connected to specific economic events, the argument is weak and the conclusion unreliable. Argument 11 is 100 per cent post hoc and undiluted superstition. There is no difference in kind between this argument and much of the notorious post hoc reasoning of centuries ago: “That woman gave me the evil eye. The next day I broke my leg. That proves she’s a witch, and the elders of Salem should have her put to death!” Ignoring the Common Causal Factor Sometimes A and B are correlated with each other, and genuinely causally connected, but A doesn’t cause B and B doesn’t cause A. Rather, both A and B are caused by some third factor, C, that they share in common. One often-cited example is this: there is a correlation between sales of ice cream and deaths due to drowning across the months of the year. Does ice cream cause people to drown? No. Does drowning somehow cause a rise in ice cream sales? Highly unlikely! The truth is that both of those things are more common during a particular season—namely, summer. In the heat of summer, more people go swimming, and therefore, the rate of drownings goes up. And sales of ice cream likewise go up in summer. So summertime is the common causal factor shared by those two variables. (Note: common here means “shared,” not “frequent.”) Another example: imagine reading about a survey that suggests that Canadians with access to high-speed Internet tend to go out to see bands play live more than people with poor Internet access. Is there a causal connection between the two? Well, there might be: maybe people use the Internet to find out when good bands are playing, and Canadians without good Internet access are left out. But it’s more likely that there’s a common causal factor connecting the two: people who live in the city are much more likely to have high-speed Internet than people who live in 8 | Inductive Reasoning 325 Everyday Problems and Decisions Health Care Decisions Some of the most critical decisions we make in life are about health care. Sometimes those decisions must be made on behalf of someone else, such as a child. In late 2014 and early 2015, the CBC reported on two different cases involving parents of girls with cancer. In both cases, the girls suffered from dangerous but treatable forms of cancer. In both cases, the parents opted to reject having their daughters treated at a hospital—treatment that would have included things like chemotherapy and perhaps radiation therapy—and instead opted for “natural” treatment options, including a vegan diet of raw, sugar-free foods. It is interesting and instructive to ask about the thinking process that might have gone into such a decision. Clearly, it had to be based on these parents’ understanding of what would be best for their daughters. And that would surely be based on their understanding of the sum total of the available evidence about what would be most likely to help their daughters—that is, what would be most likely to cause them to get better. The physicians advising them told them that the existing scientific and medical evidence suggested that chemotherapy would be both necessary, and likely sufficient, to save the girls’ lives. For whatever reason, both sets of parents rejected that advice. One of the girls—Makayla Saulk—died in January of 2015. The fate of the other girl, known as J.J., has not been made public. rural areas. People who live in the city also tend to live near lots of clubs and bars where they can hear live music. More evidence would be needed before we could be certain what the real causal story is. Confusing Cause and Effect Sometimes we may realize that there’s a causal relationship between two factors but we may not know which factor is the cause and which is the effect. We may be confused, in other words, about the answers to questions like these: Does your coffee drinking cause you to feel stressed out—or do your feelings of being stressed out cause you to drink coffee? Does participation in high school sports produce desirable virtues, such as courage and self-reliance—or do the virtues of courage and self-reliance lead students to participate in high school sports? Does regular exercise make people healthy—or are healthy people naturally prone to regular exercise? As you can see, it’s not always a simple matter to discern what the nature of a causal link is. Again, we must rely on our rule of thumb: don’t assume that a causal connection exists unless you have good reason for doing so. This tenet applies not only The Art Archives/Culver Pictures 326 Part Three | Arguments to our ordinary experience but also to all states of affairs involving cause and effect, including scientific investigations. In everyday life, sorting cause from effect is often easy because the situations we confront are frequently simple and familiar—as when we’re trying to discover what caused the kettle to boil over. Here, we naturally rely on Mill’s methods or other types of causal reasoning. But as we’ve seen, in many other common circumstances, things aren’t so simple. We often cannot be sure that we’ve identified all the relevant factors or ruled out the influence of coincidence or correctly distinguished cause and effect. Our rule of thumb, then, should be our guide in all the doubtful cases. Science faces all the same kinds of challenges in its pursuit of causal explanations. And despite its sophisticated methods and investigative tools, it must expend a great deal of effort to pin down causal connections. Identifying the cause of a disease, for example, usually requires not one study or experiment but many. The main reason is that it’s always tough to uncover relevant factors and exclude irrelevant or misleading factors. That’s What role did the post hoc fallacy play in Salem during the witch trials of the 1690s? why we should apply our rule of thumb even to scientific research that purports to identify a “Luck has nothing to do causal link. In Chapters 9 and 10, we’ll explore procedures for evaluating scienwith it, because I have spent tific research and for applying our rule of thumb with more precision. many, many hours, countless hours, on the court working for my one moment in time, not knowing when it would come.” —Serena Williams necessary condition A condition for the occurrence of an event without which the event cannot occur. sufficient condition A condition for the occurrence of an event that guarantees that the event occurs. Necessary and Sufficient Conditions To fully appreciate the dynamics of cause and effect and to be able to skilfully assess causal arguments, you must understand two other important concepts: necessary condition and sufficient condition. Causal processes always occur under specific conditions. So we often speak of cause and effect in terms of the conditions for the occurrence of an event. Scientists, philosophers, and others go a step further and emphasize a distinction between necessary and sufficient conditions for the occurrence of an event: A necessary condition for the occurrence of an event is one without which the event cannot occur. A sufficient condition for the occurrence of an event is one that guarantees that the event occurs. 8 | Inductive Reasoning Review Notes Causal Confusions • • • • • Misidentifying relevant factors Overlooking relevant factors Confusing coincidence with cause Confusing cause with temporal order (post hoc fallacy) Confusing cause and effect Suppose you drop a water-filled balloon from the top of a building (aiming it at your least favourite professor, of course) and it breaks on the pavement. What are the necessary conditions for the breaking of the balloon (the effect)? There are several, including (1) your releasing the balloon, (2) the force of gravity acting on the object, (3) the weakness of the material that the balloon is made of (its breakability), and (4) the hardness of the pavement. If any one of these conditions is not present, the water balloon will not break. To state the obvious, if you don't release the balloon, it won't drop. If gravity is not in force, the balloon won't fall. If the balloon material isn't breakable, it won't break. If the pavement isn't hard enough, even a breakable balloon won't rupture. (For the sake of illustration, this list of necessary conditions is incomplete. Many, if not most, events in nature have large numbers of necessary conditions.) What are the sufficient conditions for the balloon's breaking? Not one of the four conditions by itself is sufficient to cause the balloon to break. None guarantees the occurrence of the effect; none suffices to produce the event. But all the necessary conditions combined (these four and others) are sufficient to guarantee the balloon's breaking. Failing to feed a healthy goldfish for a few weeks is a sure way to kill it. So this deprivation is a sufficient condition for its death, as is removing the water from its fishbowl. But neither taking away the fish's food nor draining its bowl is a necessary condition for a goldfish's death because its death can be caused without resorting to either of these methods. On the other hand, necessary conditions for sustaining the fish's life include feeding it, providing it with water to live in, ensuring that the water is properly oxygenated, and so on. Again, in this instance, the whole set of the necessary conditions would constitute a sufficient condition for sustaining the fish's life. In cases in which a complete set of necessary conditions constitutes a sufficient condition for an event, we say that the conditions are individually necessary and jointly sufficient for an event to occur. As the previous examples suggest, however, it's possible to have a set of conditions that are individually necessary but not jointly sufficient. Say some of the conditions necessary for sustaining the goldfish's life are present but not all of them are. Because some necessary conditions are missing, the sufficient condition for keeping the fish alive would not exist. On the other hand, it is also possible to have a set of conditions that are jointly sufficient but not 327 328 Part Three | Arguments individually necessary. By not feeding a goldfish for weeks, we would create a set of conditions sufficient for the death of the fish. But these conditions are not necessary for the death of a goldfish because we could ensure its death in other ways. So there are conditions that are necessary but not sufficient for the occurrence of an event and conditions that are sufficient but not necessary. There are also conditions that are both necessary and sufficient for an event. The Earth's being more massive than the moon is both a necessary and sufficient condition for the moon's being less massive than the Earth. A piece of paper's being heated to a sufficiently high temperature in the presence of oxygen is both a necessary and sufficient condition for the combustion of the paper. In some situations, depending on our interests or practical concerns, we may focus on necessary causal conditions and in other situations on sufficient causal conditions. When we're interested in preventing or eliminating a state of affairs, we often zero in on necessary causal conditions. If you were a scientist trying to discover how to prevent mosquito infestations, you would try to determine the necessary conditions for the occurrence of mosquito infestations. Uncovering and understanding just one necessary condition could give you everything you need to control the problem. If you found out, for example, that a necessary condition for mosquito breeding is standing water, you would need to look no further for an answer. Eliminating the standing water would prevent infestations. When we're interested in bringing about a state of affairs, we're likely to focus on sufficient causal conditions. If you were a doctor devoted to treating clogged arteries in your patients, you would seek out treatments scientifically proven to be sufficient for alleviating the condition. The treatments might include surgery to remove the blockage or a procedure called balloon angioplasty to widen artery passageways. Your success in appraising causal arguments often depends heavily on your ability to distinguish between statements expressing causes as necessary conditions and statements expressing causes as sufficient conditions. Consider: In the current situation, the prime minister will call an election if Parliament doesn't vote in favour of his proposal to cut taxes. This statement says that the condition required for the prime minister to call an election is Parliament not supporting his proposal to cut taxes. But is this a necessary or sufficient condition? The use of the word if by itself signals a sufficient condition. If sufficient condition is what's meant, then the statement says that Parliament's refusal to support the tax cuts will automatically trigger an election call. This outcome is assured if Parliament doesn't cooperate. But if the statement is meant to express the idea that Parliament's refusal to support the tax cut is a necessary condition, then we're talking about a very different situation. If Parliament's refusal is a necessary condition, then it will not unavoidably trigger an election call because the refusal may not be the only necessary condition. The idea of a necessary condition is expressed by the phrase "only 8 | Inductive Reasoning if" before the stipulated condition. To express necessary condition, the statement should read: In the current situation, the prime minister will call an election only if Parliament doesn't vote in favour of his proposal to cut taxes. So, depending on the kind of causal condition meant, the statement could describe an election that's sure to happen if the condition obtains—or an election that may not occur even if the condition obtains. As you might expect, conditions that are both necessary and sufficient are indicated by the phrase "if and only if." For example: The paper will combust if and only if it's heated to a sufficiently high temperature in the presence of oxygen. None of this discussion, however, should lead you to think that a causal condition must be either necessary or sufficient. It could be neither: Late delivery of the package caused John to miss his deadline. Ricardo's stubbornness caused the negotiations to break down. Exercise 8.10 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. Analyze each of the following causal arguments. Identify the conclusion, and say whether the argument appeals to the Method of Agreement, the Method of Difference, the Joint Method of Agreement and Difference, or correlation. In some cases, the conclusion may be implied but not stated. State whether the argument is strong or weak. 1. Two students in this class missed Lecture Three of the term. They also happen to be the only two who were chatting during the recap of Lecture Three during Week Four. And guess what? Those are the only students who did badly on Question 10 of the midterm exam. *2. Research suggests that eating lots of fruits and vegetables may provide some protection against several types of cancer. Studies have revealed that the risk of getting cancer associated with the lowest intakes of fruits and vegetables is twice as high as that associated with the highest intakes. This association holds for several types of cancer, including cancers of the breast, colon, pancreas, and bladder. 3. Whenever a murder happens in a predominantly white neighbourhood, the police are quick to respond. But when a murder happens in a black neighbourhood, the cops take forever just to show up. It's clear that police just don't care about black lives the way they care about white lives. 329 330 Part Three | Arguments 4. We tested 20 samples of ground beef from six different processing plants across Canada. All samples were subjected to the standard test for E. coli O157:H7. Test results showed that 17 of them were free of E. coli and hence, in this regard, safe for human consumption. The other three, however, showed significant levels of E. coli. The only relevant factor common to these three samples is that they all came from processing plants owned by a single company, JBR Meats, Inc. (and none of the 17 uncontaminated samples came from a plant owned by JBR). We conclude that there are significant deficiencies in JBR's food-safety procedures. 5. A voluntary relationship survey conducted at my workplace showed that 30 per cent more people were now in a committed relationship compared to last year. Every single one of the people who reported having started a new relationship since last year's survey also stated that they had started using the dating app Tinder. 6. In Instance 1, when factors X, Y, and Z were present, E happened. In Instance 2, when factors X, Y, and P were present, E happened. In Instance 3, when factors X and Z were present, E did not happen. In Instance 4, when Z and P were present, E did not happen. And in Instance 5, when X, Z, and P were present, E did not happen. Therefore, Y caused E. *7. Educators have frequently noted the connection between education level and salary. The higher a person's education level is, the higher his or her annual salary is likely to be. Education increases people's earning power. 8. "On 20 May 1747, I took twelve patients [with] scurvy on board the Salisbury at sea. Their cases were as similar as I could have them. They all in general had putrid gums, the spots and lassitude, with weakness of their knees. They lay together in one place, being a proper apartment for the sick in the fore-hold; and had one diet in common to all. . . . Two of these were ordered each a quart of cider a day. Two others took [25 drops of] vitriol three times a day. . . . Two others took two spoonfuls of vinegar three times a day. . . . Two of the worst patients [were given a half pint of seawater daily]. . . . Two others had each two oranges and one lemon given them every day. . . . The two remaining patients took [small doses of nutmeg, garlic, mustard seed, and a few other ingredients]. The consequence was that the most sudden and visible good effects were perceived from the use of the oranges and lemons; one of those who had taken them being at the end of six days fit for duty. . . . The other was the best recovered of any in his condition, and being now deemed pretty well was appointed nurse to the rest of the sick. As I shall have occasion elsewhere to take notice of the effects of other medicines in this disease, I shall here only observe that the result of all my experiments was that oranges and lemons were the most effectual remedies for this distemper at sea." (James Lind, Of the Prevention of the Scurvy, 1753) 9. Johnny owns a successful mid-sized telemarketing company. Three months ago, one of his best sales managers, Jeff, left to work elsewhere, and Johnny hired Fred to replace him. Last week, while analyzing his employees' performance reports, he noticed many unfamiliar names. After a little digging, 8 | Inductive Reasoning he discovered that the employee turnover rate had increased substantially since Jeff left. Moreover, Fred managed the vast majority of the employees that the company had lost. Therefore, Johnny concludes that Fred is an incompetent sales manager. 10. Scientists wanted to see whether giving prepubescent children dietary supplements of calcium could significantly increase the density of the children's bones. (Bone density is a key part of bone strength.) So they selected 71 pairs of identical twins and gave one twin of each pair a daily supplement of extra calcium and the other twin a sugar pill (placebo). All the twins had diets that contained adequate amounts of all nutrients. The investigators monitored the twins and their diets for three years. The only relevant difference between the twins was the extra calcium that half of them received. At the end of the three years, the scientists found that the twins who had received the extra calcium had significantly greater bone density. They concluded that the extra calcium caused the increased density. 11. As a sales clerk at H&M, I've noticed that whenever sales of mittens go up, so do sales of scarves. To sell more scarves, sell more mittens! 12. The risk of atherosclerosis (hardening of the arteries) is linked to the amount of "bad" cholesterol (low-density lipoproteins) in the bloodstream. The higher those cholesterol levels, the greater the risk of atherosclerosis. There's a causal connection between levels of "bad" cholesterol and risk of atherosclerosis. *13. Investigators tested the performance of four gasoline-powered lawnmowers before and after a tune-up. The machines differed in age, manufacturer, engine type, and controls. The performance of every mower was better after the tune-up, leading the testers to conclude that tune-ups can improve the performance of lawnmowers. 14. Minhiriath, Enedwaith, and Rohan are geographical regions that have similar climates year-round. They are renowned for a unique flower that only grows within their borders, the lissuin. Last year, Minhiriath experienced an unusual amount of rainfall, much more than Enedwaith and Rohan. The lissuin there didn't grow properly, whereas the flowers in the other two locations grew like they did every year. Therefore, growth of the lissuin depends very heavily on the amount of rain the flowers receive. 15. Sometimes reception on my phone is excellent, and sometimes it's terrible. There's only one important factor that seems to make a difference. When I'm out on the street, the reception is excellent. When it's terrible, I'm usually at school. For some reason, being in this building interferes with my phone reception. *16. The price of a barrel of oil on the world market has hit $40 only 12 times in the last 30 years. Sometimes major world economies were in recession, and sometimes they weren't. Sometimes there was an increase in the average fuel consumption of cars, sometimes not. War has been the only constant. 17. I think Charlie is upset because he got a rejection letter from art school on Friday. He was pretty happy all week, but then he started acting really bummed out just before the weekend. 331 332 Part Three | Arguments 18. In our test, after people washed their hands with Lather-Up germicidal soap, no germs whatsoever could be detected on their hands. But under exactly the same conditions, after they washed their hands with Brand X germicidal soap, plenty of germs were found on their hands. Lather-Up is better. *19. For years now, violent crimes in the downtown core of this city have consistently averaged three to four per month. After the police doubled foot patrols there, the rate has been one or two violent crimes every three months. That police presence has made a huge difference. 20. The cause of Barry's criminal behaviour—his involvement in pickpocketing and purse-snatching—is no mystery. Barry commits most of his criminal acts when outdoor temperatures are highest. When it's very cold out, he behaves himself. In fact, the incidence of his criminal behaviour rises as the temperature rises. Barry's problem is that he has a heat-sensitive personality. Exercise 8.11 For each argument in Exercise 8.10, identify errors in causal reasoning that are most likely to occur in the circumstances indicated. The possibilities include (a) misidentifying or overlooking relevant factors, (b) being misled by coincidence, (c) falling for the post hoc fallacy, and (d) confusing cause and effect. Answers for 2, 7, 13, 16, and 19 are provided in Appendix B. Exercise 8.12 For each of the following causal statements, indicate whether the specified cause is (a) a necessary condition, (b) a sufficient condition, (c) a necessary and sufficient condition, or (d) neither a necessary nor a sufficient condition. *1. Sylvia's exposure to the influenza virus caused her to get the flu. 2. Dorothy was texting, and so she ended up driving right through a red light. 3. The trees were cut down, and then we sprayed pesticides on the remaining vegetation; next thing you know, all the animals that had lived there were just gone. *4. Chopping off the head of the king put an end to him. 5. The mighty Casey hit the ball out of the park, winning the game by one run. 6. I won't tolerate your cheating! I want you to move out right now! 7. Taz yelled at the customer just because it was his last day at work, so he knew couldn't be fired for it. 8. BUS221 is a required course for all accounting majors, which is why Kaitlin was allowed to register in the class. *9. A single spark started the internal combustion engine. 10. When carbon atoms are arranged in the proper crystalline arrangement, they make a diamond. 8 | Inductive Reasoning 333 Mixed Arguments We noted in Chapter 3 the distinction between deductive and inductive arguments. We said that a deductive argument is intended to provide logically con clusive support for its conclusion and that an inductive argument is intended to provide probable—not conclusive—support for its conclusion. In Chapters 6 and 7, we discussed deductive reasoning in more detail and ways of evaluating deductive arguments. And here in Chapter 8, we've discussed several forms of inductive reasoning and ways of evaluating them. Since the processes for evaluating deductive and inductive arguments are so different, it makes sense to learn about them separately. But in real life, arguers will very often combine inductive and deductive elements within a single, compound argument. Let's look briefly at the notion of mixed arguments and how to evaluate them. There are no limits to the ways in which arguers may try to combine deductive and inductive elements within a single, mixed argument. One of the simplest ways in which deductive and inductive elements may be combined is seen when one of the premises of a categorical syllogism is actually the conclusion of an inductive argument—say, an argument that uses enumerative induction. Here's an example: In our study, we gave 100 average Canadian consumers a simple quiz about basic science. None of them passed it. It seems average Canadian consumers just don't have an understanding of basic science. Only people who understand science should get to have a say on scientific issues like the safety of genetically modified wheat. So average Canadians consumers should not have a say on genetically modified wheat. The first part of that argument is an example of enumerative induction: it's a kind of survey, one that reaches a dramatic conclusion based on a rather small sample: • • • • Target population: Canadian consumers Sample: 100 Canadian consumers Relevant property: understanding of basic science Conclusion: 0 per cent of Canadian consumers understand basic science. The second part of the argument is a categorical syllogism: Premise 1: No Canadian consumers understand basic science. Premise 2: All people who should get a say on the safety of genetically modified wheat are people who understand basic science. Conclusion: No Canadian consumers are people who should get a say on the safety of genetically modified wheat. Let's look at those two components of the argument, beginning with the inductive part. How strong is the argument that "no Canadian consumers understand basic science?" The first thing to note, of course, is that the sample is very mixed argument An argument that includes both inductive and deductive elements. 334 Part Three | Arguments small: a sample of just 100 people leaves a very large margin of error. We also need more information about whether the sample was random or representative. We would also, ideally, want to ask questions about just what kind of quiz was administered and what the quiz-givers count as "basic" science. But even with the minimal information available here, and especially given the small sample, it looks as if this inductive part of the argument is pretty weak. But let's accept it for now, for the sake of argument, and move on to assess the deductive component of the argument. Since the conclusion is about Canadian consumers and whether they're the sort who should have a say, we'll assign S and P (subject and predicate) this way: S = Canadian consumers P = people who should get a say on the safety of genetically modified wheat We'll assign M (for middle term) to the term that's left—namely, the bit about understanding basic science: M = people who understand basic science Next, let's take the categorical syllogism expressed above and put it into standard form, using the letters we just assigned: No S are M. All P are M. Therefore, no S are P. Now we can ask, is this a valid argument? Let's do a Venn diagram to figure it out. Diagramming the two premises produces a diagram like this: M S P Does this diagram—with the premises drawn in—show the thing that is stated in the conclusion—namely, that "No S are P"? Yes, you can clearly see that the area of overlap between the S circle and the P circle is entirely shaded out. It's empty, just as it should be to show that "no S are P." The deductive part of our overall argument, then, is valid. 8 | Inductive Reasoning So what about our mixed argument as a whole? Well, the deductive part is fine. But since the inductive argument offered in support of one of the premises for the deductive part is quite weak, we should consider this mixed argument, as a whole, to be weak. Summary An inductive argument is intended to provide only probable support for its conclusion, being considered strong if it succeeds in providing such support and weak if it does not. Inductive arguments come in several forms, including enumerative, analogical, and causal. In enumerative induction, we argue from premises about some members of a group to a generalization about the entire group. The entire group is called the target group; the observed members of the group, the sample; and the group characteristics we're interested in, the relevant property. An enumerative induction can fail to be strong by having a sample that's too small or not representative. When we draw a conclusion about a target group on the basis of too small a sample, we are said to commit the error of hasty generalization. Opinion polls are enumerative inductive arguments, or the basis of enumerative inductive arguments, and must be judged by the same general criteria used to judge any other enumerative induction. In analogical induction, or argument by analogy, we reason that since two or more things are similar in several respects, they must be similar in some further respect. We evaluate arguments by analogy according to several criteria: (1) the number of relevant similarities between things being compared; (2) the number of relevant dissimilarities; (3) the number of instances (or cases) of similarities or dissimilarities; and (4) the diversity among the cases. A causal argument is an inductive argument whose conclusion contains a causal claim. There are several inductive patterns of reasoning used to assess causal connections. These include the Method of Agreement, the Method of Difference, the Method of Agreement and Difference, and the Method of Concomitant Variation. Errors in cause-and-effect reasoning are common. They include misidentifying relevant factors in a causal process, overlooking relevant factors, confusing cause with coincidence, confusing cause with temporal order, and mixing up cause and effect. Crucial to an understanding of cause-and-effect relationships are the notions of necessary and sufficient conditions. A necessary condition for the occurrence of an event is one without which the event cannot occur. A sufficient condition for the occurrence of an event is one that guarantees that the event occurs. Mixed arguments are ones that include both deductive and inductive elements within a single argument. They are quite common, as when the conclusion of an inductive argument is used as a premise for a deductive argument, such as a syllogism. In such cases, you will need to use the tools for evaluating both inductive and deductive arguments to determine the quality of the argument as a whole. 335 336 Part Three | Arguments Field Problems 1. Devise an extended argument by analogy (200–250 words) to support the idea that a business giving $10,000 to a government official as a thank-you for helping win a government contract is just like giving a waiter or waitress a tip. Use several relevant similarities in your argument. Then write a short critique of your argument (100–150 words), focusing especially on relevant dissimilarities and the number of relevant similarities. 2. Design an opinion poll to determine the percentage of people in the community where you live who believe that people who use municipal parks should be charged a user fee. Specify all of the following parameters: (1) the target group; (2) the makeup and size of the sample; (3) the methods for ensuring a random sample; (4) the methods for ensuring a representative sample; (5) the exact phrasing of the polling question(s); (6) the method for gathering the responses (telephone survey, "man on the street" poll, email questionnaire, etc.); and (7) the acceptable margin of error. Explain the reasons for your choices. 3. Select a causal argument on a political issue from a political blog or news website. Then critique it, explaining why it's strong or weak, specifically noting whether it misidentifies or overlooks relevant factors, confuses cause with coincidence, commits the post hoc fallacy, confuses cause and effect, or mishandles or misunderstands necessary and sufficient conditions. 4. Think of a causal claim that you recall being put forward by someone you know—perhaps a claim about what caused their cold, or an accident they saw happen, or their bad grade on a particular test at school. Did they put forward a causal argument or merely a causal claim? Do you see any evidence of any of the "usual" errors that affect causal reasoning? Self-Assessment Quiz 1. In enumerative induction, what do we mean by the terms "target group," "sample," and "relevant property"? 2. What is the logical form of enumerative induction, described schematically? 3. What are the two major ways in which an enumerative induction can fail to be strong? 4. In statistical syllogism, what do we mean by the terms individual, group, char acteristic, and proportion? 8 | Inductive Reasoning For each of the following enumerative inductions, state whether the argument is strong or weak. If it's weak, indicate whether the problem is a sample that's too small, not representative, or both. 5. Look at the evidence! David Milgaard was wrongly convicted of murder in Saskatchewan in 1970. Donald Marshall Jr. was wrongfully convicted of murder in Nova Scotia in 1971. And Guy Paul Morin was wrongfully convicted, in 1994, of the 1984 murder of Christine Jessop in Ontario. People whose last names begin with an M get a raw deal from the Canadian justice system! 6. Over 90 per cent of the members of a national women's amateur hockey league (2500 members) are in favour of additional funding for amateur sports. Everyone in my running club is in favour of such funding. And all my pals from the gym are in favour of more funding for amateur sports. The fact is, almost all Canadians who are concerned with their fitness are in favour of additional funding for amateur sport. 7. In November, my kid got sick just before I went to Vancouver on business. In February my husband and I went on a two-day vacation, and my kid got sick again. It seem like every time I leave town, my kid gets sick. 8. Canadians are still fond of their first prime minister, Sir John A. Macdonald. A poll showed that the largest group of respondents—44 per cent—disapprove of removing Macdonald's name from buildings and landmarks, even though some of his policies caused harm to Indigenous peoples.3 9. I taught Nancy to play tennis last summer, and before long she was kicking my butt at it. And even though she just took up squash this year, she is already talking about joining a competitive league. That girl is good at just about any sport! 10. Media coverage of police brutality in Toronto has taught me that the cops are not to be trusted under any circumstances. They're just power-hungry bullies who will try to abuse their power whenever they can. Evaluate each of the following arguments by analogy, indicating (1) the two things being compared, (2) the conclusion, and (3) whether the argument is strong or weak. 11. "Suppose that someone tells me that he has had a tooth extracted without an anaesthetic, and I express my sympathy, and suppose that I am then asked, How do you know that it hurt him? I might reasonably reply, 'Well, I know that it would hurt me. I have been to the dentist and know how painful it is to have a tooth stopped without an anaesthetic, let alone taken out. And he has the same sort of nervous system as I have. I infer, therefore, that in these conditions he felt considerable pain, just as I should myself.'" (Alfred J. Ayer) 12. "As for one who is choosy about what he learns . . . we shall not call him a lover of learning or a philosopher, just as we shall not say that a man who is difficult 337 338 Part Three | Arguments about his food is hungry or has an appetite for food. We shall not call him a lover of food but a poor eater. . . . But we shall call a philosopher the man who is easily willing to learn every kind of knowledge, gladly turns to learning things, and is insatiable in this respect." (Socrates) 13. "Recently, several state attorneys general have announced their plans to use the coercive power of their offices to obtain confidential business information from ExxonMobil. The argument goes that Exxon perpetrated a fraud on consumers over the last several decades by misleading them into believing that climate change is false and that emission of greenhouse gases is harmless. The investigation is supposedly justified based on an analogy to the tobacco fraud litigation. . . . The tobacco companies were accused of inducing consumers to purchase cigarettes through misleading characterization of nicotine's risks." (Damien Schiff, The Hill, 16 April 2016) Analyze each of the following causal arguments. Identify the conclusion and whether the argument is weak or strong. If it's weak, explain why with reference to the material in this chapter. 14. I love this new magnetic knee brace. I wrapped it tightly around my knee and didn't run for a couple of days. The next thing you know, my knee felt a lot better. The power of magnets to heal is truly amazing! 15. Smoking and exposure to second-hand smoke among pregnant women pose a significant risk to both infants and fetuses. According to numerous studies, each year the use of tobacco causes thousands of spontaneous births, infant deaths, and deaths from SIDS (Sudden Infant Death Syndrome). Death rates for fetuses are 35 per cent higher among pregnant women who smoke than among pregnant women who don't smoke. 16. Why are crime rates so high, the economy so bad, and our children so prone to violence, promiscuity, and vulgarity? These social ills have arisen—as they always have—from the "moral vacuum" created when Canadians turn away from religion. Our current slide into chaos started when kids stopped saying "The Lord's Prayer" before class and families stopped saying grace before dinner. And as God has slowly faded from public life, we have got deeper in the hole. 17. Ken's electronics store wanted to find out how to build the best computer, so they conducted a multitude of tests on 20 different hardware configurations of computers. Of the 20 configurations, all of them scored highly on the energy efficiency test except the one computer with the newest NVidia graphics card. Thinking there might be a problem with the overall configuration of the computer, Ken decided to put the NVidia graphics card into the other 19 computers while keeping all their other parts the same. He found that the energy efficiency test scores for all the other computers dropped dramatically after the graphics card was installed. Ken concludes that the 8 | Inductive Reasoning newest NVidia graphics card makes computers less energy-efficient and that he shouldn't use them. 18. Cancer is mainly caused by TV. Cancer rates have risen substantially since the middle of the twentieth century when TV first became popular. Today, people even watch TV on their computers and mobile phones. And in rural parts of Japan, where they don't have TV, cancer is seldom reported at all. 19. Yesterday my astrological chart said that I would meet an attractive person today, and I did. Last week, it said I'd come into some money, and I did. (I got paid the very next day, Friday.) Now I'm a believer. The stars really do rule our lives. 20. Most of the terminal cancer patients in this ward who had positive attitudes about their disease lived longer than expected. Most of the negative-attitude patients didn't live as long as expected. A positive attitude can increase the life expectancy of people with terminal cancer. Integrative Exercises These exercises pertain to material in Chapters 3 and 6–8. For each of the following arguments, specify the conclusion and premises, and say whether it is deductive or inductive. If it's deductive, use Venn diagrams or truth tables to determine its validity. If it's inductive, say whether it's an enumerative, analogical, statistical, or causal induction and whether it's strong or weak. If necessary, add implicit premises and conclusions. 1. All businesses are liars, so some liars are innovators. Because, after all, some businesses are innovators. 2. Neighbours heard the dog barking just after 7 p.m.—and Mr Levin was found dead just after 8 p.m. This doesn't prove that the barking of the dog killed him, but it does show that the two events—the dog's barking and the death of Mr Levin—were somehow causally linked. 3. If society truly cared about the safety of our children, they would outlaw the civilian use and ownership of guns completely. Since Canadians can still own and use guns for hunting and recreation, our society must not care about the safety of our children. 4. "If we take in hand any volume; of divinity or school metaphysics, for instance; let us ask, Does it contain any abstract reasoning concerning quantity or number? No. Does it contain any experimental reasoning concerning matter of fact and existence? No. Commit it then to the flames; for it can contain nothing but sophistry and illusion." (David Hume) 339 340 Part Three | Arguments 5. Pharmacists have substantial scientific knowledge. Anyone who has scientific knowledge knows that homeopathic remedies contain no active ingredients. So any pharmacist who sells or recommends a homeopathic remedy is selling or recommending something he or she knows has no active ingredient. 6. Dr Gosling says that anyone who has missed two or more doses of medication should be considered a non-compliant patient and can't be a patient in his medical practice anymore. But anyone can miss a pill or two; in some cases, it happens because people just can't afford their medication. Gosling's rules are punishing people for being poor. 7. Whenever Nancy eats something with garlic in it, she gets a stomach ache. She got a stomach ache in the hour after dinner, so the dressing on the salad must have had garlic in it. 8. If we increase security in the country because of terrorist attacks, our personal freedoms will be reduced. If we do not increase security in the country, terrorist attacks will increase. So either our personal freedoms will be curtailed or terrorist attacks will increase. 9. Because the core values of the Canada Health Act are universality and accessibility, we believe it is crucial that health care in Canada remain a public good, and we reject two-tier health care of any kind. 10. As former Prime Minister Pierre Elliott Trudeau argued when he was justice minister, "The state has no place in the bedrooms of the nation." This implies that governments should take no notice of people's gender or sexual orientation. When it comes to issuing marriage licences, then, all people must be equal under the law. 11. [Be careful: This one has an unstated conclusion.] The standard of living in Canada ranks among the very highest in the world. Yet that fact glosses over some very uncomfortable facts. Despite its promises and obligations, the Canadian government has done little to improve the lot of its Indigenous peoples, many of whom continue to struggle with poverty, poor health care, and substandard educational opportunities. And many Indigenous communities continue to be plagued by crime and addiction. 12. Almost all of the owners of restaurants, bars, and clubs in Halifax are opposed to the city's total ban on smoking in indoor public places. The vast majority of Haligonians simply do not like this law. 13. Most people who are good at math go into engineering. After all, every engineering major I know is really good at math. 14. "The evils of the world are due to moral defects quite as much as to lack of intelligence. But the human race has not hitherto discovered any method of eradicating moral defects. . . . Intelligence, on the contrary, is easily improved by methods known to every competent educator. Therefore, until some method of teaching virtue has been discovered, progress will have to be sought by improvement of intelligence rather than of morals." (Bertrand Russell) 8 | Inductive Reasoning 15. Television is destroying morality in this country. As TV violence, sex, and vulgarity have increased, so have violent crimes, sexual assaults, and violations of obscenity laws. 16. When dolphins are rewarded with food that they like, they are more likely to perform tricks. When provided with food that they didn't like, they often refused to perform any tricks altogether. So researchers concluded that good food makes dolphins perform tricks. 17. "Some people would have us believe that the Supreme Court of Canada, emboldened by the Charter of Rights and Freedoms, has adopted an increasingly 'activist' stance and is now usurping powers that should legitimately be exercised by the legislature. . . . [But] it is highly misleading to speak as though the Supreme Court is taking power away from the legislature when it rules on charter cases. The role of the Supreme Court is to decide whether the legislature has satisfied the conditions required for the creation of legitimate law. Thus the only power that the Supreme Court takes away, when it rules against the legislature, is the power to engage in an illegitimate use of force. And this is not a power that anyone should want the legislature to have." (Joseph Heath, "Why Have a Constitution at All?" Policy Options, October 2003) 18. When asked whether or not they recreationally smoked marijuana, 90 per cent of the students at QWE Community College said "yes." A recent scientific study shows that students who smoke marijuana recreationally end up trying harder drugs. Since George will be attending QWE Community College, he will end up trying hard drugs. 19. The expansion of the new airport, on an island near downtown, has created serious traffic congestion. There's always a huge lineup of taxis near the ferry terminal waiting to pick up arriving passengers, and the excess traffic often backs up into neighbouring streets. I've lived here for years and have never seen such serious traffic delays downtown. Now, almost every weekday, traffic is a nightmare. 20. Look, you're either going to come out with us tonight or you're going to stay home. If you come out with us, you won't be able to study for tomorrow's quiz, and so you'll probably fail it. If you stay home, you'll be able to study. But even if you study, the professor is totally unfair, so you'll probably fail anyway. Either way, you're probably going to fail. Writing Assignments 1. In a 250-word essay, use an enumerative inductive argument to argue that your school is (or is not) relatively free of plagiarism. Feel free to invent some plausible data to flesh out your argument. 2. Using either enumerative induction or argument by analogy, write a 500word rebuttal to Essay 6 ("Raspberry Ketone, Pure Green Coffee Extract, 341 342 Part Three | Arguments Garcinia Cambogia, Weight Loss, and the Fallacy of Appealing to Authority") in Appendix A. 3. In a short essay (400–500 words), argue for or against one of the following claims. At the end of your essay, indicate in point form what type of argument you have produced (inductive or deductive, analogical, causal, etc.) and what the key strength of your argument is. • The people of Canada enjoy the highest levels of freedom on earth. • People are fundamentally selfish. • People caught texting while driving—endangering their fellow citizens— should be put in jail. • Racial discrimination is not a problem at your school. • Aggressive behaviour in business is a bad thing. • No topics should be forbidden for discussion on a university campus. Notes 1. 2. Susan Blackmore, "Psychic Experiences: Psychic Illusions," Skeptical Inquirer 16: 367–76. "Spurious Correlations," . Used by Permission of the Skeptical Inquirer Magazine www.csicop.org. 3. "The Plurality Disapprove of Removing Sir John A. MacDonald's Name from Things," The Form Poll, 27 January 2018, sir-john-a-january-2017. PART FOUR Explanations 9 Inference to the Best Explanation Chapter Objectives Explanations and Inference You will be able to • define inference to the best explanation and understand how it differs from other kinds of induction. • clarify what an explanation (including theoretical explanation) is and how it differs from an argument. • appreciate how inference to the best explanation is used in all disciplines and in everyday life. • demonstrate how to use inference to the best explanation in a range of different situations. Theories and Consistency You will be able to • check an explanation for internal and external consistency. Theories and Criteria You will be able to • • • • understand the importance of using criteria to judge the adequacy of theories. list and explain the five criteria of adequacy. apply the criteria of adequacy to simple causal theories. define and explain an ad hoc hypothesis. 9 | Inference to the Best Explanation Telling Good Theories from Bad You will be able to • list and explain the four steps in the TEST formula. • recognize the importance of considering alternative explanations. • use the TEST formula to evaluate theories. L et's take stock of the inductive terrain we've travelled so far. In Chapter 8, we closely examined the nature and uses of inductive reasoning. We were reminded that a deductive argument, unlike an inductive one, is intended to provide logically conclusive support for its conclusion. If it succeeds in providing such support, it is said to be valid; if it does not, it is invalid. If a valid argument has true premises, it is said to be sound. But an inductive argument is intended to supply only probable support for its conclusion. If it manages to provide such support, it is said to be strong; if it does not, it is weak. The conclusion of an inductively strong argument is simply more likely to be true than not. If a strong argument has true premises, it's said to be cogent. We also saw that inductive arguments come in several forms. One of them is enumerative induction in which we reason from premises about some members of a group to a conclusion, or generalization, about the group as a whole. All the swans you have ever seen are white, so you conclude that all swans are white. Forty per cent of the students at your university have a driver's licence, so you conclude that forty per cent of all students everywhere must have a driver's licence. (Whether these enumerative inductive arguments are strong or cogent is another matter.) Another kind of inductive argument is argument by analogy (or analogical induction) in which we reason that since two or more things are similar in several respects, they are likely to be similar in some additional respect. In an analogical induction you might argue, for example, that (1) since humans can move about, solve mathematical equations, win chess games, and feel pain, and (2) since robots are like humans in that they can move about, solve mathematical equations, and win chess games, it is therefore probable that robots can also feel pain. Analogical induction, like all inductive reasoning, can establish conclusions only with a degree of probability. Finally, we saw that causal arguments—inductive arguments whose conclusions contain causal claims—can be enumerative inductions, analogical inductions, or arguments that rely on Mill's methods and similar kinds of inferences. Reasoning well about causal connections means avoiding numerous common errors, including misidentifying or overlooking relevant factors, confusing coincidence with cause, and committing the post hoc fallacy. We previously noted only in passing that there is another kind of inductive reasoning that is so important that all of Part 4 of this book is devoted to 345 346 Part Four | Explanations Review Notes A Look Back at the Basics • • • • Statement (claim): An assertion that something is or is not the case. Premise: A statement given in support of another statement. Conclusion: A statement that premises are intended to support. Argument: A group of statements in which some of them (the premises) are intended to support another of them (the conclusion). • Indicator words: Words that are frequently found in arguments and signal that a premise or conclusion is present. • Deductive argument: An argument intended to provide conclusive support for its conclusion. • Inductive argument: An argument intended to provide probable support for its conclusion. inference to the best explanation A form of inductive reasoning in which we reason from premises about a state of affairs to an explanation for that state of affairs: Phenomenon Q. E provides the best explanation for Q. Therefore, it is probable that E is true. theoretical explanation A theory, or hypothesis, that tries to explain why something is the way it is, why something is the case, or why something happened. it: inference to the best explanation. Well, here we are in Part 4, and so it's time to look closely at this kind of inductive reasoning, perhaps the most commonly used form of inference and arguably the most empowering in daily life. Explanations and Inference Recall from Chapter 1 that an explanation is a statement (or statements) asserting why or how something is the case. For example: I can't use my phone because the battery is dead. He was sad because his dog had died. She cracked the egg by hitting it against the edge of the bowl. These explanations and all others are intended to clarify and elucidate and thus to increase our understanding. Remember too our discussion of the important distinction between an explanation and an argument. Whereas an explanation tells us why or how something is the case, an argument gives us reasons for believing that something is the case. As you've probably already guessed, there are also different kinds of explanations (see the Review Notes box "The Lore of Explanations" on page 318). For instance, some explanations are what we might call procedural—they try to explain how something is done or how an action is carried out. ("She opened up the engine, then examined the valves, and then checked the carburetor.") Some are interpretive—they try to explain the meaning of terms or states of affairs. ("This word means 'fancy' or 'showy.'") And some are functional—they try to explain how something functions. ("The heart circulates and oxygenates the blood.") But the kind of explanation we're concerned with here—and the kind we bump into most often—is what we'll call, for lack of something snappier, a theoretical explanation. Such explanations are theories, or hypotheses, that try to explain why something is the way it is, why something is the case, or why something happened. In this category we must include all explanations intended to explain the cause of events—the causal explanations that are so important to both 9 | Inference to the Best Explanation science and daily life. Theoretical explanations, of course, are claims. They assert that something is or is not the case. Don't be scared off by the word theoretical here. We're not necessarily talking about science, although the pursuit of theoretical explanations does play a very large role in science. Theoretical explanations, as you'll see below, are very often common-sense explanations of everyday things. When you assert that "the house is cold because someone left a window open," you're offering a theoretical explanation. Now, even though an explanation is not an argument, an explanation can be part of an argument. It can be the heart of the kind of inductive argument known as inference to the best explanation. And in this kind of inference, the explanations we use are theoretical explanations. In inference to the best explanation, we reason from premises about a state of affairs to an explanation for that state of affairs. The premises are statements about observations or other evidence to be explained. The explanation is a claim about why the state of affairs is the way it is. The key question that this type of inference tries to answer is "What is the best explanation for the existence or nature of this state of affairs?" The best explanation is the one most likely to be true, even though there is no guarantee of its truth as there is in deductive inference. Recall that enumerative induction has this pattern: X per cent of the observed members of group A have property P. Therefore, X per cent of all members of group A probably have property P. And recall that analogical induction has this pattern: Thing A has properties P1, P2 , and P3, plus the property P4. Thing B has properties P1, P2 , and P3. Therefore, thing B probably has property P4. Inference to the best explanation, however, has this pattern: I've noticed phenomenon Q. E provides the best explanation for Q. Therefore, it is probable that E is true. For example: The new quarterback dropped the ball again. The best explanation for that screw-up would be that he's nervous. So I think he's definitely nervous. The best explanation for Maria's absence today is that she's angry at the boss. Yeah, she's mad at the boss all right. The defendant's fingerprints were all over the crime scene, the police found the victim's blood on his shirt, and he was in possession of 347 "There is nothing more practical than a good theory." —Leonid Ilyich Brezhnev 348 Part Four | Explanations Chris Wildt/www.CartoonStock.com the murder weapon. The only explanation for all this that makes any sense is that the defendant actually committed the crime. So he must be guilty. If the explanations in these arguments really are the best, then the arguments are inductively strong. And if the premises are also true, then the arguments are cogent. If they are cogent, we are justified in believing that the explanations provided for these phenomena are in fact correct. Notice that an inference to the best explanation always goes "beyond the evidence"—it tries to explain facts but does so by positing a theory that is not derived entirely from those facts. It tries to understand the known by putting forth—through inference and imagination—a theoretical pattern that encompasses both the known and the unknown. It proposes a plausible pattern that expands our understanding. The fact that there are best explanations, of course, implies that not all explanations for a state of affairs are equally good; some are better than others. Just because you've come up with an explanation for something doesn't mean that you're justified in believing that the explanation is the right one. If other explanations are just as good, your explanation is in doubt. If other explanations are better than yours, you are not justified in believing yours. But much of the time, after further study or thought, you can reasonably conclude that a particular explanation really is the best explanation. (We'll see later how to evaluate the quality of an explanation.) In this way, you can come to understand the state of affairs better than you did before. Inference to the best explanation probably seems very familiar to you. That's because you use it all the time—and need it all the time. Often, when we try to understand something in the world, we construct explanations for why this something is the way it is, and we try to determine which of these explanations is the best. Devising explanations helps to increase our understanding by fitting our experiences and background knowledge into a coherent pattern. At every turn we are confronted Causation can be hard to figure out. And no, technology won't with phenomena that we can only fully always help. How might building a proper causal argument help you to determine which explanation is the best? understand by explaining them. 9 | Inference to the Best Explanation 349 Review Notes The Lore of Explanations An explanation is a statement (or statements) asserting why or how something is the case. In traditional terminology, the fancy term for the thing that is to be explained in an explanation is explanandum, and the term for the thing that does the explaining is explanans. Take this explanation: "The dog barked because a prowler was nearby." In this example, the explanandum is "the dog barked," and the explanans is "a prowler was nearby." You can categorize explanations in many ways, depending on the kind of explanandum you're interested in. Here are a few of the more common categories: • Teleological explanations try to explain the purpose of something, how it functions, or how it fits into a plan. (Telos is a Greek word meaning "end" or "purpose.") Example: The wall switch is there so you can turn off the lamp from across the room. Example: These wildflowers are here as a blessing from God. • Interpretive explanations concern the meaning of terms or states of affairs. These explanations seek to understand not the purpose or cause of something but rather its sense or semantic meaning. Example: When Mary smiled and nodded, she was indicating her agreement. Example: The verb to effect means to accomplish, but the verb to affect means to influence. • Procedural explanations try to explain how something is done or how an action is carried out. Example: To cool the broccoli and keep it from cooking further, Eric plunged it into ice water. Example: She paid his taxes by filling in the online forms and then using her credit card number. In all cases, remember that an example of an explanation is not always an example of a good explanation! Each of the examples above is an explanation, but without knowing more about the situations referred to, we cannot know whether they are the best, or even plausible, explanations. Sometimes we're barely aware that we're using inference to the best explanation. If we awaken and see that the streets outside are wet, we may immediately posit this explanation: it's been raining. Without thinking much about it, we may also quickly consider whether a better explanation is that a street-sweeper machine has wet the street. Just as quickly we may dismiss this explanation because we see that the houses and cars are also wet. After reasoning in this fashion, we may decide to carry an umbrella that day. Let's consider a more elaborate example. Say you discover that your car won't start in the morning; that's the phenomenon to be explained. You would like to know why it won't start (the explanation for the failure) because you can't take appropriate action unless you know what the problem is. You know that there are several possible explanations or theories: 1. The battery is dead. 2. The fuel tank is empty. "A superstition is a premature explanation that overstays its time." —George Iles 350 Part Four | Explanations Food For Thought Darwin and the Best Explanation It can hardly be supposed that a false theory would explain, in so satisfactory a manner as does the theory of natural selection, the several large classes of facts above specified. It has recently been objected that this is an unsafe method of arguing; but it is a method used in judging of the common events of life, and has often been used by the greatest natural philosophers.1 © shalamov/iStockphoto Charles Darwin (1809–82) offered the theory of evolution by natural selection as the best explanation for a wide variety of natural phenomena. He catalogued an extensive list of facts about nature and showed that his theory explained them well. He argued that, on the other hand, the alternative theory of the day—the view that God independently created various species— did not explain them. Darwin declared: The blue-footed booby was one of the many species collected by Charles Darwin in the Galapagos Islands. How can alternate theories lead to accurate theories? 3. The starter has malfunctioned. 4. A vandal has sabotaged the car. 5. All or several of the above. So you need to try to figure out which theory is the most plausible, that is, most likely to be true. Let's say you see right away that there is snow around the car from yesterday's snowstorm—and there are no footprints (except yours) and no signs of tampering anywhere. So you dismiss theory 4. You remember that you filled up the gas tank yesterday, the fuel gauge says that the tank is full, and you don't see any signs of leakage. So you can safely ignore theory 2. You notice that the lights, heater, and radio work fine and the battery gauge indicates a fully charged battery. So you discard theory 1. When you try to start the car, you hear a clicking sound like the one you heard when the starter had failed previously. Among the theories you started with, then, theory 3 now seems the most plausible. This means that theory 5 also cannot be correct, since it involves two or more of the theories and you've already ruled out all but one. If you wanted to, you could state your argument like this: (1) Your car won't start in the morning. (2) The theory that the starter has malfunctioned is the best explanation for the car's not starting in the morning. (3) Therefore, it's probable that the malfunctioning starter caused the car not to start in the morning. 9 | Inference to the Best Explanation 351 Note what you've accomplished here: you've started with a description of a situation, evaluated possible explanations, and reasoned your way to a causal conclusion. In science, where inference to the best explanation is an essential tool, usually the theories of interest are causal theories in which events are the things to be Food For Thought The fictional character Sherlock Holmes owes his great success as a detective primarily to inference to the best explanation. He is, in the stories written by Sir Arthur Conan Doyle, so good at this kind of inference that people (especially his sidekick, Dr Watson) are frequently astonished at his skill. Holmes, however, is guilty of spreading some confusion about his ability. He calls his method deduction, though it is clearly inductive. Here is Holmes in action, speaking to Dr Watson shortly after meeting him for the first time: I knew you came from Afghanistan. From long habit the train of thoughts ran so Inductive arguments sometimes only need one really swiftly through my mind that I arrived at good premise, based on one really important observation. How does Sherlock Holmes successfully use the conclusion without being conscious of inference to the best explanation? intermediate steps. There were such steps, however. The train of reasoning ran, "Here is a gentleman of medical type, but with the air of a military man. Clearly an army doctor, then. He has just come from the tropics, for his face is dark, and that is not the natural tint of his skin, for his wrists are fair. He has undergone hardship and sickness, as his haggard face says clearly. His left arm has been injured. He holds it in a stiff and unnatural manner. Where in the tropics would an English army doctor have seen much hardship and got his arm wounded? Clearly in Afghanistan."2 Jack Ziegler/The New Yorker Collection/The Cartoon Bank Sherlock Holmes and Inference to the Best Explanation Here Holmes explains how he knew that a man had "gone about in fear of some personal attack within the last twelve-month": "You have a very handsome stick," I answered. "By the inscription I observed that you had not had it more than a year. But you have taken some pains to bore the head of it and pour melted lead into the hole so as to make it a formidable weapon. I argued that you would not take such precautions unless you had some danger to fear."3 In each of these cases, Holmes makes an observation and then seeks to arrive at a theory as to what would best explain what he has observed. 352 Part Four | Explanations explained and the proposed causes of the events are the explanations. Just as we do in everyday life, scientists often consider several competing theories for the same event or phenomenon. Then—through scientific testing and careful thinking— they systematically eliminate inadequate theories and eventually arrive at the one that's rightly regarded as the best of the bunch. Using this form of inference, scientists discover planets, viruses, cures, subatomic particles, black holes—as well as many things that can't even be directly observed. And then there are all those other occupations and professions that rely on inference to the best explanation. Physicians use it to pinpoint the cause of symptoms in patients. Police detectives use it to track down lawbreakers. Judges and juries use it to determine the guilt or innocence of accused persons. And mechanics use it to determine why a car is failing to function properly. With so many people in so many areas of inquiry using inference to the best explanation, you would expect the world to be filled with countless theories proposed by innumerable people looking to explain all sorts of things. And so there are. Here's a brief table of notable or interesting proposed theories and the phenomena they are meant to explain: Theory To Explain . . . Atomic Behaviour of subatomic particles Germ Spread of disease HIV Cause of AIDS Oedipus complex Behaviour of men and boys Placebo effect Apparent cure of disease Bleak winters Why Canadians are funny Violent video games Violence in children El Niño Bad weather El Niña Good weather Incumbent politicians A bad economy Carbon emissions related to human activity Climate change Of course, it's often easy to make up theories to explain things we don't understand. The harder job is sorting out good theories from bad, a topic we'll explore more fully later in this chapter. Exercise 9.1 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. 9 | Inference to the Best Explanation 1. What is an explanation? 2. What is inference to the best explanation? 3. Is inference to the best explanation inductive or deductive? *4. What is it that theoretical explanations attempt to explain? 5. What is the basic logical pattern of inference to the best explanation? For analogical induction? For enumerative induction? 6. Under what circumstances can an inference to the best explanation be deemed strong? Cogent? 7. What is an interpretive explanation? A teleological explanation? A procedural explanation? *8. What is a causal explanation? Are causal explanations used in inference to the best explanation? 9. How does the kind of explanation used in inference to the best explanation differ from a procedural explanation? 10. Give an example of an occupation or profession whose members make regular use of inference to the best explanation in their work. Give an example of how they use it. 11. Have you seen someone you know use inference to the best explanation today? If so, how did they use it? (Give an example from people you observed or spoke to today.) Exercise 9.2 For each of the following explanations, say what state of affairs is being explained and what the explanation is. 1. Applications from foreign students to Canadian universities are up these days because more students are avoiding the United States. *2. We all know that the polar bear is endangered, and the only explanation for that is the thinning of Arctic ice, caused by global warming. 3. Why is Georgia wearing orange goggles? Because she's a bit eccentric and she likes the way they look. 4. Nursing students love Professor Walton's class because she takes dull material and makes it interesting. *5. Yes, I can tell you why the "hot" water from your faucet isn't very hot: your hot-water heater is over 20 years old and just can't keep up with modern water usage patterns. 6. Many consider crows to be one of the smartest animals in the world. They have been shown to be able to make and use rudimentary tools and can even recognize human faces. 7. Americans are fond of the death penalty, but Europeans and Canadians are not. Americans just never got over the old Wild West eye-for-an-eye 353 354 Part Four | Explanations mentality. Europeans never had a Wild West, and Canada's west was kept orderly by the North West Mounted Police, the police force that eventually became the RCMP. *8. Boy, are my hands shaking! I think I've been drinking too much coffee. 9. Corporate CEOs make so much money because the skills they have are highly in demand. 10. It wasn't about greed. Toby fudged the numbers in the monthly sales reports out of loyalty—out of a desire to make the boss look good. Exercise 9.3 For each of the following, determine whether the type of explanation offered is theoretical (the kind used in inference to the best explanation) or non-theoretical (e.g., teleological, interpretive, procedural). Be careful to note any borderline cases (explanations that could be either theoretical or non-theoretical). 1. He knew her username and guessed her password—that's how he got into her email. 2. Homeopathic treatments are controversial because while such treatments have many fans, scientists say they are entirely without scientific merit. 3. Ethics is the critical study of morality. *4. Horatio caught a cold because he stood outside in the cold rain. 5. There is no peace in the Middle East—and there never will be—because of the stubbornness of all sides in the conflict. 6. A cat that has dilated pupils, an arched back, and ears folded all the way back is one that is ready to pounce. *7. When you experience memory loss, that can only mean one thing: Alzheimer's disease. 8. Dana took the job on Bay Street so that he could pay off his student loans. 9. She did well on her essay by starting it early, writing a clear outline, researching the topic, and paying attention to the way she expressed her ideas. 10. He keeps the music box on his desk because it reminds him of his long lost love. 11. The plunger beside the toilet is just there in case of a clogged drain. *12. That painting is without vibrancy or cohesion. Just look at the dull colours and mishmash of forms. 13. J.P. has trouble keeping women employees because he doesn't treat them with respect. 14. Sam has been weight-training, so she's pretty buff. 15. Blech! I got food poisoning after eating a bad burger at the campus pub. 16. I misunderstood the instructions because my understanding of Cantonese is not very good. 17. I always wear these socks when I play hockey—for good luck! 9 | Inference to the Best Explanation Exercise 9.4 In each of the following examples, a state of affairs is described. Devise two theories to explain each one. Include one theory that you consider plausible and one theory that you think is not plausible. 1. Small, local coffee shops in my area have all been closing down one by one over the past six months. None of the owners has given any explanation as to why. They've just gone without even saying goodbye. Some of my neighbours pointed out that Starbucks shops have filled those vacant locations, one by one. *2. When Jack came home, he noticed the window in the kitchen was broken, there were muddy footprints on the kitchen floor, and some valuable silverware was missing. 3. Mutilated cows have been found on the outskirts of several towns in western Canada. In each case, organs are missing from the carcasses. There are never any signs of vehicle tracks or footprints. The precise cause of death is unknown. The method used to remove the organs is also unknown, although the wounds show indications that precise surgical tools were used. 4. Many Canadians are now avoiding travel to the United States. 5. During the 1980s, the demand for food assistance rose dramatically, and a massive charitable food-assistance system emerged. *6. Alice has been taking vitamin C every day for a year, and during that time she has not had a cold or a sore throat. 7. I drank four glasses of red wine and ate a bag of chips last night. And this morning I woke up with a headache. 8. Scientists have discovered that there is a direct correlation between saturated fat in people's diets and heart disease. The more saturated fat, the greater the risk of heart disease. 9. The most famous act performed by the illusionists Penn and Teller is the one in which they catch bullets in their teeth. The audience sees Penn and Teller fire powerful .357 Magnum handguns at each other, and then each of the pair smiles to reveal a bullet resting safely between his teeth. Exercise 9.5 Read each of the following passages, and answer these questions: 1. What is the phenomenon being explained? 2. What theory is suggested as a possible explanation for the phenomenon? 3. Is the theory plausible? If not, why not? 4. Is there a plausible theory that the writer has overlooked? If so, what is it? 355 356 Part Four | Explanations Passage 1 Students who major in philosophy tend to do very well on the Law School Admissions Test (LSAT) and Medical College Admissions Test (MCAT). This is because studying philosophy gives students a chance to practise the abstract reasoning skills that are the key to success on such tests. Passage 2 "The number of worldwide unprovoked shark attacks dropped 17.3 per cent in 2016. "The International Shark Attack File (ISAF) analyzed 150 incidents involving shark–human interaction and concluded that 81 of these events were, in fact, unprovoked attacks on humans. "In 2015, the number shark attacks had hit 98. According to the ISAF, an unprovoked attack is an attack that occurred in the shark's habitat with no human provocation of the predator. "'These totals are remarkably low given the billions of human- hours spent in the water each year,' explains George H. Burgess, curator of the International Shark Attack File, a project run at the University of Florida. "The long-term trend in fatality rates has been one of constant reduction over the past 11 plus decades, reflective of advances in beach safety practices and medical treatment, and increased public awareness of avoiding potentially dangerous situations."4 Passage 3 "If you smoke cigarettes or drink alcohol daily, you may want to consider letting your tea cool before you enjoy it. Drinking tea while it's too hot could increase your risk of esophageal cancer, a new study suggests. "In the study, published Monday in the Annals of Internal Medicine, drinking 'hot' or 'burning hot' tea was associated with a two- to fivefold increase in esophageal cancer, but only in people who also smoked or drank alcohol. "The study, the largest of its kind, followed close to 500,000 adults in China over an average of 9½ years. Because of the large size, it may set the bar for years to come, according to Neal Freedman, senior investigator at the National Cancer Institute in Bethesda, Maryland, who was not involved in the new research. "Participants who drank tea on a weekly basis were asked to describe its temperature as 'warm,' 'hot' "or 'burning hot.' Drinking 'hot' or 'burning hot' tea was not, by itself, a predictor of esophageal cancer, which is good news for tea aficionados. 9 | Inference to the Best Explanation 357 "'Drinking hot tea contributed to cancer only when it clustered with smoking and drinking alcohol excessively,' Jun Lv, a professor in the Department of Epidemiology and Biostatistics at Peking University, said. "'Very hot drinks could make the esophagus more vulnerable to known cancer-causing agents such as alcohol and smoke,' Freedman said. "'Irritating the lining of the esophagus could lead to increased inflammation and more rapid turnover of the cells,' he said. 'Alternatively, hot liquids may impair the barrier function of the cells lining the esophagus, leaving the tissue open to greater damage from other carcinogens.' "So tea drinkers who don't smoke or drink alcohol excessively probably don't need to switch to a different beverage anytime soon, according to Lv. "'Of course, keeping away from both tobacco and excessive alcohol use is the most important means for esophageal cancer prevention,' she added." 5 Passage 4 In Canada, women are wildly under-represented on corporate boards of directors. Despite making up more than half the population and a growing proportion of business-school graduates, women make up only about 20 per cent of the boards of publicly traded companies. But the reason is clear: women simply don't have business instincts required to be involved in the crucial task of guiding a big company. Besides, women generally don't want to be on boards—it seems like that's just not the kind of role women want. If they did want to play that kind of role, there would be more of them actively seeking board positions. Abductive Reasoning The process involved in making an inference to the best explanation is sometimes referred to by philosophers as abduction, or abductive reasoning. Abductive reasoning involves looking at a phenomenon, or a set of circumstances, and putting forward a hypothesis as to what would be a good explanation for that phenomenon or those circumstances. For example, imagine you're at home and you hear a loud bang outside. Your mind immediately generates some possible explanations—some potential sources of such a noise. Maybe it occurs to you that the noise might have been produced abduction (abductive reasoning) The form of reasoning used when putting forward a hypothesis as to what would explain a particular phenomenon or set of circumstances. 358 Part

Four | Explanations by a car backfiring. You then have the option of looking outside to verify your hypothesis or looking for other evidence that might tend to confirm or disconfirm it. Are there any cars on the street? Abduction is sometimes half-seriously referred to as a process that involves making a guess. And it’s true that abduction involves something like guesswork: if the facts of the case pointed to one, and only one, possible explanation, then we would be dealing with deduction rather than abduction. But although abduction involves taking a leap, it is not a leap into thin air. Our “guesswork” in such cases should be guided by our background knowledge and, where possible, by experience. If we have an upset stomach, our abductive reasoning about its cause will be guided by our knowledge of what sorts of things can and cannot cause an upset stomach. Of course, our background knowledge can sometimes be misleading, and our experience may be insufficient. We can formalize the process of abduction as follows: O = an observation (the phenomenon that needs to be explained) T = a background theory (about how some part of the world works) E = an explanation (of the observation) In terms of the example cited above: O = a bang outside T = cars sometimes backfire, making a bang E = a car backfired outside your house The process of abduction involves first asking, “Is E consistent with T?” In other words, does E fit with your background knowledge of what sorts of things make loud bangs? Second, abduction involves asking, “Would O follow from E and T together?” In other words, if in fact cars backfiring sometimes make a bang, and if a car backfired outside your house, is it true that you would then hear a bang? That seems quite likely, so E is a pretty good explanation of O in this case. But of course, that’s just a start. Several possible Es may satisfy these conditions; lots may be consistent with both the initial observation and with your background knowledge. You must therefore use some common sense to weed out all sorts of highly improbable possibilities (e.g., a meteor just landed outside your house). Once you’ve narrowed it down a bit—and your brain may well do that automatically—you can apply more formal rules, like our criteria of adequacy. Theories and Consistency Very often we may propose a theory as an explanation for a phenomenon, or we may have a theory presented to us for consideration. In either case, we will likely be dealing with an argument in the form of inference to the best explanation. The conclusion of the argument will always say, in effect, this theory is the best 9 | Inference to the Best Explanation explanation of the facts. And we will be on the hot seat trying to decide if it really is. How do we do that? The work is not always easy, but there are special criteria we can use to get the job done. Before we apply these criteria, though, we have to make sure that the theory in question meets the minimum requirement of consistency. A theory that does not meet this minimum requirement is worthless, so there is no need to use the special criteria to evaluate the theory or to compare it to other available theories. A theory that meets the requirement is at least eligible for further consideration. Here we are concerned with both internal and external consistency. A theory that is internally consistent is consistent with itself—it’s free of contradictions. A theory that is externally consistent is consistent with the data it’s supposed to explain—it fully accounts for the observable data. If we show that a theory contains an internal contradiction, we have refuted it. A theory that implies that something both is and is not the case cannot possibly be true. By exposing an internal contradiction, Galileo once refuted Aristotle’s famous theory of motion, a long-respected hypothesis that had stood tall for centuries. Galileo showed that Aristotle’s theory implied two contradictory things—namely, that a large, light object falls both faster and slower than a small, heavy one. Those things can’t both be true, so there’s a fatal internal contradiction in Aristotle’s theory. If a theory is externally inconsistent, we have reason to believe that it’s false. Suppose you leave your car parked on the street overnight and the next morning discover that (1) the windshield has a large round hole in it, (2) there’s blood on the steering wheel, and (3) there’s a brick on the front seat. And let’s say that your friend Charlie offers this theory to explain these facts: someone threw a brick through your windshield. What would you think about this theory? You would probably think that Charlie had not been paying attention. His theory is consistent with the fact that the windshield is broken, and it would explain why there’s a brick on the seat. And it’s not inconsistent with the observation of blood, though it doesn’t explain it either. But most important, Charlie’s theory (that someone threw a brick—a sharp-edged, rectangular object—through your windshield) is inconsistent with the fact that the hole in the windshield is round. Charlie’s theory is a good try, but it doesn’t work. It’s externally inconsistent— inconsistent with the data. Keep looking for a better answer! 359 “In making theories, keep a window open so that you can throw one out if necessary.” —Bela Schick (Hungarian-born American pediatrician) Review Notes Minimum Requirement: Consistency • Internal consistency: A theory that is internally consistent is free of contradictions. • External consistency: A theory that is externally consistent is consistent with the data it’s supposed to explain. 360 Part Four | Explanations Theories and Criteria For a moment let’s return to our example, discussed earlier in this chapter, of the car that won’t start. Recall that we examined five possible explanations for the non-start phenomenon: 1. 2. 3. 4. 5. The battery is dead. The fuel tank is empty. The starter has malfunctioned. A vandal has sabotaged the car. All or several of the above. But what if someone suggested that our analysis of this problem was incomplete because we failed to consider several other possible theories that they feel are at least as plausible as these five? Consider these, for example: 6. Each night, you are sabotaging your own car while you sleepwalk. 7. Your 90-year-old uncle, who lives 1000 kilometres away from you, has secretly been visiting at night and going for joyrides in your car, thus damaging the engine. 8. A poltergeist (a noisy, mischievous ghost) has damaged the car’s carburetor. 9. Yesterday, you scrambled the electrical system by accidentally driving the car through an alternative space–time dimension. What do you think of these theories? More specifically, are these last four theories really at least as plausible as the first five? If you think so, why? If you think not, why not? A critical perspective is a good start: we shouldn’t accept these theories as plausible just because someone says they are. But next we want to give you some specific tools that you can use to evaluate theories. Remember that the strangeness of a theory is no good reason to discount it. It will not do simply to say that theories 6 to 9 are too weird to be true. In the history of science, plenty of bizarre theories have turned out to be correct. (Quantum theory in physics, for example, is about as weird as you can get.) Earlier we concluded that theory 3 was better (more likely to be true) than theories 1, 2, 4, and 5. But what criteria did we use to arrive at this judgment? And on the basis of what criteria can we say that theory 3 is any better than theories 6 to 9? There must be some criteria because it is implausible that every theory is equally correct. Surely there is a difference in quality between a theory that explains rainfall by positing some natural meteorological forces and one that alleges that Donald Duck causes weather phenomena. A simple answer to the problem of theory choice is this: just weigh the evidence for each theory, and the theory with the most evidence wins. As we will soon see, the amount or degree of evidence that a theory has is indeed a crucial factor—but it cannot be the sole criterion by which we assess explanations. Throughout the history of science, major theories—from the heliocentric theory 9 | Inference to the Best Explanation of the solar system to Einstein’s general theory of relativity—have never been established by empirical evidence alone. Fortunately, there are reasonable criteria and reliable procedures for judging the merits of eligible theories and for arriving at a defensible judgment of which theory is best. The criteria of adequacy are the essential tools of science and have been used (sometimes implicitly) by scientists throughout history to uncover the best explanations for all sorts of events and states of affairs. Science, though, doesn’t own these criteria. They are as useful—and as used—among non-scientists as they are among men and women of science. Applying the criteria of adequacy to a set of theories constitutes the ultimate test of a theory’s value, for the best theory is the eligible theory that meets the criteria of adequacy better than any of its competitors. Here, eligible means that the theory has already met the minimum requirement for consistency. All of this implies that the evaluation of a particular theory is not complete until alternative, or competing, theories are considered. As we’ve seen, there is seemingly no limit to the number of theories that could be offered to explain a given set of data. The main challenge is to give a fair assessment of the relevant theories in relation to each other. To fail to somehow address the alternatives is to overlook or deny relevant evidence, to risk biased conclusions, and to court error. Such failure is probably the most common error in the appraisal of theories. A theory judged, according to these criteria, to be the best explanation for a certain set of facts should be considered worthy of our belief, and we may legitimately claim to know that such a theory is true. But the theory is not then necessarily 361 criteria of adequacy The standards used to judge the worth of explanatory theories. They include testability, fruitfulness, scope, simplicity, and conservatism. Food For Thought Inference to the Best Explanation and the External World In Chapters 10 and 11, we will explore in detail how inference to the best explanation can be used to tackle some big issues. Here we just want to mention one of the “big questions” to which philosophers and other thinkers have applied inference to the best explanation. A problem that has historically occupied thinkers in the history of philosophy is whether we have any good reasons to believe that there is a world outside our own thoughts. That is, is there an external world independent of the way we represent it to ourselves? Some people have denied that we have any such good reasons because we can never look at ourselves “from the outside” to objectively compare our subjective, internal experiences with reality. All we know is the nature of our perceptions—which may or may not be linked to the “real world” in any way. Many philosophers have applied inference to the best explanation to this puzzle. They argue that we can indeed know that there is an external reality because that belief is the best explanation of the peculiar pattern of our perceptions. In other words, the best explanation—though admittedly not the only possible explanation—of why we seem to see a tree in front of us is that there really is a real tree in front of us. Our senses might fool us on particular occasions, but it’s highly unlikely that they are doing so literally all of the time. 362 Part Four | Explanations or certainly true in the way that the conclusion of a sound deductive argument is necessarily or certainly true. Inference to the best explanation, like other forms of induction, cannot guarantee the truth of the best explanation. That is, it is not truth-preserving. The best theory we happen to have examined so far may actually turn out to be false. Nevertheless, we would have excellent reasons for supposing our best theory to be a true theory. The criteria of adequacy are testability, fruitfulness, scope, simplicity, and conservatism. Let’s examine each one in detail. Testability testability A criterion of adequacy for judging the worth of theories. A testable theory is one for which there is some way to determine whether the theory is true or false— that is, it predicts something other than what it was introduced to explain. Most of the theories that we encounter every day and all the theories that scientists take seriously are testable—there is some way to determine whether the theories are true or false. If a theory is untestable—if there is no possible procedure for checking its truth—then it is worthless as an explanatory theory. Suppose someone says that an invisible, undetectable spirit is causing your headaches. What possible test could we perform to tell if the spirit actually exists? None. So the spirit theory is entirely empty; it’s a wild guess that can never be confirmed or disconfirmed, and we can assign no weight to such a claim. Here’s another way to look at it. Theories are explanations, and explanations are designed to increase our understanding of the world. But an untestable theory does not—and cannot—explain anything. It is equivalent to saying that an unknown thing with unknown properties acts in an unknown way to cause a phenomenon—which is the same thing as offering no explanation at all. We often run into untestable theories in daily life, just as scientists sometimes encounter them in their work. Many practitioners of alternative medicine claim that health problems are caused by an imbalance in people’s chi, an unmeasurable form of mystical energy that is said to flow through everyone. Some people say that their misfortunes are caused by God or the Devil. Others believe that certain events in their lives happen (and are inevitable) because of fate. And parents may hear their young daughter say that she did not break the lamp but her invisible friend did. Many theories throughout history have been untestable. Some of the more influential untestable theories are the theory of witches (some people called witches are controlled by the Devil), the moral fault theory of disease (immoral behaviour causes illness), and the divine-placement theory of fossils (God created geological fossils to give the false impression of an ancient Earth). People have believed these theories but not for good reasons. But what does it mean to say that a theory is testable or untestable? A theory is testable if it predicts something other than what it was introduced to explain. Suppose your electric clock stops each time you touch it. One theory to explain this event is that there is an electrical short in the clock’s wiring. Another theory is that an invisible, undetectable demon causes the clock to stop. The wiring theory predicts 9 | Inference to the Best Explanation 363 Review Notes Criteria of Adequacy • • • • • Testability: Whether there is some way to determine if a theory is true. Fruitfulness: The number of novel predictions made. Scope: The amount of diverse phenomena explained. Simplicity: The number of assumptions made. Conservatism: How well a theory fits with existing knowledge. that if the wiring is repaired, the clock will no longer shut off when touched. So it is testable—there is something that the theory predicts other than the obvious fact that the clock will stop when you touch it. But the demon theory makes no predictions about anything except the obvious, the very fact that the theory was introduced to explain. It predicts that the clock will stop if you touch it, but we already know this. So our understanding is not increased, and the demon theory is untestable. Now, if the demon theory says that the demon can be detected with X-rays, then there is something the theory predicts other than the clock’s stopping when touched. You can X-ray the clock and examine the film for demon silhouettes. If the theory says the demon can’t be seen but can be heard with sensitive sound equipment, then once again you have a prediction, something to look for other than clock stoppage. But you’ll note that people who propose such spooky theories are seldom able even to propose a test that could be performed to shed light on the situation. So other things being equal, testable theories are superior to untestable ones; they may be able to increase our understanding of a phenomenon. But an untestable theory is just an oddity. Fruitfulness Imagine that we have two testable theories, theory 1 and theory 2, that attempt to explain the same phenomenon. Theory 1 and theory 2 seem comparable in most respects when measured against other criteria of adequacy. Theory 1, however, successfully predicts the existence of a previously unknown entity, say, a star in an uncharted part of the sky. What would you conclude about the relative worth of these two theories? If you thought carefully about the issue, you would probably conclude that theory 1 is the better theory—and you would be right. Other things being equal, theories that perform this way—that successfully predict previously unknown phenomena—are more credible than those that don’t. They are said to be f ruitful—to yield new insights that can open up whole new areas of research and discovery. This fruitfulness suggests that the theories are more likely to be true. “The weakness of the man who, when his theory works out into a flagrant contradiction of the facts, concludes ‘So much the worse for the facts: let them be altered,’ instead of ‘So much the worse for my theory.’” —George Bernard Shaw fruitfulness A criterion of adequacy for judging the worth of theories. A fruitful theory is one that yields new insights. 364 Part Four | Explanations Food For Thought The Importance (and Fun) of Outrageous Theories Many theories proposed throughout the history of science have been, well, kooky or even outrageous. That is, they have been unorthodox or heretical, with a shockingly different take on the world. The - heliocentric (or sun-centred) theory of our solar system is a prime example. Some of these outrageous theories have turned out to be good theories—they measured up to the criteria of adequacy very well. So an outrageous theory is not necessarily a bad theory. Science as a whole has always been open to offbeat explanations, but they had to be judged to have merit. Most kooky theories in science or on the fringes of science, though, fail the criteria of adequacy miserably. The challenge for scientists and other critical thinkers is to remain open to unorthodox theories but not be afraid to test them through critical reasoning. Besides, offbeat theories are fun. The following theories have been found on the Internet: “Is it strange how, when we are in the middle of summer, it can be raining out, and one day it is very ‘hot,’ the next day it is 15 degree cooler, and two days later, it is ‘hot’ again? Does this seem strange? How about earthquakes in parts of the world, that are so devastating, that if they were to happen here, our whole economy could be ruined. Do you think it is ‘odd’ that people would suggest that the government can and does control the weather? I know it sounds a little paranoid, but if you do the research to investigate, you will undoubtably arrive at the same conclusions. Our weather is controlled!”6 Chris Madden/www.CartoonStock.com “Crystals have been valued by shamans in every part of the world throughout history. Because they act as amplifiers, they have been used to heighten the energy for healings and rituals. In the building of pyramids in ancient Egypt, crystals were the force that enabled the huge sandstone blocks to be positioned precisely. Also, the immense weight of the sandstone pressing of the granite base activated the billions of tiny crystals in the granite, thus creating a gigantic generator.”7 Just because an explanation genuinely is the best one, does that mean it’s going to be welcomed by everyone? What fallacies might lead people to disregard a better theory? “Repressed technology is technology that is being repressed for one reason or another. Some suspect that it’s because releasing it to the general public would have too big an impact upon society. Others think that certain technology is repressed because the inventors of it have been either bought off or threatened so their tech is not used. On this page, you will learn of repressed technology and be informed of what exists even though you ordinarily wouldn’t learn of it through mainstream media sources. . . . Is this the technology that was hinted at in the James Bond movie ‘Die Another Day’? I suspect it is.”8 9 | Inference to the Best Explanation 365 If a friend of yours is walking through a forest where she has never been before, yet she seems to be able to predict exactly what’s up ahead, you would probably conclude that she possessed some kind of accurate information about the forest, such as a map. Likewise, if a theory successfully predicts some surprising state of affairs, you are likely to think that the predictions are not just lucky guesses. All empirical theories are testable (they predict something beyond the thing to be explained). But fruitful theories are testable and then go beyond that—they not only predict something, but they also predict something that no one expected. The element of surprise is hard to ignore. Decades ago, Einstein’s theory of relativity gained a great deal of credibility by successfully predicting a phenomenon that was extraordinary and otherwise entirely unexpected. The theory predicts that light travelling close to massive objects (such as stars) will appear to be bent because the space around such objects is curved. The curve in space causes a curve in nearby light rays. At the time, however, the prevailing opinion was that light always travels in straight lines—no bends, no curves, no breaks. In 1919, the physicist Sir Arthur Eddington devised a way to test this prediction. He managed to take two sets of photographs of exactly the same portion of the sky—when the sun was overhead (in daylight) and when it was not (at night). He was able to get a good photo of the sky during daylight because there was a total eclipse of the sun at the time. If light rays really were bent when they passed near massive objects, then stars whose light passes near the sun should appear to be shifted slightly from their true position (as seen at night, when the sun isn’t a factor). Eddington discovered that stars seen near the sun did appear to have moved relative to their position as seen at night and that the amount of their apparent movement was just what Einstein’s theory predicted. This novel prediction demonstrated the fruitfulness of Einstein’s theory, provided a degree of confirmation for the theory, and opened up new areas of research. So the moral is that, other things being equal, fruitful theories are superior to those that aren’t fruitful. Certainly, many good theories make no really novel predictions but end up being accepted nonetheless. The reason is usually that they excel in other criteria of adequacy. Scope Suppose theory 1 and theory 2 are two equally plausible theories to explain phenomenon X. Theory 1 can explain X well, and so can theory 2. But theory 1 can explain or predict only X, whereas theory 2 can explain or predict X—as well as phenomena Y and Z. Which is the better theory? We must conclude that theory 2 is better because it explains more diverse phenomena. That is, it has more scope than the other theory. The more a theory explains or predicts, the more it extends our understanding. And the more a theory explains or predicts, the less likely it is to be false because it has more evidence in its favour. scope A criterion of adequacy for judging the worth of theories. A theory with scope is one that explains or predicts phenomena other than that which it was introduced to explain. 366 Part Four | Explanations A major strength of Newton’s theory of gravity and motion, for example, was that it explained more than any previous theory. Then came Einstein’s theory of relativity: it could explain everything that Newton’s theory could explain plus many phenomena that Newton’s theory could not explain. This increased scope of Einstein’s theory helped to convince scientists that it was the better theory. Here’s a more down-to-earth example. For decades psychologists have known about a phenomenon called constructive perception (discussed in Chapter 4). In constructive perception, what we perceive (see, hear, feel, etc.) is determined in part by what we expect, know, or believe. Studies have shown that when people expect to perceive a certain stimulus (say, a flashing light, a certain colour or shape, or a shadow), they often do end up perceiving it, even if there is no stimulus present. The phenomenon of constructive perception then can be used to explain many instances in which people seem to perceive something when it is not really there or when it is actually very different from the way people think it is. One kind of case that investigators sometimes explain as an instance of constructive perception is the sighting of UFOs (Unidentified Flying Objects). Many times, people report seeing lights in the night sky that look to them like alien spacecraft, and they explain their perception by saying that the lights were caused by alien spacecraft. So we now have two theories to explain the experience: constructive perception and UFOs from space. If these two theories differ only in the degree of scope provided by each one, then we must conclude that the constructive perception theory is better. (In reality, theories about incredible events usually fail on several criteria.) The constructive perception theory can explain not only UFO sightings but also all kinds of ordinary and extraordinary experiences— hallucinations, feelings of an unknown “presence,” misidentification of crime suspects, contradictory reports in car accidents, and more. The UFO theory, however, is (usually) designed to explain just one thing: an experience of seeing strange lights in the sky. Scope is often a crucial factor in a jury’s evaluation of theories put forth by both the prosecution and the defence. The prosecution will have a very powerful case against the defendant if the prosecutor’s theory (that the defendant committed the crime in question) explains all the evidence while the defence theory (innocence) does not. The defendant will be in big trouble if the prosecutor’s theory explains the blood on the defendant’s shirt, the eyewitness accounts, the defendant’s fingerprints on the wall, and the sudden change in his usual routine—and if the innocence theory leaves these facts downright mysterious. Other things being equal, then, the best theory is the one with the greatest scope. And if other things aren’t equal, a theory with superior scope doesn’t necessarily win the day because it may do poorly on the other criteria or another theory might do better. 9 | Inference to the Best Explanation 367 Simplicity Let’s return one last time to the scenario about the non-starting car. Recall that the last four theories are as follows: 6. Each night, you are sabotaging your own car while you sleepwalk. 7. Your 90-year-old uncle, who lives 1000 kilometres away from you, has been damaging the engine by secretly visiting and going for joyrides in your car. 8. A poltergeist (a noisy, mischievous ghost) has damaged the car’s carburetor. 9. Yesterday, you accidentally drove the car through an alternative space– time dimension, scrambling the electrical system. By now you probably suspect that these explanations are somehow unacceptable, and you are right. One important characteristic that they each lack is simplicity. Other things being equal, the best theory is the one that is the simplest—that is, the one that makes the fewest assumptions. The theory making the fewest assumptions is less likely to be false because there are fewer ways for it to go wrong. Another way to look at it is that since a simpler theory is based on fewer assumptions, less evidence is required to support it. If the theory makes assumptions, then to defend that theory, you’re going to need to dig up evidence in support of each of those assumptions. Explanations 8 and 9 lack simplicity because they each must assume the existence of an unknown and unproven entity (poltergeists and another dimension that scrambles electrical circuits). Such assumptions about the existence of unknown objects, forces, and dimensions are common in occult or paranormal theories. Explanations 6 and 7 assume no new entities, but they do assume complex and unlikely chains of events. This alone makes them less plausible than the simple explanation of 3, the starter malfunction. The criterion of simplicity has often been a major factor in the acceptance or rejection of important theories. For example, simplicity is an important advantage that the theory of evolution has over creationism, the theory that the world was created all at once by a divine being (see Chapter 10). Creationism must assume the existence of a creator and the existence of unknown forces (supernatural forces used by the creator). But evolution does not make either of these assumptions. Scientists eventually accepted Copernicus’s theory of planetary motion (which held that the planets orbit around the sun) over Ptolemy’s older theory (Earth-centred orbits) because the former was simpler (see Chapter 10). In order to account for apparent irregularities in the movement of certain planets, Ptolemy’s theory had to assume that planets have extremely complex orbits (orbits within orbits). Copernicus’s theory, however, had no need for so much extra baggage. His theory could account for the observational data without so many orbits within orbits. simplicity A criterion of adequacy for judging the worth of theories. A simple theory is one that makes as few assumptions as possible. 368 Part Four | Explanations ad hoc hypothesis A hypothesis, or theory, that cannot be verified independently of the phenomenon it is supposed to explain. Ad hoc hypotheses always make a theory less simple—and therefore less credible. Sometimes a theory’s lack of simplicity is the result of constructing ad hoc hypotheses. An ad hoc hypothesis is one that cannot be verified independently of the phenomenon it’s supposed to explain. If a theory is in trouble because it is not matching up with the observational data of the phenomenon, you might be able to rescue it by altering it—by dreaming up additional entities or properties that could in principle account for the data. Such tinkering is legitimate (scientists do it all the time) if there is an independent way of confirming the existence of these proposed entities and properties. But if there is no way to verify their existence, the modifications are ad hoc hypotheses. Ad hoc hypotheses always make a theory less simple—and therefore less credible. Food For Thought There’s No Theory Like a Conspiracy Theory Conspiracy theories try to explain events by positing the secret participation of numerous conspirators. The assassination of President John F. Kennedy, the terrorist attacks of 9/11, the Watergate scandal, the AIDS crisis—all these and more have been the subject of countless conspiracy theories, both elaborate and provocative. Some conspiracy theories, of course, have been found to be true after all. But most of them are implausible. The main problem with them is that they usually fail to meet the criterion of simplicity. They would have us make numerous assumptions that raise more questions than they answer. How do the conspirators manage to keep their activities secret? How do they control all the players? Where is the evidence that all the parts of the conspiracy have come together just so? Nonetheless, many conspiracy theories remain quite popular, perhaps because they engage our imaginations. Here’s a short list of things that, we are told, are the centre of a massive conspiracy: • • • • • • The terrorist attacks of 9/11 The death of Elvis Presley The assassination of Martin Luther King Jr The Oklahoma City bombing The death of Princess Diana The death of former Enron CEO Kenneth Lay And here are a few of the alleged evil-doers that are doing all the dirty deeds: • • • • • • • The US government The Vatican The CIA The Illuminati, a secret society controlling the government Doctors The Freemasons The pharmaceutical industry 9 | Inference to the Best Explanation 369 Conservatism What if a trusted friend told you that—believe it or not—some dogs lay eggs just as chickens do? Let’s assume that your friend is being perfectly serious and believes what she is saying. Would you accept this claim about egg-laying dogs? Not likely. But why not? Probably your main reason for rejecting such an extraordinary claim would be that it fails the criterion of conservatism, though you probably wouldn’t state it that way. (Note: “conservatism” in this sense of has nothing to do with politics or social values!) This criterion says that, other things being equal, the best theory is the one that fits best with our established beliefs. In other words, we want a theory that allows us to conserve or keep what we already know. We would reject the canine-egg theory because, among other things, it conflicts with our well-founded beliefs about mammals, evolution, canine anatomy, and much more. Humans have an enormous amount of experience (scientific and otherwise) with dogs, and none of it suggests that dogs can lay eggs. In fact, a great deal of what we know about dogs suggests that they cannot lay eggs. To accept the canine-egg theory despite its conflict with a mountain of solid evidence would be irrational—and destructive of whatever understanding we had on the subject. Perhaps one day we may be shocked to learn that, contrary to all expectations, dogs do lay eggs. But given that this belief is contrary to a massive amount of credible experience, we must assign a very low probability to it. We are naturally reluctant to accept explanations that conflict with what we already know, and we should be. Accepting beliefs that fly in the face of our knowledge has several risks: 1. The chances of the new belief being true are not good (because it has no evidence in its favour, while our well-established beliefs have plenty of evidence on their side). 2. The conflict of beliefs undermines our knowledge (because we cannot know something that is in doubt, and the conflict would be cause for doubt). 3. The conflict of beliefs lessens our understanding (because the new beliefs cannot be plausibly integrated into our other beliefs). So everything considered, the more conservative a theory is, the more plausible it is.9 Here’s another example. Let’s say that someone claims to have built a perpetual motion machine. A perpetual motion machine is a device that is supposed to function without ever stopping and without requiring any energy input from outside the machine; it is designed to continuously supply its own energy. Now, this is an intriguing idea—but one that we shouldn’t take too seriously. The problem is that the notion of a perpetual motion machine is not conservative at all. It conflicts with a very well-established belief, namely, one of the laws of conservatism A criterion of adequacy for judging the worth of theories. A conservative theory is one that fits with our established beliefs. 370 Part Four | Explanations Food For Thought Was the Moon Landing a Hoax? xkcd.com A stunning conspiracy theory says yes—NASA faked the whole thing. Here’s NASA’s side of the story: All the buzz about the Moon began on February 15th when Fox television aired a program called Conspiracy Theory: Did We Land on the Moon? Guests on the show argued that NASA technology in the 1960s wasn’t up to the task of a real Moon landing. Instead, anxious to win the Space Race any way it could, NASA acted out the Apollo program in movie studios. Neil Armstrong’s historic first steps on another world, the rollicking Moon Buggy rides, even Al Shepard’s arcing golf shot over Fra Mauro—it was all a fake! . . . According to the show NASA was a blundering movie producer thirty years ago. For example, Conspiracy Theory pundits pointed out a seeming discrepancy in Apollo imagery: pictures of astronauts transmitted from the Moon don’t include stars in the dark lunar sky—an obvious production error! What happened? Did NASA film-makers forget to turn on the constellations? Most photographers already know the answer: it’s difficult to capture something very bright and something else very dim on the same piece of film—typical emulsions don’t have enough “dynamic range.” Astronauts striding across the bright lunar soil in their sunlit spacesuits were literally dazzling. Setting a camera with the proper exposure for a glaring spacesuit would naturally render background stars too faint to see. Here’s another one: pictures of Apollo astronauts erecting a US flag on the Moon show the flag bending and rippling. How can that be? After all, there’s no breeze on the Moon. . . . Not every waving flag needs a breeze—at least not in space. When astronauts were planting the flagpole they rotated it back and forth to better penetrate the lunar soil (anyone who’s set a blunt tent-post will know how this works). So of course the flag waved! Unfurling a piece of rolled-up cloth with stored angular momentum will naturally result in waves and ripples—no breeze required! . . . The best rebuttal to allegations of a “Moon Hoax,” however, is common sense. Evidence that the Apollo program really happened is compelling: a dozen astronauts (laden with cameras) walked on the Moon between 1969 and 1972. Nine of them When the first explanation is a conspiracy theory, it’s relatively are still alive and can testeasy to arrive at explanations that are not just better but funny ify to their experience. They too. What critical thinking techniques does NASA implement in its didn’t return from the Moon argument? 9 | Inference to the Best Explanation empty-handed, either. Just as Columbus carried a few hundred natives back to Spain as evidence of his trip to the New World, Apollo astronauts brought 841 pounds of Moon rock home to Earth. “Moon rocks are absolutely unique,” says Dr David McKay, Chief Scientist for Planetary Science and Exploration at NASA’s Johnson Space Center (JSC). McKay is a member of the group that oversees the Lunar Sample Laboratory Facility at JSC where most of the Moon rocks are stored. “They differ from Earth rocks in many respects,” he added.10 “For example,” explains Dr Marc Norman, a lunar geologist at the University of Tasmania, “lunar samples have almost no water trapped in their crystal structure, and common substances such as clay minerals that are ubiquitous on Earth are totally absent in Moon rocks.” “We’ve found particles of fresh glass in Moon rocks that were produced by explosive volcanic activity and by meteorite impacts over 3 billion years ago,” added Norman. “The presence of water on Earth rapidly breaks down such volcanic glass in only a few million years. These rocks must have come from the Moon!”10 physics—specifically, one of the laws of thermodynamics. The law of conservation of mass-energy states that mass-energy cannot be created or destroyed. A perpetual motion machine, though, would have to create energy out of nothing. Like any law of nature, however, the law of conservation of mass-energy is supported by a vast amount of empirical evidence. We must conclude, then, that it is extremely unlikely that anyone could escape the law of conservation of mass-energy through the use of any machine. (This fact, however, has not stopped countless optimistic inventors from claiming that they’ve invented such devices. When the devices are put to the test, they invariably fail to perform as advertised.) It’s possible, of course, that a new theory that conflicts with what we know could turn out to be right and a more conservative theory could turn out to be wrong. But we would need good reasons to show that the new theory was correct before we would be justified in tossing out the old theory and bringing in the new. Science looks for conservative theories, but it still sometimes embraces theories that are departures (sometimes radical departures) from the well-worn, accepted explanations. When this dramatic change happens, it’s frequently because other criteria of adequacy outweigh conservatism. We’ll explore the creation and evaluation of scientific theories in the next chapter. Occult or paranormal theories often run afoul of the criterion of conservatism. Take dowsing, for instance. Dowsing is the practice of detecting underground water by using a hand-held Y-shaped wooden stick (known as a divining rod or dowsing rod), a pendulum, or another device. It’s a folk tradition that’s hundreds of years old. Dowsers claim to be able to detect the presence of underground water by walking over a given terrain and holding the two branches of the dowsing rod (one in each hand) with its point facing skyward away from the body. (This claim, as it turns out, is unsupported.) When the point of the rod dips toward the ground, that’s supposed to indicate that water is beneath the dowser. 371 372 Part Four | Explanations It seems to the dowser (and sometimes to observers) that the rod moves on its own as though under the influence of some hidden force. One theory to account for the rod’s movements is that an unknown form of radiation emanating from the underground water pulls on the divining rod, causing it to move. (A well-supported alternative theory is that the movement of the divining rod in the dowser’s hands is caused by suggestion and unconscious muscular activity in the dowser.) As it stands, the radiation theory is not testable, fruitful, or simple. But its major failing is its lack of conservatism. The claim about the strange, occult radiation conflicts with what scientists know about energy, radiation, and human sensory systems. It is possible that the dowser’s radiation exists, but there is no reason to believe that it does and good reason to doubt it. We will look at many more examples shortly, but before we go any further, you need to fully understand two crucial points about the nature of theory appraisal. First, there is no strict formula or protocol for applying the criteria of adequacy. In deductive arguments there are rules of inference that are precise and invariable. But inference to the best explanation is a different thing altogether. There are no precise rules for applying the criteria, no way to quantify how a theory measures up according to each criterion, and no way to rank each criterion according to its importance. Sometimes we may assign more weight to the criterion of scope if the theory in question seems similar to other theories on the basis of all the remaining criteria. Other times we may weight simplicity more when considering theories that seem equally conservative or fruitful. The process of theory evaluation is not like solving a math problem—but more like diagnosing an illness or making a judicial decision. It is rational but not formulaic, and it depends on the dynamics of human judgment. The best we can do is follow some guidelines for evaluating theories generally and for applying the criteria of adequacy. Fortunately, this kind of help is usually all we need. (You’ll get this kind of guidance in the following pages.) Second, despite the lack of formula in theory assessment, the process is far from subjective or arbitrary. There are many judgments that we successfully make every day that are not quantifiable or formulaic—but they are still objective. We can agree, for example, on many key features that go into making a car a good one: various safety features, fuel efficiency, cargo space, and so on. We cannot say exactly how to rank those features, but that doesn’t stop us from arriving at sound judgments; leaving aside questions of price, a BMW 520i is a better car than a Ford Fiesta. Of course, there are cases that are not so clear-cut that give rise to reasonable disagreement among reasonable people—various luxury sedans may be very similar in quality, with only minor differences. But there are also many instances that are manifestly unambiguous. Pretending that these questions of quality are unclear would be irrational. It would simply be incorrect to believe that a Toyota Yaris is “just as good” a car as an S-Class Mercedes. The same goes for evaluating theories. The criteria that apply are well understood. The fact that there’s no formula for applying those criteria does nothing to prevent us from applying them in a sensible manner to tell good theories from bad ones. 9 | Inference to the Best Explanation Exercise 9.6 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. 1. Is the quantity of evidence available for various theories a sufficient indication of which theory you should accept? Why or why not? *2. In theory evaluation, what is the minimum requirement of consistency? 3. What does it take to completely evaluate a particular theory? What does this imply about what makes a theory the “best” theory? 4. According to the text, what are the criteria of adequacy? 5. What does it mean for a theory to be conservative? Testable? Fruitful? *6. What does it mean to say that a theory does not have much scope? 7. What does it mean when we say that a best explanation is not “truth- preserving”? Why is this important? 8. What role does the concept of simplicity play in determining the best theory? What are the risks involved in accepting a theory that is not simple? Exercise 9.7 Following are several pairs of theories used to explain various phenomena. For each pair, determine (1) which theory is simpler and (2) which one is more conservative. 1. Phenomenon: Sales of our smart phone are down this year. Theories: Apple’s newest iPhone has more features and more innovations than ours does, at a competitive price; Apple has bribed a huge number of our sales people to do what they can to make sure our phones don’t sell. *2. Phenomenon: Your cold symptoms end. Theories: This is part of the natural cycle of the cold; it’s the result of taking a homeopathic remedy with no measurable active ingredients. 3. Phenomenon: A woman is limping across campus, wearing a ski jacket with a day-pass for a local ski hill attached to the zipper. Theories: She hurt her leg skiing; she is an international spy who escaped an assassination attempt but was wounded in the leg. *4. Phenomenon: A huge drop in the incidence of measles over the last 100 years. Theories: This is due to mandatory immunization; this is because of lower levels of air pollution. 5. Phenomenon: Your professor has brought candy to class. Theories: Her husband is a dentist, and she wants to make sure he keeps getting lots of business; today is the day students will fill out course evaluations and she wants you in a good mood. 6. Phenomenon: Panic has spread among the people of your town. Theories: A serial killer has started a killing spree nearby and nobody knows who it is 373 374 Part Four | Explanations or who will be the next victim; a new species of highly aggressive wasps has infested the town. *7. Phenomenon: A hurricane hitting Nova Scotia. Theories: A pre-existing tropical storm was amplified by unusually warm ocean currents; it was caused by radiation from outer space. 8. Phenomenon: A dream about bumping into an old friend comes true the next day. Theories: It’s a coincidence; it’s a psychic connection between you and your old friend. Telling Good Theories from Bad “For any scientific theory is born into a life of fierce competition, a jungle red in tooth and claw. Only the successful theories survive— the ones which in fact latched onto the actual regularities in nature.” —Bas Van Fraassen TEST formula A four-step procedure for evaluating the worth of a theory: Step 1. State the Theory and check for consistency. Step 2. Assess the Evidence for the theory. Step 3. Scrutinize alternative theories. Step 4. Test the theories with the criteria of adequacy. Many (perhaps most) explanatory theories that you run into every day are easy to assess. They are clearly the best (or not the best) explanations for the facts at hand. The dog barked because someone was approaching the house. Your friend blushed because he was embarrassed. The mayor resigned because of a scandal. In such cases, you may make inferences to the best explanation (using some or all of the criteria of adequacy) without any deep reflection. But at other times, you may need and want to be more deliberate, to think more carefully about which explanation is really best. In either case, it helps to have a set of guidelines that tells you how your inquiry should proceed if you’re to make cogent inferences. Here, then, is the TEST formula, four steps to finding the best explanation: Step 1. State the Theory and check for consistency. Step 2. Assess the Evidence for the theory. Step 3. Scrutinize alternative theories. Step 4. Test the theories with the criteria of adequacy. (In the next chapter, you will see that this formula is also one way of describing the general approach used in science to evaluate sets of theories.) Step 1. State the theory and check for consistency. Before you can evaluate an explanatory theory, you must express it in a statement that’s as clear and specific as possible. Once you do this, you can check to see if the theory meets the minimum requirement for consistency. If it fails the consistency test, you can have no good grounds for believing that it’s correct. And, obviously, if the theory fails step 1, there’s no reason to go to step 2. Step 2. Assess the evidence for the theory. To evaluate any theory critically, you must understand any reasons in its favour—the empirical evidence or logical arguments that may support or undermine it. Essentially, this step involves an honest assessment of the empirical evidence relevant to the truth (or falsity) of the theory. To make this assessment, you must put to use what you already know about the credibility of sources, causal reasoning, and evidence from personal and scientific observations (topics covered in Chapters 4 and 8). 9 | Inference to the Best Explanation 375 In this step, you may discover that the evidence in favour of a theory is strong, weak, or non-existent. You may find that there is good evidence that seems to count against the theory. Or you may learn that the phenomenon under investigation did not occur at all. Whatever the case, you have to have the courage to face up to reality. You must be ready to admit that your favourite theory has little to recommend it. Step 3. Scrutinize alternative theories. Inference to the best explanation will not help us very much if we stop after examining just one explanation and aren’t willing to consider alternative ones. Simply examining the evidence relevant to a single eligible theory is not enough. Theories can often appear stronger than they really are if we don’t bother to compare them with others. To take an outrageous example, consider this theory designed to explain the presence of the Canadian superhero Wolverine in the X-Men movies and comic books. The explanation? Wolverine isn’t a fictional character at all but a real Canadian superhero. The evidence for this explanation is the following: (1) millions of young children read the comic books or see the movies and believe Wolverine is real; (2) the other characters in the movies and comic books speak to Wolverine as if he’s real; (3) it’s possible that there really are mutants like Wolverine in the world and that they mostly just remain hidden from the public; (4) it’s not impossible that the science exists to have coated Wolverine’s bones and claws with an indestructible metal known as adamantium; and (5) the creators of the comic books and movies have “stolen” Wolverine’s life story for use in entertainment because they know it is an exciting story. Now, you don’t believe that Wolverine is real (do you?), even in the face of reasons 1–5. But perhaps you’ll admit that the Wolverine theory is at least a tiny bit plausible. And if you never hear any alternative explanations, you might eventually Everyday Problems and Decisions Grades, Studying, and the Criteria of Adequacy Explanations are an important part of everyday life, and inference to the best explanation is at the heart of many important decisions. Consider, for example, the question of what to do in the wake of a poor performance on a test or quiz. Let’s say you’re a B+ student who gets a D on a particular quiz. Of course, you’re disappointed and maybe a little upset. But what should you do about it? What’s your plan, as a student? Deciding what to do requires that you first figure out why the bad grade happened. What’s the best explanation? So you start listing the possibilities. Maybe you didn’t study enough. Maybe the test was unfair. Maybe the material was much harder than usual. Maybe the professor made a grading error. The criteria of adequacy can help you to sort through what the most likely explanation is. And knowing what the most likely explanation is helps you to know what to do next— both regarding this quiz and regarding how to prepare for the next one. 376 Part Four | Explanations become a true believer. (Anthropologists can plausibly argue that various cultures have come to believe in many very unlikely phenomena and exotic deities in large part because of a lack of alternative explanations.) When you do consider an alternative explanation—for example, that Wolverine is an imaginary character invented to entertain you—the Wolverine-is-real theory looks a little silly. And once you consider the evidence for this alternative theory (e.g., documentation that Wolverine was dreamed up by Roy Thomas and Len Wein at Marvel Comics), the other explanation looks even sillier. Step 3 requires us to have an open mind, to think outside the box, to ask if there are other ways to explain the phenomenon in question, and to consider the evidence for those theories. Specifically, in this step we must conscientiously look for competing theories, then apply both step 1 and step 2 to each one of them. This process may leave us with many or few eligible theories to examine. In any case, it’s sure to tell us something important about the strength or weakness of competing theories. Many times, the criteria of adequacy can help us to do a preliminary assessment of a theory’s plausibility without our surveying alternative theories. For example, a theory may do so poorly regarding a particular criterion that we can conclude that, whatever the merits of alternative explanations, the theory at hand is not very credible. Such a clear lack of credibility is often apparent when a theory is obviously neither simple nor conservative. Skipping step 3 is an extremely common error in the evaluation of explanations of all kinds. This is a classic example of many types of errors discussed in earlier chapters—overlooking evidence, preferring available evidence, looking only for confirming evidence, and denying the evidence. Carrying out step 3 does not come naturally. The human tendency is instead to grab hold of a favourite theory—and then to halt any further critical thinking right there. Our built-in bias is to seize on a theory immediately—because we find it comforting or because we supposedly just “know” it’s the right one—and then ignore or resist all other possibilities. The result is a greatly increased likelihood of error and delusion and a significantly decreased opportunity to achieve true understanding. Failure to consider alternative theories is the classic mistake in inquiries into the paranormal or supernatural (a topic we touch upon in Chapter 10). The usual pattern is this: (1) you come across an extraordinary or impressive phenomenon, (2) you can’t think of a natural explanation of the facts, and (3) you conclude that the phenomenon must not be natural but instead paranormal or supernatural. This conclusion, however, would be unwarranted. Just because you can’t think of a natural explanation doesn’t mean that there isn’t one. You may simply be unaware of the correct natural explanation. In the past, scientists have often been confronted with extraordinary phenomena that they couldn’t explain—phenomena that were later found to have a natural explanation. 9 | Inference to the Best Explanation Review Notes Evaluating Theories: The TEST Formula Step 1: State the Theory and check for consistency. Step 2: Assess the Evidence for the theory. Step 3: Scrutinize alternative theories. Step 4: Test the theories with the criteria of adequacy. Step 4. Test the theories with the criteria of adequacy. As we’ve seen, simply adding up the evidence for each of the competing theories and checking to see which one gets the highest score will not do. We need to measure the plausibility of the theories by using the criteria of adequacy. The criteria can help us put any applicable evidence in perspective and allow us to make a judgment about theory plausibility even when there’s little or no evidence to consider. By applying the criteria to all the competing theories, we can often accomplish several important feats. We may be able to eliminate some theories immediately, assign more weight to some than to others, and distinguish between theories that at first glance seem equally strong. The best way to learn how to do step 4, as well as steps 1–3, is by example. Watch what happens when we assess the plausibility of theories for the following set of events. A Doomed Flight On 2 September 1998, Swissair Flight 111 crashed into the Atlantic Ocean not far from Peggy’s Cove, Nova Scotia, killing all 229 people on board. The incident, like most airline disasters, prompted a search for explanations for the crash. The ensuing investigation was led by the Canadian Transportation Safety Board (TSB), with the cooperation of the US Federal Aviation Administration (FAA) and the aircraft manufacturers Pratt & Whitney. The investigation relied heavily on criteria of adequacy to sort through competing theories. After an investigation lasting five years, the TSB concluded that faulty wiring in the aircraft’s entertainment system had started a fire that eventually brought the plane down. Using this incident as inspiration and guide, let’s devise another story of a mysterious jetliner crash and examine the main theories to explain it. We will assume that all the facts in the case are known, that all relevant reports are honest (no intent to deceive), and that no other information is forthcoming. In other words, this is a very contrived case. But it suits our purposes here just fine. Here we go. The (made-up) facts of the case are these: at 8:30 p.m., Flight 222, a M cDonnell Douglas MD-11, left JFK airport in New York on its way to Oslo, Norway. 377 378 Part Four | Explanations At 9:38 p.m. the crew issued a “Mayday” call, and at 9:42 p.m. the plane crashed into the ocean 50 kilometres off the coast of Newfoundland. The crash happened during a time of heightened awareness of possible terrorist attacks on aircraft. Now let’s try steps 1–4 on a supposedly popular theory and some of its leading alternatives. Here’s the pop theory in question. Theory 1: A missile fired by a terrorist brought down the plane. This one meets the requirement for consistency, so our first concern is to assess the evidence for the theory. Those who favour this theory point to several pieces of evidence. Eyewitnesses said that they had seen a bright streak of light or flame speeding toward the plane. A few people said that they thought they were watching a missile intercept the plane. And a journalist reported on the Internet that the plane had been shot down by a missile fired from a boat. There are, however, some problems with this evidence. Eyewitness reports of the movements of bright lights in a dark sky are notoriously unreliable, even when the eyewitnesses are experts. Under such viewing conditions, the actual size of a bright object, its distance from the observer, its speed, and even whether it’s moving are extremely difficult to determine accurately by sight. Also, another phenomenon could have easily been mistaken for a speeding missile. It’s known that an explosion rupturing a fuel tank on an aircraft’s wing can ignite long streams of fuel, which from the ground may look like a missile heading toward the plane. In addition, the Canadian Coast Guard monitors boats and ships in the area in which Flight 222 crashed, and it says that there were none in the immediate area when the crash occurred. Because of the distances involved and other factors, firing a missile from the ground at Flight 222 and hitting it was virtually impossible. Finally, an unsupported allegation—whether from a journalist or anyone else—is not good evidence for anything. Then we have this explanation. Theory 2: An alien spacecraft shot the plane down. For the sake of illustration, we will assume that this explanation meets the consistency requirement. The evidence is this: several people say that they saw a UFO fly near the plane just before the plane exploded. And tapes of radar images show an unknown object flying close to the MD-11. These eyewitness accounts suffer from the same weakness as those mentioned in theory 1. Observations under the conditions described are not reliable. Thus, many alleged alien craft have turned out to be airplanes, helicopters, blimps, meteors, and even the planet Venus, an extremely bright object in the sky. Radar tapes may show many objects that are “unknown” to untrained observers but are identified precisely by experts. The radar evidence might be more impressive if the flight controllers had not been able to provide an alternative account for an object flying close to Flight 222. Theory 3: A bomb on board the plane exploded, bringing the aircraft down. This explanation is internally and externally consistent. The main evidence for it is the existence of trace amounts of explosive residue on a few of the recovered aircraft parts. Also, the story of the crash of Flight 222 resembles the media account of the 9 | Inference to the Best Explanation crash of another jetliner that’s known to have been brought down by an onboard bomb. This resemblance, though, is only that—it’s not evidence that counts in favour of the bomb theory. And the explosive residue is not such clear evidence after all. Investigators determined that the residues are most likely left over from a security training exercise conducted on the plane a week earlier. Moreover, examination of the wreckage and patterns of damage to it suggests that a bomb was not detonated inside the aircraft. Theory 4: A mechanical failure involving the fuel tanks caused the explosion that brought the plane down. This is an eligible theory. It’s backed by evidence showing that an explosion occurred in one of the plane’s fuel tanks. Experts know that a short circuit in wiring outside a fuel tank can cause excess voltage in wiring that’s inside the tank and thus ignite the fuel. Investigators found that there was indeed a short circuit in some of the fuel-tank wiring. In addition, explosions in several other large jets, some smaller planes, and various machine engines have been linked to faulty wiring in fuel tanks. Theory 5: A solar flare disrupted electrical circuits in the plane, releasing a spark that made the fuel tanks explode. This too is an eligible theory. Solar flares are massive electromagnetic explosions on the surface of the sun. They can sometimes disrupt radio communications and even cause radio blackouts. Theory 5 says that a solar flare so dramatically affected electrical circuits in the plane that a spark was emitted that ignited the fuel. The rationale behind this theory is that flying planes, being closer to the sun, are more susceptible to the powerful effects of solar flares. The evidence for this theory, however, is nil. There is no good reason to believe that a solar flare could ever cause a spark in an electrical circuit. Now let’s apply the criteria of adequacy to these explanations. We can see right away that all the theories do equally well in terms of testability and fruitfulness. They’re all testable, and none has yielded any surprising predictions. Except for theory 4, they also have equal scope because they explain only the phenomenon they were introduced to explain, the crash of Flight 222 (and perhaps similar airline crashes). Theory 4, however, has a slight edge because it can explain certain airline crashes as well as explosions in other systems that have wired fuel tanks. So if we are to distinguish between the theories, we must rely on the other criteria. This is bad news for theories 2 and 5 because they fail the criteria of simplicity and conservatism. The evidence in favour of the alien spacecraft theory is extremely weak. Even worse, it conflicts with a great deal of human experience regarding visitors from outer space. We simply have no good evidence that anyone has ever detected any beings or technology from outer space. Moreover, the probability of the Earth being visited by beings from outer space must be considered low (but not zero) in light of what we know about the size of the universe and the physical requirements of space travel. Likewise, the solar flare theory has no evidence to support it, and it too conflicts with what we know. There are no documented cases 379 380 Part Four | Explanations “Science is organized common sense where many a beautiful theory was killed by an ugly fact.” —Thomas Henry Huxley of solar flares causing sparks in electrical wiring. And neither theory is simple. Theory 2 assumes an unknown entity (aliens), and theory 5 assumes unknown processes (solar flares causing sparks in wiring). These are excellent grounds for eliminating theories 2 and 5 from the running. That leaves theories 1, 3, and 4, which we must also sort out by using the criteria of simplicity and conservatism. They fare equally well in terms of simplicity because none assumes any unknown or mysterious entities or processes. Conservatism, though, is a different story. Neither theory 1 nor 3 accords with the evidence. In each case, existing evidence counts against the theory. Theory 4, though, accords well with the evidence. It not only doesn’t conflict with what we know, but the evidence also supports the theory in important ways. Theory 4, then, is the best explanation for the crash of Flight 222 and the theory most likely to be true. And the explanation we started with, theory 1, is implausible. Without a detailed formula, without a weighting system, and without quantifying any criteria, we have arrived at a verdict regarding competing theories. Deciding among theories is not always so straightforward, of course. But this lack of clear-cut answers is what gives rise to more research and more critical thinking. Exercise 9.8 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. On the basis of what you already know and the criteria of adequacy, determine which theory in each group is most plausible. 1. Phenomenon: A man shows up at a local walk-in clinic, complaining of sinus congestion, a cough, and a sore throat. Theories: (1) lung cancer, (2) the common cold, (3) he has been poisoned by his wife. 2. Phenomenon: A sudden and dramatic drop in the price of a particular food corporation’s shares. Theories: (1) rumours of a sex scandal involving the entire senior management team, (2) manipulation of the share price by one powerful shareholder, (3) a hard winter in the prairies raises the price of key ingredients for the company’s products. *3. Phenomenon: Extraordinarily large human-like footprints in the snow on a mountainside. Theories: (1) the legendary man-beast known as the Yeti, (2) falling rocks from the sky, (3) a very big human mountain-climber. 4. Phenomenon: A decrease in the number of subscribers for cable TV. 9 | Inference to the Best Explanation Theories: (1) a decrease in the overall population, (2) the increasing popularity of on-demand Internet media streaming services such as Netflix, (3) the younger generation’s preference for reading books over watching television. 5. Phenomenon: A large increase in reports of sexual harassment in the workplace. Theories: (1) a startling new epidemic of sexual harassment, (2) an increase in the willingness of women to report sexual harassment when it happens because of the #MeToo movement, (3) an increase in the number of women in the workplace. Exercise 9.9 Evaluate the following theories by using the TEST formula. As part of your evaluation: a. State the claim to be evaluated. b. Indicate what phenomenon is being explained. c. Specify at least one alternative theory. d. Use the criteria of adequacy to assess the two theories, and determine which one is more plausible. e. Write a paragraph detailing the reasons for your choice. Use your background knowledge to fill in any information about the theories and how well they do regarding each criterion. 1. A religious sect based in Montreal predicts that the end of the world will occur on 1 January 2017. The world, of course, does not end then. The leader of the sect explains that the prophecy failed to come true because members of the sect did not have enough faith in it. 2. A small, secret society of corporate CEOs and international bankers runs the economies of Canada, the United States, and Europe. For its own benefit and for its own reasons, the society decides when these nations go into and come out of recession, what levels of production will be achieved by the oil industry, and what each country’s gross national product will be. Members of the society are so rich and powerful that they are able to hide the society’s activities from public view and operate without the knowledge of governments and ordinary citizens. 3. I’m pretty sure I’m dying. I feel terrible. I threw up several times this morning. Last night, after getting home from the sushi restaurant, I had awful stomach cramps, and so I went straight to bed, but I slept badly. I looked up stomach cancer online, and the article I read listed symptoms just like these. I’m pretty sure I have cancer. 4. Officer, it’s not what it looks like! I know there’s a dead body in our kitchen, and the body belongs to the guy I found sleeping with my wife, and my 381 382 Part Four | Explanations fingerprints are on the knife that’s in his chest, but I swear it was a total stranger wearing a ski mask who killed him! 5. What difference does footwear make? Well, your feet are connected to your legs, which are connected to your back, and your back includes your spine. And your spinal cord is the conduit for electrical impulses that either control or affect every major organ of your body. So we looked at the shoes people wear. We went out in public and found people wearing soft-soled sneakers and asked them about their health. We also found people wearing hard-soled leather shoes and asked them about their health. We also took both groups’ blood pressure. We found that people wearing sneakers tended to be less overweight and had lower blood pressure and had fewer complaints about depression and anxiety. These results demonstrate that the right shoes can have a huge impact on your health. 6. My professor doesn’t like me very much. I did badly on my first test. I tried to speak to her about it at the start of class, but I was a bit late because I was rushing to class from a meeting of the Choir Club. I thought about talking to her after class but had to go to work. I know I could have talked to her about it during her office hours, but I couldn’t make it due to soccer practice, and she said she didn’t have any other time that day. She really isn’t willing to make time to see me. Exercise 9.10 Read the following passages, and answer these questions for each one: 1. What is the phenomenon being explained? 2. What theories are given to explain the phenomenon? (Some theories may be unstated.) 3. Which theory seems the least plausible and why? (Use the criteria of adequacy.) 4. Which theory is the most plausible and why? 5. Regarding the most credible theory, what factors would need to change in order to convince you to regard it as even more plausible? 6. What factors might be different that could persuade you to regard the least credible theory as at least somewhat more plausible? Passage 1 Unethical behaviour seems quite common in the world of business. Some people blame this on the role that greed plays in human psychology. Others blame it on the capitalist system. Some blame it on the kind of people who are attracted to the world of business and believe that such people are typically ones who were not raised to have good values. But in reality, people in the world of business don’t act unethically any more than people do in other aspects of life. The world 9 | Inference to the Best Explanation of business is full of good, honest people. They mostly go about their day, producing goods and services in an entirely ethical way. Sometimes business behaviour that seems unethical really isn’t. When a company lays off workers, sometimes that’s to ensure the long-term survival of the company and the continued employment of the rest of its workforce. And when companies outsource manufacturing to factories in developing countries, they are providing much-needed jobs and are doing something those countries really need. The amount of truly unethical behaviour in business seems higher than it is because journalists report on business very selectively: they only report the worst behaviours, and so that’s all that the public gets to see. Passage 2 “Parapsychologists claim man’s ability to know when he is being stared at has existed since the time of primitive man and served, in those days, to warn him of impending danger and attack from savage beasts. They also believe this ability still exists in modern men and women today. Skeptics deny this claim and believe it is nothing more than superstition and/or a response to subtle signals from the environment that are not strong enough to let us know exactly what caused them. For example, if we are in a very dark room and we suddenly sense the presence of another person—even though we do not see or hear him—we may know he is there because of the person’s shaving lotion, movement of air currents in the room, body heat, etc. In other words if we are warned of another’s presence, it is likely due to subtle physical cues in the environment that we normally do not attend to—not to any so-called ‘psychic’ or paranormal ability! “To determine if people can tell when they are being stared at, two demonstrations were completed. In the first, forty individuals were stared at for an average time of 8.6 minutes while they were eating, reading, or watching a computer screen or television. When they finished they were asked if they were aware they were being stared at. Of the forty a total of thirty-five reported they were 'totally unaware that anyone was looking at them.' For the other five there is good reason to believe they also were not aware they were being viewed. In the second demonstration fifty students sat at a table in front of a one-way mirror and were observed by two experimenters, one minute at a time, five times during a twenty-minute observation period. The students' task was to try to guess when they were being stared at and report their degree of certainty. None of the fifty were able to correctly guess when they were being stared at. The mean accuracy score for the group was 1.24; the chance score for guessing was 1.25 out of a total of five guesses."11 383 384 Part Four | Explanations Summary Even though an explanation is not an argument, an explanation can be part of an argument—a powerful kind of inductive argument known as inference to the best explanation. In inference to the best explanation, we reason from premises about a state of affairs to an explanation for that state of affairs. Such explanations are called theoretical explanations, or theories. To be worthy of consideration, a theory must meet the minimum requirement for consistency. We use the criteria of adequacy to judge the plausibility of a theory in relation to competing theories. The best theory is the one that meets the criteria of adequacy better than any of its competitors. The criteria of adequacy are testability (whether there is some way to determine if a theory is true), fruitfulness (the number of novel predictions made), scope (the amount of diverse phenomena explained), simplicity (the number of assumptions made), and conservatism (how well a theory fits with existing knowledge). Judging the worth of a theory involves using a four-step process called the TEST formula: (1) stating the theory and checking for consistency, (2) assessing the evidence for the theory, (3) scrutinizing alternative theories, and (4) testing the theories with the criteria of adequacy. Field Problems 1. Many companies have recently marketed products that are supposed to relieve various ailments (arthritis, low-back pain, migraine headaches, tennis elbow, etc.) through the use of simple magnets. This "magnetic therapy" is said to work because magnetic fields generated by the magnets act on the body's processes or structures. Look online to find a health claim made for one of these products. Then, in a 150-word paragraph, evaluate the claim in light of the criteria of simplicity and conservatism. Check for any relevant scientific research and information at www.quackwatch.com or www.sram.org (The Scientific Review of Alternative Medicine). 2. Using the TEST formula, evaluate the theory that if, on 2 February (Groundhog Day), a groundhog emerges from his burrow and sees his shadow, winter will end shortly after. Do some research to uncover any evidence pertaining to this theory. Write a 200-word essay summarizing your findings. 3. Go to the website of a major newspaper (or your own town's main newspaper). Find a story or editorial that presents an explanation for some recent trend—a rise in crime or a drop in crime; visible changes in a particular neighbourhood; a rise in unemployment or a drop in unemployment; something like that. Does the explanation presented pass the tests suggested in this chapter? 9 | Inference to the Best Explanation Self-Assessment Quiz 1. What is the basic pattern of inference to the best explanation? How does this pattern differ from that of enumerative induction? How does it differ from analogical induction? 2. What is internal consistency? 3. What are the criteria of adequacy? 4. According to the text, what does it mean for a theory to be testable or untestable? 5. What are the elements of the TEST formula? 6. According to the text, in theory evaluation, when is a theory properly considered the best? Each of the following theories is offered to explain how it is that Arthur was aware that the mysterious stranger he met on the train was his long-lost twin brother, Arnold, before they had even exchanged names or talked about their childhood. Indicate which theory (a) lacks simplicity, (b) is not conservative, (c) is untestable, and (d) has the most scope. (Some theories may deserve more than one of these designations.) 7. The fact that Arthur correctly guessed that the stranger was his brother was coincidence. We all feel from time to time that someone else is familiar and perhaps connected to us somehow, and sometimes that feeling is bound to come true. 8. Arthur is a psychic. 9. This is an example of the strong "electric" bond between twins: their brains respond to each other's presence, even if they are not fully aware of the effect. 10. Arthur arrived at the conclusion mathematically: he met the "stranger" on the train on 13 January 2015, and the birthdate he shared with his long-lost twin was 13 January 1995. And of course 1999, subtracted from 2019, is 20. And they were on train number 20! Indicate which theory in each of the following groups is most plausible. 11. Phenomenon: The rise in popularity of a newly elected prime minister. Theories: (1) the so-called honeymoon effect in which a newly elected politician enjoys popularity until he or she is involved in serious or controversial decisions, (2) the systematic manipulation of all polling organizations by the prime minister's staff, (3) the influence of a powerful secret organization controlling the media. 12. Phenomenon: You have noticed that your grades have been "slipping" (getting lower) over the last six months. 385 386 Part Four | Explanations Theories: (1) your professors are working together to destroy your life, (2) a brain tumour is affecting your ability to think clearly, (3) your new part-time job is taking up too much time and preventing you from studying sufficiently. 13. Phenomenon: Ships, boats, and planes have been disappearing off the coast of Prince Edward Island for years. Theories: (1) considering the meteorological and atmospheric conditions of the area, it's normal for some craft to be lost from time to time, (2) the craft have all been hijacked, (3) the waters off PEI are infested with sea monsters. 14. Phenomenon: An unusual number of cases of serious gastrointestinal illness among otherwise healthy people around Ontario. Theories: (1) terrorists have been sneaking into people's homes and poisoning them, (2) they all ate contaminated meat products from the same meat- processing plant, (3) genetically modified foods are making people sick. Evaluate the following theories using the TEST formula. As part of your evaluation, (1) state the claim to be evaluated, (2) indicate what phenomenon is being explained, (3) specify at least one alternative theory, and (4) use the criteria of adequacy to assess the two theories and determine which one is more plausible. 15. Peter's credit card was declined at the supermarket today. Someone must have stolen his card number and used up all the available credit. 16. Scientists have never been able to find evidence for the existence of the Abominable Snowman, or Yeti. That's because they don't want to find such evidence. 17. People buy expensive products because of subliminal advertising—their minds are being influenced by imperceptible stimuli designed by advertising agencies. 18. Jane hired her brother, James, for the sales position because he had the most relevant work experience out of all the interviewees. 19. Dogs that bite people are ones that have been abused by humans in the past. 20. The mayor has always been against the idea of having more dedicated bike lanes. But suddenly, this year, she says she supports the idea. She also introduced a new plan to introduce fines for drivers who park in bike lanes. She's also been trying to convince the premier to provide more money for enforcing bicycle helmet laws. I think it all has to do with the fact that her daughter was struck by a car while riding her bike recently. Integrative Exercises These exercises refer to lessons in Chapters 3 and 6–9. 1. What is an inductive argument? 2. What is an invalid argument? 9 | Inference to the Best Explanation 3. What is a deductive argument? 4. What is the logical pattern of modus ponens? For each of the following arguments, specify the conclusion and premises, and state whether it is deductive or inductive. If it's deductive, use Venn diagrams or truth tables to determine its validity. If it's inductive, say whether it's an enumerative, analogical, or causal induction and whether it's strong or weak. If necessary, add implicit premises and conclusions. 5. Either you're here to collect the money I owe you or you're here for a friendly visit. And the fact that you've got two big, tough-looking dudes behind you suggests you're not here for a friendly visit, so I'm guessing you're here to collect the money. 6. I've read a lot about the Black Lives Matter movement, and I'm convinced that the issue is an essential one. In the United States, a disproportionate number of shootings by police involve black victims. And juries basically never convict a cop when the person he shot was black. And in Canada's biggest city, Toronto, police have many times been accused of racism. This has to stop. 7. The problem is that if people realized just how few "natural" health products actually work, they wouldn't buy them anymore. But people don't realize that yet. So people will continue to go to buy them. 8. It's essential for businesses to innovate. Businesses that don't believe in this principle will never earn a profit and inevitably go bankrupt. That's why all businesses strive to be innovative. 9. "Hence a young man is not a proper hearer of lectures on political science; for he is inexperienced in the actions that occur in life, but its discussions start from these and are about these; and, further, since he tends to follow his passions, his study will be vain and unprofitable, because the end aimed at is not knowledge but action." (Aristotle, Nicomachean Ethics) 10. Why should Canada be sending aid to foreign countries when there are people right here in Canada who need help? Every dollar spent on foreign aid could be better spent on problems right here at home! 11. He's in love with David. He giggles whenever David enters the room, and he won't look him in the eye. 12. It's clear that marijuana use results in a desire to drink excessive amounts of alcohol. Plenty of my friends' friends smoke weed and get really drunk. 13. Every woman I know has a warped relationship with her mother. What is it with women? They're all a bunch of emotional wrecks. 14. I can tell he's the one who drank the last of the coffee without starting a new batch. I noticed him shifting uneasily in his seat and avoiding eye contact when the boss asked the whole office who had done that. He's also the only one in the room who has a full cup of coffee sitting on his desk. 387 388 Part Four | Explanations Evaluate each of the following theories, and indicate whether it is plausible or implausible. 15. People are more likely to behave strangely, even violently, during a full moon. 16. David Milgaard was sent to prison for raping and murdering a nursing assistant, Gail Miller, and he spent 21 years behind bars. Three of Milgaard's friends testified against him in court. Milgaard was released in 1997 after DNA evidence supposedly proved he didn't commit the crime. But I'll trust the word of three witnesses over some fancy scientific test any day! 17. In Area 51, the famous portion of a military base in Nevada, the US government is concealing real alien visitors or an actual space vehicle used by the visitors to reach Earth. 18. People who complain about not being able to find a job are really saying that they can't find a job that they are willing to do. There are plenty of positions that need to be filled—the restaurant across the street has a "Dishwasher Wanted" sign in the window, for crying out loud. And Tim Hortons is pretty much always hiring. People are just too lazy and entitled to actually work hard for their money. 19. The large network news organizations have ignored most of the anti-war protests staged since 9/11. Coverage of any anti-war sentiment seems to be against media policy. This can only mean that top network execs have decided together that such coverage is not in their best interests. 20. Multiple studies have shown that, despite having no plausible causal relationship to each other, there is a significant positive correlation between the amount of ice cream consumed and the number of violent crimes committed on the same day. Writing Assignments 1. Think of the last few times you've been out at a restaurant or at a friend's house to eat a meal. Probably some of those meals have been very good and others less good. Think to the last several ones that you considered to be very good. Write a 250-word essay evaluating at least two theories that explain why those ones in particular were so good. Use the TEST formula. 2. In a 300-word essay, evaluate the theory that all major decisions made by the president of your university are motivated by money and have very little to do with the merits of ideas or programs. Use the TEST formula. 3. Write a 500-word paper in which you use the TEST formula to assess two theories for the apparent huge popularity of Justin Bieber in Canada. One theory is the "guerilla advertising" theory (call that Hypothesis 1). On this theory, Bieber's record company is paying hundreds of millions of dollars to have thousands of people pretend to like Bieber's music in order to influence 9 | Inference to the Best Explanation 389 the opinions of others. The other theory (call it Hypothesis 2) is that Bieber is not really so popular after all: but the government of Canada has issued secret legal orders requiring radio and television networks to play Bieber's music and videos and requiring newspapers to print false stories about how hordes of fans follow Bieber wherever he goes. Notes Charles Darwin, The Origin of Species (New York: Collier, 1962), 476. 2. Arthur Conan Doyle, A Study in Scarlet (New York: P.F. Collier and Son, 1906), 29–30. 3. Arthur Conan Doyle, "The 'Gloria Scott,'" Memoirs of Sherlock Holmes (London: George Newnes, 1894). 4. "Unprovoked shark attacks declined in 2016," SurferToday (27 January 2017), environment/13403-unprovoked-shark-attacksdeclined-in-2016. 5. " . From CNN. com, February 5 © 2018 Turner Broadcast Systems. All rights reserved. Used by permission and protected by the Copyright Laws of the United States. The printing, copying, redistribution, or retransmission of this Content without express written permission is prohibited." 1. 6. "Weather Control," Crankdotnet (16 November 2002), . 7. "Trepan.com," Crankdotnet (16 November 2002), . 8. "Time Travel," time.htm. 9. W.V. Quine and J.S. Ullman, The Web of Belief (New York: Random House, 1970), 43–4. 10. NASA , "The Great Moon Hoax," NASA Science, http:// science.nasa.gov/science-news/science-at-nasa/2001/ ast23feb_2/. Used by permission of NASA . 11. Robert A. Baker, "Can We Tell When Someone Is Staring at Us?" Skeptical Inquirer (March/April 2000), 34. Used by Permission of the Skeptical Inquirer Magazine www. csicop.org. 10 Judging Scientific Theories Chapter Objectives Science and Not Science You will be able to • understand why science is not the same thing as technology, ideology, or scientism. The Scientific Method You will be able to • list the five steps of the scientific method. • understand the logic of scientific testing. • understand why no scientific hypothesis can be conclusively confirmed or conclusively confuted. Testing Scientific Theories You will be able to • use the steps of the scientific method and be able to explain how a scientist would go about testing a simple hypothesis in medical science. • understand why scientists use control groups, make studies double-blind, include placebos in testing, and seek replication of their work. Judging Scientific Theories You will be able to • list the five criteria of adequacy and explain what they mean. • understand how to apply the criteria of adequacy to the theories of evolution and creationism and why the text says that evolution is the better theory. 10 | Judging Scientific Theories Science and Weird Theories You will be able to • explain why evaluating weird claims might be worthwhile. Making Weird Mistakes You will be able to • understand why it can be so easy to make mistakes when trying to evaluate weird theories. • explain three major errors that people often make when they are trying to assess extraordinary experiences and theories. • explain the distinction between logical possibility and physical possibility. Judging Weird Theories You will be able to • use the TEST formula to evaluate extraordinary theories. • understand why eyewitness testimony is often unreliable. S o people and organizations are constantly making claims in the form of explanations—theoretical explanations, to be more precise—about why something is the case or why something happens or happened. An overwhelming number of such theories are offered to explain the cause of events, such as why the window broke, why the water in the ocean looks blue, why Ralph stole the bike, or why the stock market crashed. As critical thinkers, we do the best we can in evaluating these theories that come our way, testing them if possible, looking for alternative theories, and applying the criteria of adequacy. As it turns out, this kind of testing in pursuit of better explanations is exactly what scientists do for a living. Science seeks to acquire knowledge and an understanding of reality, and it does so through the formulation, testing, and evaluation of theories. When this kind of search for answers is both systematic and careful, science is being done. And when we ourselves search for answers by scrutinizing possible theories—and we do so systematically and carefully—we are searching scientifically. Let's examine the scientific process more closely. Science and Not Science First, let's explore what science is not. Science is not technology. Science is a way of searching for truth—a way that uses what is often referred to as the scientific method. Technology, on the other hand, is not a search for truth; technology is the use of knowledge to do things in 391 392 Part Four | Explanations "Science is not gadgetry. The desirable adjuncts of modern living, although in many instances made possible by science, certainly do not constitute science." —Warren Weaver the world, and it is often embodied in products—DVDs, mobile phones, laptop computers, robots that vacuum the carpet, better mousetraps. Technology applies knowledge acquired through science to practical problems that science generally doesn't care about, such as the creation of electronic gadgets. Technology seeks facts to use in producing stuff. Science tries to understand how the world works, not by merely cataloguing specific facts but by discovering general principles that both explain and predict phenomena. This nice distinction sometimes gets blurry when technologists do scientific research to build a better product or scientists create gadgets to do better scientific research. But in general, there is a difference: science pursues knowledge; technology makes things. Science is not ideology. Some people say that science is not a way of finding out how the world works but a world view affirming how the world is, just as Catholicism or socialism affirms a view of things. To some, science is not only an ideology but a most objectionable one—one that posits a universe that is entirely material, mechanistic, and deterministic. On this "scientific view," the world—including us—is nothing more than bits of matter forming a big machine that turns and whirs in ways determined by impersonal laws of physics. This mechanistic notion is thought to demean humans and human endeavours by reducing us to the role of cogs and sprockets. But we can't identify science with a specific world view. At any given time, a particular world view may predominate in the scientific community, but this fact doesn't mean that the world view is what science is all about. Predominant world views among scientists have changed over the centuries, but the general nature of science as a way of searching for truth has not. For example, the mechanistic view of the universe, so common among scientists in the seventeenth century, has now given way to other views. Discoveries in quantum mechanics (the study of subatomic particles) have shown that the old mechanistic perspective is incorrect. Science is not scientism. One definition of scientism is the view that science is the only reliable way to acquire knowledge. Put another way, it is the view that science is the only reliable road to truth. But in light of the reliability of our sense experience under standard, unhindered conditions (see Chapter 4), this claim is clearly dubious. We obviously do come to know many things without the aid of scientific methodology. But there is a related point that is not so obviously dubious. Science may not be the only road to truth, but it is an extremely reliable way of acquiring knowledge of complex questions about the empirical world. (Many philosophers of science would go a step further and say that science is our most reliable source of knowledge about the world.) Why is science so reliable? Science embodies, to a high degree, what is essential to a reliable knowledge of empirical facts: systematic consideration of alternative solutions or theories, rigorous testing of them, and careful checking and rechecking of the conclusions. 10 | Judging Scientific Theories Some would say that science is reliable because it is self-correcting. Science, when done properly, does not grab hold of an explanation and never let go. Instead, it looks at alternative ways to explain a phenomenon, tests these alternatives, and opens up the conclusions to criticism from scientists everywhere. Eventually, the conclusions may turn out to be false, and scientists will have to abandon the answers they thought were solid. But usually, after much testing and thinking, scientists hit upon a theory that does hold up under scrutiny. They are then justified in believing that the theory is true, even though there is some chance that it is flawed. The Scientific Method The scientific method cannot be identified with any particular set of experimental or observational procedures because there are many different methods for evaluating the worth of a hypothesis. In some sciences, such as physics and biology, hypotheses can be assessed through controlled experimental tests. In other sciences, such as astronomy and geology, hypotheses must usually be tested through predictions and observations. For example, an astronomical hypothesis may predict the existence of certain gases in a part of the Milky Way, and astronomers can use their telescopes to check whether those gases exist as predicted. The scientific method, however, does involve several standard steps, regardless of the specific procedures involved: 1. 2. 3. 4. 5. Identify the problem or pose a question. Devise a hypothesis to explain the event or phenomenon. Derive a test implication or prediction. Perform the test. Accept or reject the hypothesis. Scientific inquiry begins with a problem to solve or a question to answer. So in step 1, scientists may ask: what causes X? Why did Y happen? Does hormone therapy cause breast cancer? Does Aspirin lower the risk of stroke? How is it possible for whales to navigate over long distances? How did early hominids communicate with one another? What are things like inside a black hole? In step 2, scientists formulate a hypothesis that will constitute an answer to their question. In every case, there are facts to explain, and the hypothesis is a potential explanation for them. The hypothesis guides the research, suggesting what kinds of observations or data would be relevant to the problem at hand. Without a hypothesis, scientists couldn't tell which data are important and which are worthless. Where do hypotheses come from? One notion is that hypotheses are generated through induction—by collecting the data and drawing a generalization from them to get a hypothesis. And sometimes that's true. But this can't be the way that most hypotheses are formulated because they often contain concepts 393 394 Part Four | Explanations "Science and everyday life cannot and should not be separated." — Rosalind Franklin (chemist and X-ray crystallographer) that aren't in the data. (Remember, theories generally reach beyond the known data to posit the existence of things unknown.) The construction of hypotheses is not usually based on any such mechanical procedure. In many ways, they are created just as works of art are created: scientists dream them up. Scientists, however, are guided in hypothesis creation by certain criteria—namely, the criteria of adequacy we examined in the last chapter. With testability, fruitfulness, scope, simplicity, and conservatism as their guide, they devise hypotheses from the raw material of the imagination. Remember, though, that scientists must consider not just their favourite hypothesis but alternative hypotheses as well. The scientific method calls for consideration of competing explanations and for their examination or testing at some point in the process. Sometimes applying the criteria of adequacy can immediately eliminate some theories from the running, and sometimes theories must be tested along with the original hypothesis. In step 3, scientists derive implications, or consequences, of the hypothesis to test. As we've seen, sometimes we can test a theory directly, as when we simply check the gas tank of the lawnmower to confirm the theory that it won't run because it's out of gas. But often theories cannot be tested directly. How would we directly test, for example, the hypothesis that chemical X is causing leukemia in menopausal women? We can't. So scientists test indirectly by first deriving a test implication from a hypothesis and then putting that implication to the test. Deriving such an observational consequence involves figuring out what a hypothesis implies or predicts. Scientists ask, "If this hypothesis were true, what consequences would follow? What phenomena or events would have to occur?" Recall that we derived test implications in the problem of the car that wouldn't start in Chapter 9. One hypothesis was that the car wouldn't start because a vandal had sabotaged it. We reasoned that if a vandal had indeed sabotaged the car, there would be tracks in the snow around it. That's an implication of the vandal theory. But there were no tracks, a fact that disconfirms that hypothesis. The logic of hypothesis testing, then, works like this: when we derive a test implication, we know that if the hypothesis to be tested (H) is true, then there is a specific predicted consequence (C). If the consequence turns out to be false (that is, if it does not obtain as predicted), then the hypothesis is probably false, and we can reject it. The hypothesis, in other words, is disconfirmed. We can represent this outcome in a conditional, or hypothetical, argument: If H, then C. Not C. Therefore, not H. This is, remember, an instance of modus tollens, a valid argument form. In this case, H would be false even if only one of several of its consequences (test implications) turned out to be false. 10 | Judging Scientific Theories 395 Food For Thought Are You Scientifically Literate? According to a 2016 Angus Reid poll, 30 per cent of Canadians believe that people who die with unfinished business may remain on Earth as spirits (ghosts).1 This is despite these facts: • No credible scientific evidence of ghosts has ever been produced. • The existence of ghosts would contradict much of what is known about physics. A little scientific literacy can help you to avoid unreasonable beliefs! Test Your Scientific Literacy! True or False? 1. Lasers work by focusing sound waves. 2. Atoms are smaller than electrons. 3. The universe began with a huge explosion, the "Big Bang." 4. The earliest humans lived at the same time as the dinosaurs. 5. Human activity is responsible for global warming. 6. Autism is caused by vaccination. Answers: 1. False, 2. False, 3. True, 4. False, 5. True, 6. False. On the other hand, we would find ourselves in a very different situation if C turned out to be true: If H, then C. C. Therefore, H. Notice that this is an instance of affirming the consequent, an invalid argument form. So the fact that C is true doesn't necessarily mean that H is true. If a consequence turns out to be true, that doesn't prove that the hypothesis is correct. In such a result, the hypothesis is confirmed, and the test provides at least some evidence that the hypothesis is true. But the hypothesis isn't then established. If other consequences for the hypothesis are tested and all the results are again positive, then there is more evidence that the hypothesis is correct. As more and more consequences are tested and they are shown to be true, we can have increasing confidence that the hypothesis is in fact true. As this evidence accumulates, the likelihood that the hypothesis is actually false decreases—and the probability that it's true increases. In step 4, scientists carry out the testing. Usually this experimentation is not as simple as testing one implication and calling it quits. Scientists may test many consequences of several competing hypotheses. As the testing proceeds, some 396 Part Four | Explanations Review Notes Steps in the Scientific Method 1. 2. 3. 4. 5. Identify the problem or pose a question. Devise a hypothesis to explain the event or phenomenon. Derive a test implication or prediction. Perform the test. Accept or reject the hypothesis. hypotheses are found wanting, and they're dropped. If all goes well, eventually one hypothesis remains, with considerable evidence in its favour. Then step 5 can happen as the hypothesis or hypotheses are accepted or rejected. Because scientists want to quickly eliminate unworthy hypotheses and zero in on the best one, they try to devise the most telling tests. This means that they are on the lookout for situations in which competing hypotheses have different test consequences. If hypothesis 1 says that C is true and hypothesis 2 says that C is false, a test of C can then help to eliminate one of the hypotheses from further consideration. As we've seen, implicit in all this is the fact that no hypothesis can ever be conclusively confirmed. It's always possible that we will someday find evidence that undermines or conflicts with the evidence we have now. Likewise, no hypothesis can ever be conclusively proven wrong. When scientists test hypotheses, they never really test a single hypothesis—they test a hypothesis together with a variety of background assumptions and theories. So a hypothesis can always be saved from refutation by making changes in the background claims. (As we detailed in the previous chapter, sometimes these changes are made by constructing ad hoc hypotheses—by postulating unverifiable entities or properties.) In such situations, no amount of evidence logically compels us to conclusively reject a hypothesis. But our inability to confirm or deny a hypothesis conclusively does not mean that all hypotheses are equally acceptable. Maintaining a hypothesis in the face of mounting negative evidence is unreasonable and so is refusing to accept a hypothesis despite accumulating confirming evidence. Through the use of carefully controlled experiments, scientists can often affirm or deny a hypothesis with a high degree of confidence. Testing Scientific Theories Let's see how we might use the five-step procedure to test a fairly simple hypothesis. Suppose you hear reports that some terminal cancer patients have lived longer than expected because they received high doses of vitamin C. And say that the 10 | Judging Scientific Theories favoured hypothesis among many observers is that the best explanation for the patients surviving longer is that vitamin C is an effective treatment against cancer. So you decide to test the hypothesis that high doses of vitamin C can increase the survival time of people with terminal cancer. (Years ago, this hypothesis was actually proposed and tested in three well-controlled clinical trials.2) An obvious alternative hypothesis is that vitamin C actually has no effect on the survival of terminal cancer patients and that any apparent benefits are due mainly to the placebo effect (the tendency for people to feel better temporarily after they're treated, even if the treatment is a fake). The placebo effect could be leading observers mistakenly to believe that people taking vitamin C are being cured of cancer and are thus living longer. Or the placebo effect could be making patients feel better, thereby enabling them to take better care of themselves (by eating right or complying with standard medical treatment, for example) and increasing survival time—regardless of whether the tablet contains vitamin C, a different vitamin, or just sugar. Now, if your hypothesis about vitamin C (if vitamin C is effective at treating cancer) is true, what would you expect to happen? That is, what test implication could you derive? If your hypothesis is true, you would expect that terminal cancer patients given high doses of vitamin C would live longer than terminal cancer patients who didn't receive the vitamin (or anything else). How would you conduct such a test? To begin with, you could prescribe vitamin C to a group of terminal cancer patients (called the experimental group) but not to another group of similar cancer patients (called the control group) and keep track of their survival times. Then you could compare the survival rates of the two groups. But many people who knowingly receive a treatment will report feeling better—even if the treatment is an inactive placebo. So any positive results you see in the treated group might be due not to vitamin C but to the placebo effect. To get around this problem, you would need to treat both groups, one with vitamin C and the other with a placebo. That way, if most of the people getting the vitamin C live longer than expected and fewer of those in the placebo group do, you can have slightly better reason for believing that vitamin C works as advertised. But even this study design is not good enough. It's possible for the people conducting the experiment, the experimenters, to bias the results unknowingly. Through subtle behavioural cues, they can unconsciously inform the test subjects which treatments are real and which ones are placebos—and this, of course, would allow the placebo effect to have full effect. Also, if the experimenters know which treatment is the real one, they can unintentionally misinterpret or skew the study results in line with their own expectations. This problem can be solved by making the study double-blind. In doubleblind experiments, neither the subjects nor the experimenters know who receives the real treatment and who the inactive one. A double-blind protocol for your vitamin study would ensure that none of the subjects would know who's getting vitamin C and neither would the experimenters. 397 "The grand aim of all science is to cover the greatest number of empirical facts by logical deduction from the smallest number of hypotheses or axioms." —Albert Einstein 398 Part Four | Explanations scientific realism The school of thought that says the goal of science is to bring our understanding of the natural world closer and closer to the truth. scientific instrumentalism The school of thought that says the goal of science is to put forward theories that are useful in helping us to predict and control the world around us. What if you have a double-blind set up but most of the subjects in the vitamin C group were sicker to begin with than those in the placebo control group? Obviously, this would bias the results, making the vitamin C treatment look less effective—even if it is effective. To avoid this skewing, you would need to ensure that both groups are as much alike as possible to start—with all subjects being around the same age, having the same physical condition, being at the same stage of cancer, and so on. Finally, you would need to run some statistical tests to ensure that your results are not a fluke. Even in the most tightly controlled studies, it's possible that the outcome is the result of random factors that cannot be controlled. Statisticians have standard methods for determining when experiment results are likely, or not likely, to be due to chance. Suppose you design your study well and you conduct it. The results are that the patients receiving the high doses of vitamin C did not live longer than the placebo group. In fact, all the subjects lived about the same length of time. Therefore, your hypothesis is disconfirmed. On the other hand, the alternative h ypothesis—that vitamin C has no measurable effect on the survival of terminal cancer p atients—is confirmed. Should you now reject the vitamin C theory? Not yet. Even apparently well-conducted studies can have hidden mistakes in them, or there can be factors that the experimenters failed to take into account. This is why scientists insist on study replication—the repeating of an experiment by different groups of scientists. If other scientists replicate the study and the study results hold up, then you can be more confident that the results are solid. In such a case, you could safely reject the vitamin C hypothesis. (This is, in fact, what scientists did in the real-life studies of vitamin C and cancer survival.) At this point, when evidence has been gathered that can bear on the truth of the hypothesis in question, good scientific judgment is crucial. It's here that consideration of other competing hypotheses and the criteria of adequacy again come into play. At this stage, scientists need to decide whether to reject or accept a hypothesis—or modify it to improve it. Judging Scientific Theories As you can see, theory testing is part of the broader effort to assess the merits of one theory against a field of alternatives. And as you know by now, this broader effort will always involve, explicitly or implicitly, the application of the criteria of adequacy to the theories in question: Testability: Whether there's some way to determine if a theory is true. Fruitfulness: The number of novel predictions made. Scope: The amount of diverse phenomena explained. Simplicity: The number of assumptions made. Conservatism: How well a theory fits with existing knowledge. 10 | Judging Scientific Theories 399 Food For Thought The Philosophy of Science Many of the issues discussed in this and the previous chapter would be considered by philosophers to be part of the study of the philosophy of science. The philosophy of science is concerned with understanding the foundations, methods, and limits of science as a whole. One of the key questions asked by philosophers of science is "What distinguishes science from non-science?" Certainly we can give examples of disciplines that we think of as branches of science, such as physics and biology and chemistry. But what, other than tradition, justifies designating them as sciences but not using that word to describe, for instance, astrology or engineering or needlepoint or the study of law? In this regard, some philosophers of science have focused on the scientific importance of generating knowledge through observation. Others (such as Karl Popper) have focused on the significance of falsifiability. In order for a claim or hypothesis to be scientifically meaningful, they argue, it must be possible, at least in principle, for there to be some empirical observation that would prove it false. As we pointed out in Chapter 9, if a theory makes no testable claims, it is of little use to us. Another important set of debates within the philosophy of science has to do with what the proper goals of science are. Some—adherents of scientific realism—argue that the goal of science is to bring our understanding of the natural world closer and closer to the truth. Philosophers who hold this view would say, for example, that from Aristotle to Ptolemy to Copernicus and beyond, science has moved ever closer to a true understanding of planetary motion. Others, however, believe that this way of thinking about science is misguided. Those who hold the position known as scientific instrumentalism argue that it makes more sense to think in terms of the usefulness of scientific theories rather than their truth. On this view, a good theory is one that we find makes useful predictions, ones that help us to predict and control the world around us. It is also worth noting—after all the time we spent discussing inductive logic in Chapters 8 and 9—that philosophers of science have given considerable thought to what is known as the problem of induction. Science is fundamentally about devising theoretical explanations for how the world works and testing those theories through observation. As evidence builds up, scientists reason inductively to an eventual conclusion about which theory is best. However, as the Scottish philosopher David Hume (1711–76) pointed out, no amount of evidence can ever allow us to generalize with certainty—we could still be missing crucial evidence. And besides, Hume pointed out, how do we even know that inductive reasoning itself is a good way to learn things? The answer, it seems, is that we figured that out inductively, by trial and error. But saying that we've learned inductively that induction works amounts to begging the question! This may not pose much of a problem for working scientists, but it poses a serious intellectual problem for philosophers of science, who are deeply concerned about understanding how, and why, science works. Let's study two important examples to see how scientists manage this task. The first is a classic case from the history of science; the second, a contemporary tale of what many perceive as a battle between science and religion. Notice that the steps itemized by the TEST formula are implicit in the evaluation process. problem of induction The philosophical question as to whether the process of induction can ever lead to real knowledge. 400 Part Four | Explanations Copernicus versus Ptolemy Consider the historic clash between the geocentric (Earth-centred) and the heliocentric (sun-centred) theories of planetary motion. It's difficult to imagine two rival theories that have more profoundly influenced how humanity views itself and its place in the universe. In the beginning was the geocentric view. Aristotle got things going by putting forth the theory that a spherical Earth was at the centre of a spherical universe consisting of a series of concentric, transparent spheres. On one celestial sphere, we see the sun, the moon, and the known planets. On the outermost sphere we behold the stars. All the heavenly bodies rotate in perfect circles around the stationary Earth. The heavenly bodies are pure, incorruptible, and unchanging; the Earth, impure, corruptible, and transient. Then came the great astronomer and mathematician Ptolemy, who lived in Alexandria, in Egypt, and wrote his key works between the years 127 and 148 CE (nearly 1900 years ago). He discovered inconsistencies in the traditional geocentric system between the predicted and observed motions of the planets. He found, in other words, that Aristotle's theory was not conservative—a crucial failing! So he fine-tuned the old view, adding little circular motions (called epicycles) along the planet orbits and many other minor adjustments. He also allowed for an odd asymmetry in which the centre of planet orbits was not exactly the centre of Earth—all this so the theory would match up with astronomical observations. By the time Ptolemy finished tinkering, he had posited 80 circles and epicycles—80 different planetary motions—to explain the movements of the sun, moon, and five known planets. Food For Thought Ancient Interest in Stars and Planets Ptolemy advanced his theory of planetary motion in the second century CE, and Copernicus advanced his theory early in the sixteenth century. But an interest in cosmology—the study of the physical universe—is much older than that. The ancient Greek mathematician, Aristarchus of Samos (310—230 BCE) correctly believed that the Earth and other planets orbit around the sun and also correctly thought that the stars are suns that are very far away. But many cultures have had their own theories about the universe. The oldest of them blend beliefs about the physical universe with beliefs about religion. Ancient Hindu cosmology, for instance, held that the physical universe has no beginning and no end but is instead cyclical. According to one version of this view, the stars and sun all revolve around Mount Meru—a mountain that may or may not have been mythical. As early as the eighth century BCE, the ancient Babylonians were trying to work out a systematic understanding of the motion of the planets, and the Babylonians were involved in cataloguing the stars as long ago as 1200 BCE. But the oldest mathematical approach to cosmology may be much older still. A bone fragment known as the Lebombo bone and found in the mountains between South Africa and Swaziland has markings on it suggesting it may have been used to count the phases of the moon. The Lebombo bone is thought to be about 43,000 years old! 401 The result was a system far more complex than Aristotle's. But the revised theory worked well enough for the times, and it agreed better than the earlier theory did with observational data. Despite the complications, learned people could use Ptolemy's system to calculate the positions of the planets with enough accuracy to manage calendars and astrological charts. So for 15 centuries, astronomers used Ptolemy's unwieldy, complex theory to predict celestial events and locations. In the West, at least, Earth stood still in the centre of everything as the rest of the universe circled around it. The chief virtue of the Ptolemaic system, then, was conservatism. It fitted, mostly, with what astronomers knew about celestial goings-on. It was also testable, as any scientific theory should be. Its biggest failing was simplicity—or the lack thereof. The theory was propped up by numerous assumptions for the purpose of making the theory fit the data. Enter Nicolaus Copernicus (1473–1543). He was disturbed by the complexity of Ptolemy's system. It was a far cry from the simple theory that Aristotle had bequeathed to the West. Copernicus proposed a heliocentric theory in which Earth and the other planets orbit the sun, which is the true centre of the universe. In doing so, he greatly simplified both the picture of the heavens and the calculations required to predict the positions of planets. Copernicus's theory was simpler than Ptolemy's on many counts, but one of the most impressive was retrograde motion, a phenomenon that had stumped astronomers for centuries. From time to time, certain planets seem to reverse their customary direction of travel across the skies—to move backward! Ptolemy had explained this retrograde motion by positing yet more epicycles, asserting that planets orbiting Earth will often orbit around a point on the larger orbital path. Seeing these orbits within orbits from Earth, an observer would naturally see the planets sometimes backing up. But the Copernican theory could easily explain retrograde motion without all those complicated epicycles. As the outer planets (Mars, Jupiter, and Saturn) orbit the sun, so does Earth, one of the inner planets. The outer planets, though, move much more slowly than Earth does. On its own orbital track, Earth sometimes passes the outer planets as they lumber along on their orbital track, just as a train passes a slower train on a parallel track. When this happens, the planets appear to move backward, just as the Even when your everyday experience supports an "obvious" explaslower train seems to reverse course when nation, scientists dedicate themselves to looking for a better one. What steps do scientists take when judging new scientific theories? the faster train overtakes it. Scott Masear/www.CartoonStock.com 10 | Judging Scientific Theories 402 Part Four | Explanations Copernicus's theory, however, was not superior on every count. It explained a great many astronomical observations, but Ptolemy's theory did too, so they were about even in scope. It had no big advantage in fruitfulness over the Ptolemaic system. It made no impressive predictions of unknown phenomena. Much more troubling, it seemed to conflict with some observational data. One test implication of the Copernican theory is the phenomenon known as parallax. Critics of the heliocentric view claimed that if the theory were true, then as Earth moved through its orbit, stars closest to it should seem to shift their position relative to stars farther away. There should, in other words, be parallax. But no one had observed parallax. Copernicus and his followers responded to this criticism by saying that stars were too far away for parallax to occur. As it turned out, they were right about this, but confirmation didn't come until 1832, when parallax was observed with more powerful telescopes. Another test implication seemed to conflict with the heliocentric model. Copernicus reasoned that if the planets rotate around the sun, then they should show phases just as the moon shows phases because of the light of the sun falling on it at different times. But in Copernicus's day, no one could see any such planetary phases. Fifty years later, though, Galileo used his new telescope to confirm that Venus had phases. Ultimately, scientists accepted the Copernican model over Ptolemy's because of its simplicity—despite what seemed at the time like evidence against the theory. As Copernicus said, "I think it is easier to believe this [sun-centred view] than to confuse the issue by assuming a vast number of Spheres, which those who keep the Earth at the center must do."3 Evolution versus Creationism Few scientific theories have been more hotly debated among non-scientists than evolution and its rival, creationism (or creation science). Both theories claim to explain the origin and existence of biological life on Earth, and each claims to be a better explanation than the other. Can science decide this contest? Yes. Despite the complexity of the issues involved and the mixing of religious themes with the non-religious, good science can figure out which theory is best. Remember that the best theory is the one that explains the phenomenon and measures up to the criteria of adequacy better than any of its competitors. There is no reason that the scientific approach cannot provide an answer here—even in this thorniest of thorny issues. Neither the term evolution nor the concept began with Charles Darwin (1809–82), who is nonetheless regarded as the father of evolutionary theory. The word showed up in English as early as 1647. The ancient Greek philosopher Anaximander (c. 611–547 BCE) was actually the first evolutionary theorist, 403 having inferred from some simple observations that humans must have evolved from an animal and that this evolution must have begun in the sea. But in his famous book The Origin of Species (1859), Darwin distilled the theory of evolution into its most influential statement. Scientists have been fine-tuning the theory ever since as new evidence and new insights pour in from many different fields, such as biochemistry and genetics. But the basic idea has not changed since Darwin: living organisms adapt to their environments through inherited characteristics, which results in changes to successive gen- Many have argued that we can reconcile science with religious erations. Specifically, the offspring of or- belief if we think of natural processes as tools of a divine power. ganisms are physically very similar to their Of course, this leaves many questions about the source and nature parents, but they are also different from of that divine power! How are creationism and evolution testable them in various small but occasionally im- theories? portant ways, and these differences can be passed on genetically to their offspring. If an offspring has an inherited trait (such as sharper vision or a larger brain) that increases its chances of surviving long enough to reproduce, that individual is more likely to survive and pass the trait on to the next generation. After several generations, this useful trait, or adaptation, spreads throughout a whole population of individuals and differentiates the population from its ancestors. The name that Darwin gave to this process is natural selection. Through natural selection, species come to be well adapted to their environ"It is a good morning exercise for a research scientist to ments. Where fly insects are plentiful, for example, populations of birds develop— discard a pet hypothesis over many years and many generations—characteristics that make it easier for every day before breakfast. It them to catch such insects. Where there is tall grass to hide in, predators (such keeps him young." as tigers) develop stripes or other patterns to help them avoid being seen by their —Konrad Lorenz prey. In this way, Darwin was able to begin, at least, to explain the vast variety of species occupying the various ecosystems we find around the globe. Creation science, on the other hand, maintains that (1) the universe and all life was created suddenly, out of nothing, only a few thousand years ago (6000– 10,000 is the range usually stated); (2) natural selection could not have produced living things from a single organism; (3) species change very little over time; (4) man and apes have a separate ancestry; and (5) the Earth's geology can be explained by catastrophism, including a worldwide flood.4 The first thing we should ask about these two theories is whether they're testable. The answer is yes. Recall that a theory is testable if it predicts or explains Rex May Baloo/www.CartoonStock.com 10 | Judging Scientific Theories 404 Part Four | Explanations Food For Thought Can You See Evolution? Critics of the theory of evolution often ask, "If evolution occurs, why can't we see it?" Here's how the US National Academy of Sciences responds to this objection: Special creationists argue that "no one has ever seen evolution occur." This misses the point about how science tests hypotheses. We don't see Earth going around the sun or the atoms that make up matter. We "see" their consequences. Scientists infer that atoms exist and Earth revolves because they have tested predictions derived from these concepts by extensive observation and experimentation. Furthermore, on a minor scale, we "experience" evolution occurring every day. The annual changes in influenza viruses and the emergence of antibiotic-resistant bacteria are both products of evolutionary forces. . . . On a larger scale, the evolution of mosquitoes resistant to insecticides is another example of the tenacity and adaptability of organisms under environmental stress. Similarly, malaria parasites have become resistant to the drugs that were used extensively to combat them for many years. As a consequence, malaria is on the increase, with more than 300 million clinical cases of malaria occurring every year.5 something other than what it was introduced to explain. On this criterion, evolution is surely testable. It explains, among other things, why bacteria develop resistance to antibiotics (adapting to their environment!), why there are so many similarities between humans and other primates, why new infectious diseases emerge, why the chromosomes of closely related species are so similar, why the fossil record shows the peculiar progression of fossils that it does, and why the embryos of related species have such similar structure and appearance. Creationism is also testable. It too explains something other than what it was introduced to explain. It claims that Earth's geology was changed in a worldwide flood, that the universe is only a few thousand years old, that all species were created at the same time, and that species change very little over time. Innumerable test implications have been derived from evolutionary theory, and innumerable experiments have been conducted confirming the theory. For example, if evolution is true, then we would expect to see a systematic change in the fossil record from simple creatures at the earlier levels to more complex individuals at the more recent levels. We would expect not to see a reversal of this configuration. And this sequence is exactly what scientists see time and time again. Creationism, however, has not fared as well. Its claims have not been borne out by evidence. In fact, they have consistently conflicted with well-established scientific findings. This latter point means that creationism fails the criterion of conservatism— it conflicts with what we already know. For example, the scientific evidence shows 10 | Judging Scientific Theories 405 that Earth is not 6000–10,000 years old—but billions of years old. According to the US National Academy of Sciences: There are no valid scientific data or calculations to substantiate the belief that Earth was created just a few thousand years ago. [There is a] vast amount of evidence for the great age of the universe, our galaxy, the Solar system, and Earth from astronomy, astrophysics, nuclear physics, geology, geochemistry, and geophysics. Independent scientific methods consistently give an age for Earth and the Solar system of about 5 billion years, and an age for our galaxy and the universe that is two to three times greater.6 Creationism also fails the criterion of conservatism on the issue of a g eology-transforming universal flood. Again, the National Academy of Sciences has this to say: Nor is there any evidence that the entire geological record, with its orderly succession of fossils, is the product of a single universal flood that occurred a few thousand years ago, lasted a little longer than a year, and covered the highest mountains to a depth of several meters. On the contrary, intertidal and terrestrial deposits demonstrate that at no recorded time in the past has the entire planet been under water. . . . The belief that Earth's sediments, with their fossils, were deposited in an orderly sequence in a year's time defies all geological observations and physical principles concerning sedimentation rates and possible quantities of suspended solid matter.7 Has either theory yielded any novel predictions? Evolution has. It has predicted, for example, that new species should still be evolving today; that the fossil record should show a movement from older, simpler organisms to younger, more complex ones; that proteins and chromosomes of related species should be similar; and that organisms should adapt to changing environments. These and many other novel predictions have been confirmed. Creationism has made some novel claims, as we saw earlier, but none of these have been supported by good evidence. Creationism is not a fruitful theory. The criterion of simplicity also draws a sharp contrast between the two theories. Simplicity is a measure of the number of assumptions that a theory makes. Both theories make assumptions, but creationism assumes much more. Creationism assumes the existence of a creator and unknown forces. Proponents of creationism readily admit that we do not know how the creator created or what creative processes were used. In this contest of theories, the criterion of scope—the number of diverse phenomena explained—is probably more telling than any of the others. Biological evolution explains a vast array of phenomena in many fields of science. In fact, "If we are going to teach creation science as an alternative to evolution, then we should also teach the stork theory as an alternative to biological reproduction." —Judith Hayes 406 Part Four | Explanations Food For Thought Creationists hold that if evolution were true, then there should be fossil remains of transitional organisms. But, they insist, there are gaps where transitional fossils should be, so evolution didn't happen. But this claim is incorrect. There are transitional fossils: Gaps in the fossil record are not even a critical test of evolution vs. progressive creation, as evolution also predicts gaps. There are some 2 million described speIn 2006, scientists discovered this 375-million-yearcies of living animals, but only 200,000 old fossil of a species that spans the gap between fish described fossil species. Thus, it is im- and land animals. What errors do creationists make possible to provide a minutely detailed by rejecting evidence of transitional fossils? history for every living species. This is because, first, the fossil record has not been completely explored. It is pretty hard to overlook a dinosaur bone! Yet, though dinosaurs have been excavated for over 150 years, 40 per cent of the known species were found in the last 20 years or so (Discover, March 1987, p. 46). It is likely many more dinosaur species remain to be found. Second, sedimentary rocks were formed locally in lakes, oceans, and river deltas, so many upland species were never fossilized. Third, many deposits that were formed have been lost to erosion. Thus, a complete record is impossible. However, there is a critical test. Evolution predicts that some complete series should be found, while [creationists predict] that none should ever be found. In fact, many excellent series exist. The evolution of the horse is known in exquisite detail from Hyracotherium (Eohippus) to the modern horse (G.G. Simpson, Horses, 2nd ed., Oxford, 1961). Scientific creationists have been forced to claim that the series is but allowed variation within a created "kind." If so, then rhinoceroses, tapirs, and horses are all the same "kind," as they can be traced to ancestors nearly identical to Hyracotherium! All of these fossils lie in the correct order by both stratigraphic and radioisotope dating. Another critical test is Darwin's prediction that ". . . our early ancestors lived on the African continent. . . ." (The Descent of Man, p. 158). An excellent, detailed series of skulls and some nearly complete skeletons now connect modern man to African australopithecines. Some of the extinct australopithecines had brains about the size and shape of those of chimpanzees.8 Ted Daeschler/Academy of Natural Sciences/VIREO Gaps in the Fossil Record? a great deal of the content of numerous scientific fields—genetics, physiology, biochemistry, neurobiology, and more—would be deeply perplexing without the theory of evolution. As the eminent geneticist Theodosius Dobzhansky put it, "Nothing in biology makes sense except in the light of evolution."9 10 | Judging Scientific Theories Virtually all scientists would agree—and go much further: It [evolution] helps to explain the emergence of new infectious diseases, the development of antibiotic resistance in bacteria, the agricultural relationships among wild and domestic plants and animals, the composition of Earth's atmosphere, the molecular machinery of the cell, the similarities between human beings and other primates, and countless other features of the biological and physical world.10 Creationism, however, can explain none of this. And it provokes, not solves, innumerable mysteries. What caused the worldwide flood? Where did all that water come from? Where did it all go? Why does Earth seem so ancient (when it's said to be so young)? How did the creator create the entire universe suddenly— out of nothing? Why does the fossil record seem to suggest evolution and not creation? So many questions are an indication of diminished scope and decreased understanding. Note that creationism tries to explain biological facts by appealing to something that's incomprehensible—a creator and his means of creating. The creationist view is that something incomprehensible using incomprehensible means created the universe. But appealing to the incomprehensible does not increase our understanding. Creationism, then, explains nothing. Creationism has zero scope. Good scientists must be prepared to admit this much: if creationism meets the criteria of adequacy as well as evolution does, then creationism must be as good a theory as evolution. But creationism fails to measure up to the criteria of adequacy. On every count it shows itself to be inferior. Scientists then are justified in rejecting creationism in favour of evolution—and this is exactly what they do. Exercise 10.1 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. 1. What is the difference between science and technology? 2. According to the text, why is science such a reliable way of knowing things? 3. According to the text, why is science not an ideology? 4. What is the scientific method? 5. What are the five steps of the scientific method? (State them in order, if you can!) 6. Can hypotheses be generated entirely through induction? Why or why not? *7. What does it mean to derive a test implication from a theory? *8. What is the conditional argument reflecting the fact that a theory is disconfirmed? Is that argument valid or invalid? 9. What is the conditional argument reflecting the fact that a theory is confirmed? Is that argument valid or invalid? 407 408 Part Four | Explanations 10. Can theories be conclusively confirmed? Why or why not? *11. Can theories be conclusively disconfirmed? Why or why not? 12. What is the difference between scientific realism and scientific instrumentalism? 13. What is falsifiability? Why is it important in the consideration of claims and hypotheses? Exercise 10.2 For each of the following phenomena, devise a hypothesis to explain it, and derive a test implication to test the hypothesis. Example Phenomenon: While riding the elevator to her office one day, Genele finds that reception on her mobile phone is very bad. Hypothesis: The metal walls of the elevator are interfering with the phone signal. Test Implication: If the walls of the elevator are interfering with the phone signal, the phone signal should improve as soon as Genele steps off the elevator. 1. The probability of getting bitten by a shark is much higher for a person with a Florida driver's licence than it is for someone with an Ontario driver's licence. *2. Jamal found giant footprints in his backyard and mysterious tufts of brown fur clinging to bushes in the area. Rumours persist that Bigfoot, the giant primate unknown to science, is frequenting the area. Two guys living nearby also claim to be perpetrating a hoax about the existence of the creature. 3. Practitioners of traditional Chinese medicine believe that the body's energy, or chi, circulates through the body along channels called meridians. 4. In the months directly following the tragedy of 11 September 2001, there were no major terrorist attacks in the United States or Canada. 5. There is a positive correlation between the number of suicides in a community and the average number of hours a worker spends in the workplace per week. *6. Weight trainers swear that the supplement creatine dramatically improves their performance. 7. Many people who take B vitamins for their headaches report a lower incidence of headaches. 8. "Whenever I think back to my childhood, all I remember are really great times and really bad times. I guess life was just never dull when I was a kid!" 9. When John got home, he found that the lock on his door had been broken and his high-definition, flat-panel TV was missing. 10. The economic gap between the very rich and the very poor widened considerably during the years 2015–19. 10 | Judging Scientific Theories Exercise 10.3 Using your background knowledge and any other information you may have about the subject, devise an alternative theory to explain each of the following, and then apply the criteria of adequacy to both of them—that is, ascertain how well each theory does in relation to its competitor on the criteria of testability, fruitfulness, scope, simplicity, and conservatism. 1. Phenomenon: A significant number of philosophy majors end up going to law school after they graduate. Theory: A training in philosophy is not useful, so philosophy majors end up needing to do additional university training in order to get jobs. 2. Phenomenon: Your best friend gets red in the face every time your mutual friend, Dana, enters the room. Theory: Your best friend has a crush on Dana. *3. Phenomenon: The unexpected melting of massive chunks of the world's glaciers. Theory: Local climate changes are melting glaciers. 4. Phenomenon: There has been a substantial increase in the number of news stories about sexual harassment in Hollywood. Theory: There has been a sudden increase in the number of instances of sexual harassment in Hollywood. 5. Phenomenon: The average Fortune 500 CEO makes a salary that far exceeds that of even the highest-paid doctors. Theory: Our society values making a profit over saving lives. 6. Phenomenon: Species of flightless birds on two adjacent islands are genetically closely related. Theory: Both populations descended separately from the same flying ancestor. *7. Phenomenon: A lot of crime is committed by people who are in financial need. Theory: Poverty fosters crime. 8. Phenomenon: After an unusually embarrassing loss, the coach of the basketball team yelled at the team for 20 minutes. They did better during their next game. Theory: Yelling at basketball players motivates them to try harder. 9. Phenomenon: Over the past year, two terminally ill cancer patients in Broderick Hospital were found to be cancer-free. Theory: Treatment with a new type of chemotherapy put these patients into remission. 10. Phenomenon: Entrance marks required to get into most Canadian universities are at their highest level in years. Theory: Increased immigration is resulting in greater competition from new Canadians, which drives up the entrance requirements. 409 410 Part Four | Explanations Exercise 10.4 For each of the following theories, derive a test implication, and indicate whether you believe that such a test would likely confirm or disconfirm the theory. 1. Birds evolved from flying mammals, such as bats, rather than from reptiles as is generally believed by scientists. *2. Ever since the city installed brighter streetlights, the crime rate has been declining steadily. 3. The J-Ray bracelet emits energy that improves athletic performance. 4. The BMW 325i is more a reliable car than the Ford Focus. 5. My friend Luenda claims to have psychic abilities. *6. Eating foods high in fat contributes more to being overweight than eating foods high in carbohydrates. 7. All business persons are driven primarily by the pursuit of profit. 8. Elephants cannot climb stairs of any kind. Exercise 10.5 Read the passages below, and answer the following questions for each one: 1. What is the phenomenon being explained? 2. What theories are advanced to explain the phenomenon? (Some theories may be unstated.) 3. Which theory seems the most plausible and why? (Use the criteria of adequacy.) 4. Regarding the most credible theory, is there a test implication mentioned? If so, what is it? If not, what would be a good test implication for the theory? 5. What test results would persuade you to change your mind about your preferred theory? Passage 1 The Roswell UFO incident is considered by some conspiracy theorists to be one of the biggest cover-ups in history. In the summer of 1947, an unidentified flying object crash-landed onto a ranch near Roswell, New Mexico. Initially, the military reported that the object was just a normal weather balloon, but this ran contrary to eyewitness reports that stated that the debris contained pieces of metal and rubber. This led many to believe that the military was engaging in a cover-up and that the wreckage was that of an alien spaceship. In the 1990s, the military admitted that there really was a cover-up but not for the discovery of extraterrestrials. They stated that the crash was actually that of a nuclear test monitor, which the military was using at the time to check if the Russians were conducting nuclear weapons tests. However, many conspiracy theorists still maintain that this is 10 | Judging Scientific Theories just another attempted cover-up to draw our attention away from the fact that aliens did indeed crash-land on Earth and that the US government is now in possession of extraterrestrial life and technology. Passage 2 "Michael Behe, a Lehigh University biochemist, claims that a light-sensitive cell, for example, couldn't have arisen through evolution because it is 'irreducibly complex.' Unlike the scientific creationists, however, he doesn't deny that the universe is billions of years old. Nor does he deny that evolution has occurred. He only denies that every biological system arose through natural selection. "Behe's favorite example of an irreducibly complex mechanism is a mouse trap. A mouse trap consists of five parts: (1) a wooden platform, (2) a metal hammer, (3) a spring, (4) a catch, and (5) a metal bar that holds the hammer down when the trap is set. What makes this mechanism irreducibly complex is that if any one of the parts were removed, it would no longer work. Behe claims that many biological systems, such as cilium, vision, and blood clotting, are also irreducibly complex because each of these systems would cease to function if any of their parts were removed. "Irreducibly complex biochemical systems pose a problem for evolutionary theory because it seems that they could not have arisen through natural selection. A trait such as vision can improve an organism's ability to survive only if it works. And it works only if all the parts of the visual system are present. So, Behe concludes, vision couldn't have arisen through slight modifications of a previous system. It must have been created all at once by some intelligent designer. . . . "Most biologists do not believe that Behe's argument is sound, however, because they reject the notion that the parts of an irreducibly complex system could not have evolved independently of that system. As Nobel Prize–winning biologist H.J. Muller noted in 1939, a genetic sequence that is, at first, inessential to a system may later become essential to it. Biologist H. Allen Orr describes the processes as follows: 'Some part (A) initially does some job (and not very well, perhaps). Another part (B) later gets added because it helps A. This new part isn't essential, it merely improves things. But later on A (or something else) may change in such a way that B now becomes indispensable.' For example, air bladders—primitive lungs—made it possible for certain fish to acquire new sources of food. But the air bladders were not necessary to the survival of the fish. As the fish acquired additional features, however, such as legs and arms, lungs became essential. So, contrary to what Behe would have us believe, the parts of an irreducibly complex system need not have come into existence all at once."11 411 412 Part Four | Explanations Exercise 10.6 Read the following passage about a study conducted on the use of vitamin C to treat cancer. Identify the hypothesis being tested, the consequences (test implication) used to test it, and whether the hypothesis was confirmed or disconfirmed. Passage 1 "In 1978, the Mayo Clinic embarked on a prospective, controlled, double-blind study designed to test Pauling and Cameron's claims [for the effectiveness of vitamin C in treating cancer]. Each patient in this study had biopsy-proven cancer that was considered incurable and unsuitable for further chemotherapy, surgery, or radiation. The patients were randomized to receive 10 grams of vitamin C per day or a comparably flavored lactose placebo. All patients took a glycerin-coated capsule four times a day. "The patients were carefully selected so that those [in the] vitamin C [and] placebo groups were equally matched. There were 60 patients in the vitamin C group and 63 in the placebo group. The age distributions were similar. There was a slight predominance of males, but the ratio of males to females was virtually identical. Performance status was measured using the Eastern Cooperative Oncology Group Scale, a clinical scale well recognized by cancer researchers. Most study patients had some disability from their disease, but only a small proportion were bedridden. Most patients had advanced gastrointestinal or lung cancer. Almost all had received chemotherapy, and a smaller proportion had undergone radiation therapy. "The results were noteworthy. About 25 per cent of patients in both groups showed some improvement in appetite. Forty-two per cent of the patients on placebo alone experienced enhancement of their level of activity. About 40 per cent of the patients experienced mild nausea and vomiting, but the two groups had no statistically significant differences in the number of episodes. There were no survival differences between patients receiving vitamin C and those receiving the placebo. The median survival time was approximately seven weeks from the onset of therapy. The longest surviving patient in this trial had received the placebo. Overall, the study showed no benefit from vitamin C."12 Science and Weird Theories What good are science and inference to the best explanation in the realm that seems to lie beyond common sense and scientific inquiry—the zone of the extraordinary, the paranormal, and the supernatural? In this land of the weird—the 10 | Judging Scientific Theories interesting and mysterious domain of UFOs, ESP, ghosts, psychic predictions, tarot card readings, and the like—exactly what work can science do? From reading Chapter 9, you probably have already guessed that science and critical thinking can be as useful in assessing weird claims as they are in sizing up mundane ones. Inference to the best explanation—whether used in science or everyday life—can be successfully applied to extraordinary theories of all kinds. Fortunately for critical thinkers, the TEST formula outlined in Chapter 9 for finding the best theoretical explanation is not afraid of ghosts, zombies, or space aliens. In the next few pages, we will get a good demonstration of these points by examining some extraordinary theories in much greater detail than we have previously. Science has always been interested in the mysterious, and from time to time it has also ventured into the weird. In the past 150 years, scientists have tested spiritualism, clairvoyance, telepathy, telekinesis, astrology, dowsing, therapeutic touch, faith healing, firewalking, and more. Among these we should also count some bizarre phenomena that scientists never tire of studying—black holes, alternative dimensions of space, and the micro-world of subatomic particles, where the laws of physics are crazy enough to stretch the imagination of a science fiction writer. "I maintain there is much more wonder in science than in pseudoscience. And in addition, to whatever measure this term has any meaning, science has the additional virtue, and it is not an inconsiderable one, of being true." —Carl Sagan Food For Thought Critical Thinking and "Magic" Some of the most well-respected stage magicians and escape artists of all time have dedicated themselves to demonstrating to the public that many weird beliefs—including belief in psychics, telekinesis, and "real" magic—are false. Harry Houdini was a stage magician and the most famous escape artist of all time. Back in the 1920s, Houdini devoted himself—when he wasn't on stage—to debunking psychics who said they could tell the future and mediums who claimed to speak to the dead. He used his own knowledge of how stage magic works to show the tricks that allowed those who claimed supernatural powers to fool the gullible. The heir to Houdini's role as debunker of the paranormal was James Randi, who went by the stage name "The Amazing Randi" when he performed stage magic in the 1960s and 70s. Like Houdini, Randi was an expert stage magician who thought it unethical to use the tricks of that trade to fool people, especially for money. In 1996, he founded the James Randi Educational Foundation, an organization whose mission is to educate the public about the risks of accepting unproven paranormal claims and to subject such claims to controlled scientific investigation. 413 Harry Houdini was a master at performing illusions so convincing that the audience actually believed he could do magic. Was Houdini's audience guilty of the mistakes outlined in this chapter? If so, which ones? Continued 414 Part Four | Explanations The foundation also administers a million-dollar prize: they will give $1 million to anyone who can prove, under controlled circumstances, that they have any supernatural ability. To date, the prize has not yet been claimed. What does this suggest to you about all those people out there who claim to be psychics? Today, the illusionist duo Penn and Teller likewise use their skill at stage magic both to entertain and to educate. Some of their best illusions end with the pair demonstrating to the crowd precisely the tricks of the trade, revealing how their "magic" is accomplished. But why should anyone bother to learn how to evaluate weird claims in the first place? Well, for one thing, some weird claims are widely believed, and they are often difficult to ignore. They are, after all, heavily promoted in countless television programs, movies, books, magazines, and tabloids. And—like claims in politics, medicine, and many other fields—they can dramatically affect people's lives, for better or worse. It's important, then, for anyone confronted with such popular and influential claims to be able to assess them carefully. In addition, if you really care whether an extraordinary claim is true or false, there is no substitute for the kind of critical evaluation discussed here. Accepting (or rejecting) a weird claim solely because it's weird will not do. A hearty laugh is not an argument, and neither is a sneer. Weird claims often turn out to be false, but as the history of science shows, they sometimes surprise everyone by being true. Making Weird Mistakes So in science and in our own lives, the critical assessment of weird theories is possible, but that doesn't mean the process is without risks. It's easy for a scientist or anyone else to make mistakes when thinking about extraordinary claims. Weird claims and experiences have a way of provoking strong emotions, preconceived attitudes, and long-held biases. In the world of the weird, people (including scientists and other experts) are prone to the kinds of errors in reasoning we discussed in Chapter 4, including resisting contrary evidence, looking for confirming evidence, and preferring available evidence. Those who contemplate extraordinary things also seem to be especially susceptible to the following errors. Leaping to the Weirdest Theory When people have an extraordinary experience—when something happens to them that is very unusual—they usually try to make sense of it, one way or another. They may have a seemingly prophetic dream, see a ghostly shape in the dark, watch their astrologer's prediction come true, think they've witnessed a miracle, or feel they have somehow lived another life centuries ago. Then they cast about for an explanation for such experiences. And when they cannot think of a natural explanation, they often conclude that the explanation must be paranormal 415 or supernatural. This line of reasoning is common but fallacious. Just because you can't think of a natural explanation doesn't mean that there isn't one. You may just be ignorant of the correct explanation. Throughout history, scientists have often been confronted with astonishing phenomena that they could not explain in natural terms at the time. But they didn't assume that the phenomena must be paranormal or supernatural. They simply kept investigating—and they eventually found natural explanations. Comets, solar eclipses, meteors, mental illness, infectious diseases, and epilepsy were all once thought to be supernatural or paranormal but were later found through scientific investigation to have natural explanations. Sometimes we encounter something that stretches our imagination. Challenge one of your own preconceived attitudes; you may When confronted, then, with a phenom- discover that it was based on sound reasoning, or you may not. enon that you don't understand, the most reasonable response is to search for a natural explanation. The fallacious leap to a non-natural explanation is a version of the appeal to ignorance discussed in Chapter 5. People think that since a paranormal or supernatural explanation has not been shown to be false, it must be true. This line, though logically fallacious, can be very persuasive. The failure to consider alternative explanations is probably the most common error in assessing paranormal claims. As we've seen, this failure can be willful. People can refuse to consider seriously a viable alternative. But honest and intelligent people can also simply be unaware of possible natural explanations. Looking for alternative explanations requires imagination and a deliberate attempt to "think outside the box." Mixing What Seems with What Is Sometimes people leap prematurely to an extraordinary theory by ignoring this elementary principle: the fact that something seems real doesn't mean that it is. Because of the nature of our perceptual equipment and processes, we humans are bound to have many experiences in which something appears to be real but is not. The corrective for mistaking the unreal for the real is to apply another important principle that we discussed in Chapter 4: it's reasonable to accept the evidence provided by personal experience only if there's no good reason to doubt it. We have reason to doubt personal experience when our perceptual abilities are impaired (we are under stress, drugged, afraid, excited, etc.), we have strong expectations about a particular experience (we strongly expect to see a UFO or hear spooky noises, for example), and observations are made under poor conditions (the stimuli are vague Mick Stevens/The New Yorker Collection/The Cartoon Bank 10 | Judging Scientific Theories 416 Part Four | Explanations and ambiguous or the environment is too dark, too noisy, too hazy, etc.). Since scientists can falter here just as anyone else can, they try to guard against faltering by using research methods that minimize reasons for doubt. Misunderstanding the Possibilities Debates about weird theories often turn on the ideas of possibility and impossibility. Skeptics may dismiss a weird theory by saying, "That's impossible!" Believers may insist that a state of affairs is indeed possible, or they may proclaim, "Anything is possible!" Such protestations, however, are often based on misunderstandings. The experts on the subject of possibility (namely, philosophers) often talk about logical possibility and logical impossibility. Something is logically impossible if it violates a principle of logic (that is, if it involves a logical contradiction). Something is logically possible if it does not violate a principle of logic (does not involve a logical contradiction). Anything that is logically impossible can't exist. We know, for example, that there are no married bachelors because these things involve logical contradictions (male humans who are both married and not married). Likewise, we know that there are no square circles because they involve logical contradictions (things that are both circles and not circles). We must conclude from all this that despite what some people sincerely believe, it is not the case that anything is possible. If a weird phenomenon is logically impossible, we needn't investigate it further because it can't exist. Most alleged paranormal phenomena, however, are not logically impossible. For example, ESP, UFOs, reincarnation, dowsing, spontaneous human combustion, and out-of-body experiences do not generally involve any logical contradiction. Philosophers also refer to physical possibility and physical impossibility. Something is physically impossible if it violates a law of science. Whatever violates a law of science cannot occur. We know that travelling faster than the speed of light is physically impossible because such an occurrence violates a law of science. Perpetual motion machines are physically impossible because they violate the law of science known as the conservation of mass energy. Thus, if an extraordinary phenomenon violates a law of science, we know that it cannot be. Review Notes Common Errors in Evaluating Extraordinary Theories 1. Believing that just because you can't think of a natural explanation, a phenomenon must be paranormal. 2. Thinking that just because something seems real, it is real. (A better principle is that it's reasonable to accept the evidence provided by personal experience only if there's no good reason to doubt it.) 3. Misunderstanding logical possibility and physical possibility. Also, believing that if something is logically possible, it must be actual. 10 | Judging Scientific Theories 417 Everyday Problems and Decisions Conspiracy and Vaccines Being a parent means making many critical decisions, including decisions about your child's health care. One of the most important steps in insuring a child's health is making sure that he or she gets properly vaccinated. Standard vaccinations for infants include vaccinations that protect against diphtheria, tetanus, influenza, measles, mumps, rubella, polio, and more. Some of the diseases that these vaccines help to prevent are deadly. Many of them have been virtually eliminated in countries like Canada and the United States, in large part because almost all children are now vaccinated against them. But many of them are still a frequent cause of illness and death in parts of the world where vaccination is unavailable or unaffordable. Some parents in Canada and the United States, however, still opt not to have their children vaccinated. In some cases, they fear the side effects they believe the vaccines to cause. It is true that all vaccines can have side effects, but most of them are very minor (like a sore arm or a mild fever) and more serious side effects are extremely rare. In other cases, parents may believe that the vaccines are simply unnecessary and that their widespread use is the result of an evil scheme, a conspiracy funded by the major pharmaceutical companies that make the vaccines. Is that possible? Perhaps, but is it likely? Parents who choose not to have their children vaccinated are ignoring the guidance of the entire medical profession, the conclusions of epidemiologists (scientists who study the spread of disease), and the advice of every single public health agency. Which theory stands up best when subjected to the tests provided in this chapter and the previous one? Some things that are logically possible, however, are physically impossible. It's logically possible for Vaughn's dog to fly to another galaxy in 60 seconds. Such an astounding performance would not violate a principle of logic. But it does violate laws of science pertaining to speed-of-light travel and gravitation; it is therefore physically impossible. The upshot of all this is that, contrary to what some people would have us believe, the fact that something is logically possible doesn't mean it's physically possible. That is, if something is logically possible, that doesn't mean it happened or exists—many logically possible things may not be real. Judging Weird Theories Now let's do a detailed evaluation of an extraordinary theory using the TEST formula from Chapter 9. Recall the four steps of the procedure: Step 1. State the theory and check for consistency. Step 2. Assess the evidence for the theory. Step 3. Scrutinize alternative theories. Step 4. Test the theories with the criteria of adequacy. 418 Part Four | Explanations Science uses such a procedure to assess all manner of extraordinary explanations, and—by proceeding carefully and systematically—so can you. Talking with the Dead "The most beautiful thing we can experience is the mysterious. It is the source of all true art and science." —Albert Einstein "Don't let anyone rob you of your imagination, your creativity, or your curiosity." — Mae Jemison (physicist and astronaut) Some people claim that they can communicate with the dead, providing impressive and seemingly accurate information about a person's dead loved ones. They are called psychics (a century ago, they were called mediums), and they have gained the respect of many who have come to them in search of messages from the deceased. They appear on television programs, publish books, and offer seminars to thousands. The most famous among these modern-day mediums are psychics John Edward, Theresa Caputo ("Long Island Medium"), and Lisa Williams. Their performances assure many people that their loved ones who "have passed over" are fine and that any unsettled issues of guilt and forgiveness can be resolved. What is the best explanation for these otherworldly performances in which the psychics appear to be in contact with the dead? Several theories have been proposed. One is that the psychics are getting information about the dead and their loved ones ahead of time (before the performances begin). Another is that the psychics are using telepathy to read the minds of the living to discover facts about the dead. But for simplicity's sake, let's narrow the list of theories down to the two leading ones. Step 1. Here's the psychics' theory. Theory 1: The psychics are communicating information or messages to and from the disembodied spirits of people who have died. In other words, the psychics are doing exactly what they claim to be doing. They are somehow identifying the appropriate deceased spirit, receiving and decoding transmissions from that spirit, conveying the information to the living, and sending messages back to the dead. Step 2. The main evidence in support of this theory is the psychics' performance. They usually perform before an audience and talk to audience members who have lost loved ones. The psychics appear to know facts about the dead that they could only know if they were actually communicating with the dead. They also seem to inexplicably know things about members of the audience. Often they also provide incorrect information (such as saying that a member of the audience has lost her mother when in fact the mother is very much alive). But their "hits" (times when they produce correct information) occur often enough and seem to be specific enough to impress. Psychics have rarely been tested scientifically. (See the text box, "Critical Thinking and 'Magic'" on page 413.) The few experiments conducted to date have been severely criticized for sloppy methodology. And those tests that have been conducted properly have failed to find any evidence at all of psychic ability. So there is no good scientific evidence to support theory 1. Investigators who have seen the psychics' live performances (not just the edited versions of the TV programs) report that the hit rates (the percentage of hits out of the total number of 10 | Judging Scientific Theories statements or questions) are actually much lower than most people realize. They have found hit rates as low as 5 per cent, with the highest being well under 50 per cent. The low hit rate, though, may not be apparent on TV shows because misses are often edited out. Psychics tend to explain their misses with ad hoc hypotheses (explanations that cannot be verified). Step 3. Here's the main alternative to the psychics' theory. Theory 2: The psychics are doing "cold reading." Cold reading is a very old skill practised by fortune tellers, tarot-card readers, and mentalists (performers who pretend to read minds). When done well, cold reading can astonish and appear to be paranormal. In cold reading, the psychic reader surreptitiously acquires information from people (the subjects) by asking them questions, making statements, observing how people behave, and listening to what they say. Good cold readers always give the impression that the information actually comes from some mysterious source, such as the spirits of the departed. Anyone can learn to do cold reading. It doesn't require any exotic skills or special powers. All that's needed is the practised ability to cleverly manipulate a conversation to elicit information from the subject. 419 "Death is a part of life, and pretending that the dead are gathering in a television studio in New York to talk twaddle with a former ballroom-dance instructor is an insult to the intelligence and humanity of the living." —Michael Shermer Food For Thought Eyewitness Testimony and Extraordinary Things A great deal of the evidence for paranormal phenomena is eyewitness testimony. Unfortunately, research suggests that eyewitness testimony generally can't be trusted—especially when the testimony concerns the paranormal. For example, in some studies people who had participated in a seance later gave wildly inaccurate descriptions of what had taken place. Researchers have found that people's beliefs and expectations seem to play a big role in the unreliability of testimony about the paranormal. Different people clearly have different beliefs and expectations prior to observing a supposed psychic—skeptics might expect to see some kind of trickery; believers may expect a display of genuine psi [parapsychological phenomena]. Some 70 years ago Eric Dingwall in Britain speculated that such expectations may distort eyewitness testimony: the frame of mind in which a person goes to see magic and to a medium cannot be compared. In one case he goes either purely for amusement or possibly with the idea of discovering "how it was done," whilst in the other he usually goes with the thought that it is possible that he will come into direct contact with the other world. Recent experimental evidence suggests that Dingwall's speculations are correct. Wiseman and Morris in Britain carried out two studies investigating the effect that belief in the paranormal has on the observation of conjuring tricks. Individuals taking part in the experiment were first asked several questions concerning their belief in the paranormal. On the basis of their answers they were classified as either believers (labelled "sheep") or skeptics (labelled "goats"). Continued 420 Part Four | Explanations In both experiments individuals were first shown a film containing fake psychic demonstrations. In the first demonstration the "psychic" apparently bent a key by concentrating on it; in the second demonstration he supposedly bent a spoon simply by rubbing it. After they watched the film, witnesses were asked to rate the "paranormal" content of the demonstrations and complete a set of recall questions. Wiseman and Morris wanted to discover if, as Hodgson and Dingwall had suggested, sheep really did tend to misremember those parts of the demonstrations that were central to solving the tricks. For this reason, half of the questions concerned the methods used to fake the phenomena. For example, the psychic faked the key-bending demonstration by secretly switching the straight key for a pre-bent duplicate by passing the straight key from one hand to the other. During the switch the straight key could not be seen. This was clearly central to the trick's method; and one of the "important" questions asked was whether the straight key had always remained in sight. A second set of "unimportant" questions asked about parts of the demonstration that were not related to the tricks' methods. Overall, the results suggested that sheep rated the demonstrations as more "paranormal" than goats did, and that goats did indeed recall significantly more "important" information than sheep. There was no such difference for the recall of the "unimportant" information.13 Note that theory 2 does not say that the cold reading is necessarily done to deliberately deceive an audience. Cold reading can be done either consciously or unconsciously. It's possible for people to do cold reading while believing that they are getting information via their psychic powers. To get the relevant information (or appear to have it), a psychic reader can use several cold-reading techniques, including the following: 1. The reader encourages the subject to fill in the blanks. READER: SUBJECT: READER: SUBJECT: I'm sensing something about the face or head or brow. You're right, my father used to have terrible headaches. I'm feeling something about money or finances. Yes, my mother always struggled to pay the bills. 2. The reader makes statements with multiple variables so that a hit is very likely. READER: I 'm feeling that your father was dealing with a lot of frustration, anguish, or anger. SUBJECT: Yes, he was always arguing with my brother. 3. The reader makes accurate and obvious inferences from information given by the subject. READER: Why was your father in the hospital? SUBJECT: He had had a heart attack. 10 | Judging Scientific Theories READER: Yes, he struggled with heart disease for years and had to take heart medication for a long time. You were really worried that he would have another heart attack. 4. The reader asks many questions and treats answers as though they confirmed the reader's insight. READER: Who was the person who got a divorce? SUBJECT: That was my daughter. She divorced her husband in 1992. READER: Because I feel that the divorce was very painful for her, that she was sad and depressed for a while. 5. The reader makes statements that could apply to almost anyone. READER: I'm sensing something about a cat or a small animal. SUBJECT: Yes, my mother owned a poodle. With such cold-reading techniques a reader can appear to read minds. Theory 2 is bolstered by the fact that the psychics' amazing performances can be duplicated by anyone skilled in the use of cold reading. In fact, magicians, mentalists, and other non-psychic entertainers have used cold-reading techniques to give performances that rival those of the top psychics. Regardless of their authenticity, the performances of Van Praagh, Edward, and other psychics seem to be indistinguishable from those based on cold reading. The psychics may indeed be communicating with the dead, but they look as if they're using cold-reading techniques. Step 4. Now we can apply the criteria of adequacy to these two competing explanations. Both theories are testable, and neither has yielded any novel predictions. So we must judge the theories in terms of scope, simplicity, and conservatism. And on each of these criteria, theory 2 is clearly superior. Theory 1 explains only the psychics' performances as described earlier, but theory 2 explains these performances plus other kinds of seemingly psychic readings, including tarot-card reading, fortune-telling, mentalist acts, and old-fashioned spiritualist seances. Theory 1, of course, fails the criterion of simplicity because it assumes the existence of unknown entities (disembodied spirits with certain abilities) and unknown processes (communication to and from the dead); theory 2 makes no such assumptions. Finally, theory 1 is not conservative. It conflicts with everything we know about death, the mind, and communication. Theory 2, though, fits with existing knowledge just fine. Here are these judgments in table form: Criterion Theory 1 Theory 2 Testable Yes Yes Fruitful No No Scope No Yes Simple No Yes Conservative No Yes 421 422 Part Four | Explanations Food For Thought Ray Hyman is professor emeritus of psychology at the University of Oregon and an expert on the scientific investigation of paranormal claims, including psychic readings. Years of research have led him to be skeptical of the validity of psychic readings, but he used to be a true believer. He explains why he went from believer to skeptic: Now it so happens that I have devoted more than half a century to the study of psychic and cold readings. I have been What is this palm saying? Psychologists think they know. How especially concerned with might the illusion of specificity sway a non-critical thinker? why such readings can seem so concrete and compelling, even to skeptics. As a way to earn extra income, I began reading palms when I was in my teens. At first, I was skeptical. I thought that people believed in palmistry and other divination procedures because they could easily fit very general statements to their particular situation. To establish credibility with my clients, I read books on palmistry and gave readings according to the accepted interpretations for the lines, shape of the fingers, mounds, and other indicators. I was astonished by the reactions of my clients. My clients consistently praised me for my accuracy even when I told them very specific things about problems with their health and other personal matters. I even would get phone calls from clients telling me that a prediction that I had made for them had come true. Within months of my entry into palm reading, I became a staunch believer in its validity. My conviction was so strong that I convinced my skeptical high school English teacher by giving him readings and arguing with him. I later also convinced the head of the psychology department where I was an undergraduate. When I was a sophomore, majoring in journalism, a well-known mentalist and trusted friend persuaded me to try an experiment in which I would deliberately read a client's hand opposite to what the signs in her hand indicated. I was shocked to discover that this client insisted that this was the most accurate reading she had ever experienced. As a result, I carried out more experiments with the same outcome. It dawned on me that something important was going on. Whatever it was, it had nothing to do with the lines in the hand. I changed my major from journalism to psychology so that I could learn why not only other people, but also I, could be so badly led astray. My subsequent career has focused on the reasons why cold readings can appear to be so compelling and seemingly specific. Nimazi/Thinkstock Why People Believe Psychic Readings 10 | Judging Scientific Theories Psychologists have uncovered a number of factors that can make an ambiguous reading seem highly specific, unique, and uncannily accurate. And once the observer or client has been struck with the apparent accuracy of the reading, it becomes virtually impossible to dislodge the belief in the uniqueness and specificity of the reading. Research from many areas demonstrates this finding. The principles go under such names as the fallacy of personal validation, subjective validation, confirmation bias, belief perseverance, the illusion of invulnerability, compliance, demand characteristics, false uniqueness effect, foot-in-the-door phenomenon, illusory correlation, integrative agreements, self-reference effect, the principle of individuation, and many, many others. Much of this is facilitated by the illusion of specificity that surrounds language. All language is inherently ambiguous and depends much more than we realize upon the context and non-linguistic cues to fix its meaning in a given situation.14 We must conclude that theory 1 is a seriously defective theory. It is unlikely to be true. Theory 2, however, is strong. It is not only superior to theory 1, but it is also a better explanation than other competing theories we haven't discussed in that it can explain most or all of the psychics' hits. If the cold-reading theory really is better than all these others, then we have good reasons to believe that Edward, Caputo, Williams, and other psychics perform their amazing feats through simple cold reading. Summary Science seeks knowledge and understanding of reality, and it does so through the formulation, testing, and evaluation of theories. Science is a way of searching for truth. It is not the only way to acquire knowledge, but it is, however, a highly reliable way of acquiring knowledge of empirical facts. The scientific method cannot be identified with any particular set of experimental or observational procedures. But it does involve several general steps: (1) identifying the problem; (2) devising a hypothesis; (3) deriving a test implication; (4) performing the test; and (5) accepting or rejecting the hypothesis. This kind of theory-testing is part of a broader effort to evaluate a theory against its competitors. This kind of evaluation always involves, implicitly or explicitly, the criteria of adequacy. Inference to the best explanation can be used to assess weird theories as well as more commonplace explanations in science and everyday life. However, when people try to evaluate extraordinary theories, they often make certain typical mistakes. They may believe that because they can't think of a natural explanation, a paranormal explanation must be correct. They may mistake what seems for what truly is, forgetting that we shouldn't accept the evidence provided by personal experience if we have good reason to doubt it. And they may not fully understand the concepts of logical and physical possibility. In both science and everyday life, 423 424 Part Four | Explanations the TEST formula enables us to appraise fairly the worth of all sorts of weird theories, including those about communication with the dead, which we examined in this chapter. Exercise 10.7 Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. 1. Why is it unreasonable to accept an extraordinary claim solely because of its weirdness? 2. Why is it unwise to reject an extraordinary claim solely because of its weirdness? 3. Why is it unreasonable to conclude that a phenomenon is paranormal just because you cannot think of a natural explanation? *4. What logical fallacy is the fallacious leap to a non-natural explanation an example of? 5. What is the critical thinking principle that can help you to avoid mistaking how something seems for how something is? *6. What is logical possibility? What is logical impossibility? 7. What is physical impossibility? How would changes in our understanding of science affect our perception of this term? 8. Is it true that "anything is possible?" If not, why not? 9. Are pigs (or pig-like things) that fly logically possible? 10. Are pigs (or pig-like things) that fly physically possible? 11. Can something be logically impossible but physically possible? How about logically possible but physically impossible? Exercise 10.8 In each of the following examples, a state of affairs is described. Devise three theories to explain each one. Include two plausible theories that are natural explanations and one competing theory that is paranormal. 1. Madame Florence (a psychic who works out of a storefront on Queen St) gazed into my eyes and held my hand. "I see troubling things in your future," she said. "You will have very bad luck this week!" The next day, my boss called me into my office to tell me I was fired. *2. Jacques lived in a house built back in the 1940s and that was now in disrepair. As he sat reading in the living room, he heard creaking sounds coming from upstairs. 3. Selena came home to find her dog in a worrisome state. The poor animal was alternating between growling and whimpering and spinning in a circle in the middle of the living room. 10 | Judging Scientific Theories 4. Some people report that in the past when they needed help in a risky situation (e.g., when they were in a car accident or when they were lost in a crime-ridden neighbourhood), they were aided by a stranger who never gave his or her name and who left the scene quickly after rendering assistance. They claim that the stranger must have been their guardian angel. 5. Want to hear something strange? One time when I was a kid we went camping, and in the middle of the night we heard these eerie sounds, and when we looked out of our tent we saw a bright light flash across the sky. It was definitely nothing we had ever seen before! 6. For her seventeenth birthday, Kerry really wants a car of her own. Her neighbour, Jed, is selling a relatively nice one, but another neighbour warns her that Jed's father had died of a heart attack while driving the car and that "everyone says" his spirit still lives in the car. Ignoring the warning, Kerry buys the car. The next day, she wakes up to find that the car is outside by the curb, even though she distinctly remembers parking it in her garage. *7. Wayne dreamed that his uncle was killed by a bear in Algonquin Provincial Park. When Wayne woke up, he got a call from his mother saying that his uncle had been injured in a car accident near the park: his car had hit a bear! 8. Reginald had begun acting strangely. Soon after his seventieth birthday, he began speaking incoherently as if in some bizarre foreign language, and he sometimes looked at his family as if he had no idea who they were. Exercise 10.9 Using your background knowledge and any other information you may have about the subject, devise a competing, naturalistic theory for each paranormal theory that follows, and then apply the criteria of adequacy to both of them—that is, ascertain how well each theory does in relation to its competitor on the criteria of testability, fruitfulness, scope, simplicity, and conservatism. 1. Phenomenon: Yolanda awoke one morning and remembered having a strange dream. She dreamed that she was being chased by zombies through her own back yard. The dream seemed extremely vivid. Later in the day, she noticed some scratches on her ankle. She didn't know how they got there. Theory: Yolanda was chased by zombies. 2. Phenomenon: Christopher and Andrew are twins. They often seem to know what each other is thinking and can finish each other's sentences. Many times they report knowing what the other is up to, even when miles apart. Theory: The twins share a special psychic connection. *3. Phenomenon: In 1917 in Cottingley, England, three little girls claimed to have taken photos of fairies who played with them in the garden. The photos showed the girls in the garden with what appeared to be tiny fairies dancing around them. (The 1997 movie Fairy Tale was about the girls and their story.) Theory: Fairies really do exist, and the girls photographed them. 425 426 Part Four | Explanations 4. Phenomenon: Ogopogo is alleged to be a large water serpent inhabiting Okanagan Lake in British Columbia. The creature is unknown to science. The serpent was known as N'ha-a-itk by the Interior Salish First Nations peoples, and there have been many reported sightings over the years. There is no hard evidence proving that the monster exists. Theory: Ogopogo actually exists. 5. Phenomenon: Margaret wears black at school all the time and keeps to herself. When a bully made fun of her unstylish clothes, Margaret glared at him and said, "You'll be sorry one day." The next day, the bully tripped on the school stairs and broke his leg. Theory: Margaret is a witch. Field Problems 1. Find a controversial health or medical theory on the Internet, and design a study to test it. Indicate the makeup and characteristics of any group in the study, whether a placebo group is used, whether the study is double-blind, and what study results would, in principle, confirm and disconfirm the theory. 2. Find a controversial theory in the social sciences (e.g., anthropology, economics, psychology, political science) on the Internet, and design a simple study to test it. Indicate the makeup and characteristics of any group in the study, whether a placebo group is to be used, whether the study will be double-blind, and what kinds of study results would confirm and disconfirm the theory. If the theory is one that you strongly believe, indicate the kind and level of evidence that could convince you to change your mind about it. If there is no imaginable evidence that could convince you to change your mind, explain why. 3. Think of someone you know well, and engage in a bit of scientific reasoning about him or her. In particular, formulate a theory about what it is that is this individual's main motivator. Is it money? Grades? Vanity? What makes him or her do what he or she does? Then devise a way of testing your theory. (Note: you don't need to carry out your test! Just design it.) Self-Assessment Quiz 1. What is a test implication? 2. Are hypotheses generated purely through induction? Why or why not? 3. When a test implication is disconfirmed, what conditional argument is exemplified? 10 | Judging Scientific Theories 4. When a test implication is confirmed, what conditional argument is exemplified? 5. Why can't scientific hypotheses be conclusively confirmed? 6. Briefly explain three common errors that people make when evaluating extraordinary theories. For each of the following phenomena, devise a hypothesis to explain it, and derive a test implication to test the hypothesis. 7. There are police on my neighbour's lawn, digging through his rose garden and hedges. 8. You hear a man on the sidewalk exclaim, "This time tomorrow I'll be at the regional jail!" 9. Steffi, while walking through a wooded area near her Winnipeg home, spots a blue-and-yellow macaw—a kind of parrot that she knows is definitely not native to Canada. For each of the following phenomena, suggest (1) a possible hypothesis to explain it, (2) a possible competing hypothesis, (3) a test implication for each hypothesis, and (4) what testing results would confirm and disconfirm the hypothesis. 10. Boaters have found dozens of dead fish floating in the waters near the waste outlet of a plastics manufacturing factory. 11. Teenage girls who were moved from a mixed class into an all-girl class showed an improvement in their grades. 12. Statisticians have noticed that people who live within 1 kilometre of a bank headquarters make significantly more money than people who live 10 kilometres or more from a bank headquarters. 13. Since the newspapers ran stories about how poorly workers in factories in the developing world are treated, our company has made a huge effort to make sure workers at our suppliers' factories in China are treated well. For each of the following hypotheses, specify a test implication, and say what evidence would convince you to accept the hypothesis. 1 4. Mobile phones cause brain cancer. 15. Most people—regardless of ethnicity—are economically better off now than their parents were 30 years ago. 16. Canada has the most effective health care system in North America. Each of the theories that follow is offered to explain why an astrological reading by a famous astrologer turned out to be wildly inaccurate. On the basis of a single person's horoscope, he had predicted that the person was a kind and generous 427 428 Part Four | Explanations person. The person turned out to be Martin Shkreli, the pharmaceutical company CEO who bought the patent for a drug used to treat AIDS patients and immediately raised the price by 5000 per cent. Say which theory (a) lacks simplicity, (b) is not conservative, (c) is untestable, and (d) has the most scope. (Some theories may merit more than one of these designations.) 17. Theory: Astrology—the notion that the position of the stars and planets at your birth controls your destiny—has no basis in fact. 18. Theory: Astrology works, but the astrologer read the horoscope wrong. 19. Theory: An unknown planetary force interfered with the astrological factors that normally determine a person's character and destiny. Evaluate the following theory using the TEST formula. Say what phenomenon is being explained. Use your background knowledge to assess the evidence. Specify one alternative theory, use the criteria of adequacy to assess the two theories, and determine which one is more plausible. 20. Carlos has always been a little strange and a bit of a loner. Recently, however, his behaviour has gone from strange to frightening. He has begun reading the ideologies of known terrorist leaders and radical thinkers. He's also been following the social media accounts of notable terrorist organizations and has posted in the forums of websites that openly support terrorism against the Western world. Yesterday, he was spotted behaving suspiciously around the local public school. I think he's planning a terror attack on the school! Integrative Exercises These exercises pertain to material in Chapters 3–5 and 8–10. 1. What is an analogical induction? 2. What is an enumerative induction? 3. What is a sufficient condition? What is a necessary condition? 4. What is the appeal to ignorance? For each of the following arguments, specify the conclusion and premises. If necessary, add implicit premises and conclusions. 5. "Conflating opposition to abortion with bigotry is simplistic, and no better than demagoguery. It's possible to be against abortion without malice in your heart toward women. For those who call themselves 'pro-life,' abortion isn't exclusively about women—it is about a woman and a fetus, and whether her right to security of the person outweighs its right to life. They will always argue that it doesn't, regardless of what the Supreme Court says, because, if 10 | Judging Scientific Theories you choose to believe—either personally or because your faith dictates it— that human life begins at conception, it's impossible to reach another conclusion." (Editorial, "In Canada, Abortion Is a Right. But So Is Criticizing It," The Globe and Mail, 22 January 2018) 6. "Privatization is neither an efficient nor an effective response to the shortage of long-term care facilities. Some Regional Health Authorities see [privatization] as an obstacle to the provision of well-coordinated and fiscally- responsible care. Centralized administration of public health care provides both lower administrative costs and economies of scale. Indeed, the fact that health care costs so much more in the United States than in Canada— 13.5 per cent of GDP in the United States compared with 9.2 per cent in Canada—is largely the result of higher administrative costs in a system comprised of numerous competitive insurance firms, hospitals, clinics, and so on." (Editorial, Canadian Centre for Policy Alternatives, www.policyalternatives.ca) 7. "The current tax burden is massively distorted by land values (since buildings depreciate as they get older) and falls heavily on those in built-up areas where values reflect scarcity, not service costs or incomes. The perverse impact is to push residents and small businesses out of denser areas on the basis of high taxes. That's totally at odds with the city's development plan to encourage inner-city growth. And it is simply wrong and completely backwards for the city to dictate where you can live or where you do business just to maximize taxes on property. "Homeowners have some protection under an assessment cap, but this only puts more burden on small business. Instead, we need a new system based on actual service costs and real ability to pay, and that doesn't tax people out of homes and business locations they can otherwise afford and want to remain in." (Editorial, Halifax Chronicle-Herald, 25 January 2012) For each of the following phenomena, suggest (1) a possible hypothesis to explain it, (2) a possible competing hypothesis, and (3) a test implication for each hypothesis. 8. The accident rate on Highway 401 was very high but was reduced considerably after police announced that they had taken away the licences of over a dozen speeders during the holiday weekend. 9. The popularity of hip hop has risen in Canada since Drake became famous. 10. There are several new businesses on the east side of town despite the fact that the new Walmart there resulted in several small stores closing. Indeed, business near the new Walmart seems to be booming! Evaluate each of the following theories by using the TEST formula. Use your background knowledge to assess the evidence. Specify one alternative theory, use the criteria of adequacy to assess the two theories, and determine which one is more plausible. 429 430 Part Four | Explanations 11. Canadian universities have seen an increase in applications from international students over the past couple of years because of anti-immigrant sentiment in the United States. 12. The key to a long and healthy life is a simple diet consisting mostly of grains, fruits, and vegetables. 13. The NDP has never formed a federal government in Canada because influential Americans have worked hard to prevent Canada from becoming "too left-wing." 14. Controlling the supply of illegal firearms in Canada is so hard because the lax gun laws in the United States makes smuggling guns from the United States into Canada much easier. Writing Assignments 1. In a one-page essay, use the TEST formula to evaluate one of the following theories: a. Phenomenon: People with the flu report feeling better after drinking chamomile tea. Theory 1: Chamomile tea cures the flu. Theory 2: The placebo effect. b. Phenomenon: A temporary rise in the crime rate in Winnipeg occurred during an important Winnipeg Blue Bombers game. Theory 1: Drunken fans committed crimes they would not commit while sober. Theory 2: The homes of fans who were at the game were burglarized. c. Phenomenon: We took six puppies to a nursing home for senior citizens one morning, and nurses reported that the patients generally reported fewer minor health problems during the rest of the day. Theory 1: Puppies prevent minor illnesses. Theory 2: Puppies improve patients' mood, which results in them complaining less about their health. 2. Read Essay 8 ("Unrepentant Homeopaths") in Appendix A, and write a 500word essay evaluating homeopathy by comparing the following two theories: (1) homeopathy is an elaborate system of placebos, without any real effect; (2) homeopathy is effective in a way not fully understood today by science. Use the TEST formula. 3. Devise two theories to explain the prevalence of plagiarism among university students, and then write a 500-word essay evaluating the adequacy of the two theories. 10 | Judging Scientific Theories 431 Notes 1. The Angus Reid Institute, "Extra-Terrestrials and Other Stranger Things: Four-in-Five Canadians Believe" (24 August 2016), extra-terrestrials-stranger-things/. 2. See Stephen Barrett et al., Consumer Health, 6th ed. (New York: McGraw-Hill, 1993), 239–40. 3. Thomas S. Kuhn, The Copernican Revolution: Planetary Astronomy in the Development of Western Thought (Cambridge, MA: Harvard University Press, 1957), 179. 4. 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Stephen Barrett, "High Doses of Vitamin C Are Not Effective as a Cancer Treatment," Quackwatch.com, revised 3 October 2011, www.quackwatch.org/01 QuackeryRelatedTopics/Cancer/c.html. Used with permission of Quackwatch. 13. Richard Wiseman, Matthew Smith, and Jeff Wiseman, "Eyewitness Testimony and the Paranormal," Skeptical Inquirer (November/December 1995). www.csicop.org/SI/ show/eyewitness_testimony_and_the_paranormal. Used by Permission of the Skeptical Inquirer Magazine www.csicop. org. 14. Ray Hyman, "How Not to Test Mediums," Skeptical Inquirer (January/February 2003) www.csicop.org/si/ show/how_not_to_test_mediums_critiquing_the_afterlife experiments. Used by Permission of the Skeptical Inquirer Magazine www.csicop.org. 11 Contexts of Application Thinking Critically about Health, Law, and Ethics Chapter Objectives Thinking Critically about Health and Health Care You will be able to • • • • appreciate the risks posed by various causal confusions in reasoning about health. understand the importance of critically evaluating all news reports related to health. recognize the importance and limits of expert advice related to health. avoid the most common fallacies found in reasoning about health. Thinking Critically about the Law You will be able to • appreciate the role of "inference to the best explanation" in legal reasoning. • understand the way that legal reasoning involves application of categorical logic. • recognize the significance of key fallacies as they appear in legal reasoning. Thinking Critically about Ethics You will be able to • distinguish between ethical claims and descriptive claims. • appreciate why critical thinking skills are as relevant to ethical claims as they are to other sorts of claims. • distinguish among ethical premises that draw upon the three historically important traditions of ethics. 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics I n this chapter, we turn to examining several contexts in which the application of critical thinking skills is especially important. In Chapter 10, we applied our critical thinking skills to the world of science. But there is a sense in which science, rather than being an area of application, is really just a specialized form of critical thinking itself. In the present chapter, we will look at four different areas of decision-making in which the sorts of skills you have learned in the preceding chapters turn out to be especially important. Thinking Critically about Health and Health Care There are few decisions that we make in life that are more important than the decisions we make about our health. When it comes to our health, good decision-making can literally be a matter of life and death. And even when the question at hand is not quite that serious, decisions about our health still matter greatly, not least because good health makes it easier to enjoy the other things we enjoy in life. Making good decisions about health depends on figuring out what to believe, and that is precisely the business of critical thinking. This textbook began with the observation that all of us are faced with the challenge of figuring out what to believe given the enormous number of possible beliefs vying for space in our brains. This is nowhere more obvious than in the world of health. Every day we are bombarded with news reports detailing medical breakthroughs, friendly advice on how to stay healthy, and half-remembered lessons taught to us by our parents. We are faced with claims about what kinds of foods we should eat, how much exercise we should get, what sorts of personal habits will keep us healthy, and what to do when we get sick. It can all be truly bewildering. Key Skills In order to make sense of this flood of information, we really do need to apply the full range of critical thinking skills and techniques. But a few skills stand out as being particularly useful in evaluating health information. The most basic critical thinking skill when it comes to thinking critically about your health is the ability to engage in reasoning about causation. In essence, almost all significant health claims are answers to questions about causation. That is true whether we are interested in the cause of illness or in what will reverse illness and maintain health. With regard to the causes of illness, we need to find good answers to questions like these: • What sorts of foods lead most readily to obesity? • Can a sexually transmitted infection like herpes or chlamydia really be transmitted via the seat of a public toilet? 433 434 Part Four | Explanations • Will lack of sleep make me more likely to "get run down" and catch a cold or the flu? If I get extra sleep later, will that let me "catch up"? • What are the most likely causes of a headache or a rash or aches and pains? • Can I catch a disease from a public toilet seat? With regard to preserving or restoring health, we need to be able to evaluate causal claims to answer questions such as the following: • • • • • Does drinking red wine reduce our risk of heart disease? Will taking an antibiotic cure my cold? How important is exercise in maintaining a strong immune system? Does stretching before running make it less likely that I will pull a muscle? Are herbal remedies a safe and effective way to treat various illnesses? As a starting point, evaluating such claims requires that you recall the lessons learned about causal reasoning in Chapter 8. But in many cases, evaluating causal claims related to health will also require that you critically examine the arguments behind various causal claims. To begin with, you need to remember that causal reasoning is a branch of inductive logic. As such, causal reasoning can only ever give us conclusions that are probable rather than certain—although in some cases, the weight of available evidence is sufficient to make particular conclusions highly probable. For example, the evidence marshalled over the last several decades makes it highly probable that smoking cigarettes has a strong tendency to cause cancer. This is not a deductive argument, so it can never guarantee its conclusion. But the evidence in this case is so strong that it would be foolish not to believe this causal claim. Compare this to more recent claims that yoga may be effective in treating depression. A handful of recent studies point in this direction, but this is a very small amount of evidence, relatively speaking. An inductive argument that reasons from this evidence alone to a conclusion about how to treat depression would be a relatively weak one. As in all situations requiring the evaluation of causal explanations or hypotheses, we must be on guard against various causal confusions. For example, we must be careful not to be misled by coincidence. Imagine you notice that every time you've caught a cold over the last year, it has happened just before a major essay is due at school. Is it really likely that having an essay due is causing you to catch a cold? Is that consistent with what you know about the role of viruses in causing colds? As we learned previously, a correlation is not enough to establish causation. Another common causal confusion involves confusing temporal order with causation. As we learned in Chapter 8, if we assume that simply because A is followed by B, then A must have caused B, we commit the fallacy known as post hoc, ergo propter hoc ("after that, therefore because of that"). If you take a homeopathic remedy on the fourth day of a bad cold, you may well find that the cold goes away two or three days later. Is that because the homeopathic remedy was effective or because the average cold only lasts a total 435 of seven days anyway? Likewise, we must be careful not to ignore common-causal factors. When A is found to be correlated with B, is that because one of them causes the other, or is it instead because both are caused by some third factor, C? For example, you might have heard that knee trouble is common among people who also have heart disease. But does knee trouble cause heart disease? Does heart disease cause knee trouble? We might be tempted by one of those causal hypotheses until we consider that both of those ail- Thinking critically about health has always been important. ments are known very often to result from a What questions should we ask to ensure that a health claim is valid? common cause—namely, obesity. Of course, in many cases we do not evaluate health-related causal hypotheses ourselves but instead rely—directly or indirectly—on expert opinion. Sometimes expert opinions come to us directly, from our physician or from other health professionals, and sometimes expert opinions are conveyed to us by the news media. Evaluating Health Claims in the News Another important skill is the ability to critically evaluate claims in the news. To begin with, we need to adopt a critical attitude to the process by which news—including health news—is reported. As outlined in Chapter 4, not all news is created equal. The quality of reporting varies enormously, especially, perhaps, with regard to health. For example, a 2011 study published in the journal Public Understanding of Science examined claims made in news stories about the relationship between various foods and people's health. The authors of the study systematically looked at items reported in various UK newspapers and examined whether various health claims were justified based on available scientific evidence. They concluded that 72 per cent of health claims made in UK newspapers were supported by levels of evidence lower than what would be thought of as "convincing" and 68 per cent were supported by levels of evidence lower than what would be required even to make those claims "probable."1 This suggests that we cannot take health claims found in the news at face value. In part, this may be a result of the very fact that health is so important to us. News outlets are motivated to feature stories that will get our attention, and they know that stories about food and health are likely to do just that. In some cases, that motivation is liable to outweigh their motivation to report carefully and critically. It is also worth pointing out that, in some cases, reporters themselves may lack the necessary skills to evaluate claims about health science. The result can be reporting that exaggerates the significance of new scientific Alex Gregory/The New Yorker Collection/Cartoon Bank 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics 436 Part Four | Explanations findings or that fails to ask hard questions about just how much evidence there is in favour of particular points of view. In evaluating novel health claims made in news stories, you should ask yourself the following questions: • Are the opinions cited in the story the opinions of people with genuine, relevant expertise? • Does the news story report a range of views, including the opinions of experts who are skeptical of those novel claims? • Does the reporter make an effort to explain the overall body of evidence with regard to the topic at hand, or does he or she merely report narrowly on what is newest and apparently most exciting? • Is the reporter experienced at reporting on health and science? Is he or she a "health reporter" or just a reporter who happens to be covering a health story? • Finally, is the media outlet doing the reporting a credible source of information? Major news outlets like the Globe and Mail and the New York Times have reputations for high-quality reporting. That doesn't mean they don't make mistakes, but it does tend to make their health reporting more reliable. It is also important to read beyond the headlines. In many cases, sensationalistic headlines accompany news stories about scientific findings related to health that are actually much more bland and unexciting. A headline may trumpet a "PROMISING NEW TREATMENT FOR CANCER!" even though the story below it merely describes a relatively small advance in scientific understanding of one aspect of one type of cancer. Finding and Evaluating Expert Advice "Be careful of reading health books. You may die of a misprint." —Mark Twain There are many health issues that we are all perfectly capable of thinking through on our own. Most of us don't need expert advice to understand the health dangers of sharp objects or to know that a diet consisting entirely of bread would be bad for us. But in some cases, understanding what will cause health problems or what will prevent or cure them requires the input of experts. As we learned in Chapter 4, an expert is someone who is more knowledgeable in a particular subject area or field than most others are. When experts tell us that some claim (in their area of expertise) is true, they are more likely to be right than we are. Experts on health are more likely to be right because (1) they have access to more information on health than we do and (2) their experience makes them better at judging health information than we are. They tend to have access to vast quantities of data and are specially trained at evaluating such data to arrive at useful conclusions. 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics As we also noted in Chapter 4, the special insight that experts have means that they can help us evaluate novel claims, and that includes claims about health. If a health claim conflicts with the opinion of a health professional, we have good reason to doubt that claim. But of course, there are plenty of occasions on which experts disagree with each other with regard to health. There is expert disagreement, for example, about the value of various health-screening tests—such as cholesterol testing, Pap smears, screening for prostate cancer, and so on—at least for particular populations. In such situations, we should follow a further principle, modified from one in Chapter 4, regarding expert disagreement: When health experts disagree about a health claim, we have good reason to doubt it. However, with regard to our health we often cannot afford simply to throw up our hands when faced with disagreement among experts. We can doubt whether a particular claim is true or not, but that doesn't necessarily help us to make a decision. If a particular health issue is of special significance for us such that we need to arrive at a conclusion, we can ask the following questions to help us navigate through expert disagreement: 1. Are the experts involved all true experts, with relevant expertise? (Make sure the apparent disagreement, in other words, is not a disagreement between health researchers on one hand and concerned celebrities on the other!) 2. Does the issue in question deeply divide the population of relevant experts, or are there just a few experts who disagree with the majority? In such situations, you still have reason to doubt, but if you need to make a decision about your health, you should take expert opinions as bits of evidence, and—as we have said previously—proportion your belief to the evidence. 3. You should consider whether expert disagreement is rooted in evidence that is specific to the particular segment of the population of which you are part. For example, there might be expert disagreement concerning the value of cholesterol testing for the general population yet wide expert agreement concerning the importance of such testing for people of your age group. We should also remember that disagreement among experts often pertains to small details, which can sometimes distract us from broad expert agreement on more important issues. They might disagree, for example, about the exact kind and quantity of exercise that is required to keep us healthy—and news reports might make a big deal out of such disagreement—despite fundamental agreement on the importance of maintaining an active lifestyle. 437 438 Part Four | Explanations Food For Thought Critical Thinking and Health Professionals How does critical thinking fit into the world of health professionals? Obviously, critical thinking plays an essential role in that world; we rely on health professionals precisely because they are able to critically evaluate health information, including the information relevant to diagnosing and treating our illnesses. It may already have occurred to you that health professionals are experts in the sense discussed in Chapter 4. That is true, and it has implications for their ability to assess and understand claims about health and health care. As we noted in Chapter 4, experts have an advantage in that they have access to more information on the subject of health than the average consumer does and they are better at judging that information than the average consumer is. A well-trained doctor, pharmacist, or nurse, for example, knows a good deal about how to evaluate the conclusions reached by particular scientific studies—the announcement of a breakthrough in cancer care, for example. They also know how to assess the cumulative weight of the various pieces of evidence that are relevant to a particular question, such as whether acupuncture is effective at treating back pain. But health professionals themselves face challenges in deciding what to believe. After all, the amount of relevant information is truly enormous and growing rapidly; it is probably impossible for any health professional to keep up with all the latest findings in anything but a very narrow specialty. And expertise is always limited in scope. A nurse or pharmacist will generally not know as much about diagnosing illness as a physician does; a physician or nurse will generally not know as much about the interactions of different drugs as a pharmacist does; and a pharmacist or physician will generally not know as much about measuring and recording a patient's vital signs (pulse, blood pressure, etc.) as a nurse does. Outside of his or her own specialty, a health professional may be more knowledgeable than the average person but not a true expert. When health professionals are faced with claims on topics that fall partly or entirely outside their field of practice, they must be cautious: they must not only proportion their belief to the evidence but must also temper their degree of belief according to what they know to be the limits of their own ability to judge that evidence. And—ethically—they are obligated not to overstate their degree of certainty with regard to matters that fall outside their special areas of expertise. Stumbling Blocks "It is easier to change a man's religion than to change his diet." —Margaret Mead (anthropologist) Deciding what to believe with regard to staying healthy and responding to illness is an effort that is subject to many of the fallacies discussed in Chapter 5. Think, for example, of the prominence of appeal to tradition and appeal to popularity in the realm of health. For instance, you may have been told that "everyone knows" that you can catch a cold if you go outside in winter without a scarf. But of course, that's pure appeal to popularity—the fact that it is widely believed doesn't mean it's true. Such appeals are particularly worrisome with regard to health. Health is a complex matter, and there are many subtopics on which the general public simply is not well informed. Similarly, your grandmother may tell you that the best cure for a cold is chicken soup or a "mustard plaster" applied to your chest while you rest in bed. 439 Why? Because that's what her mother told her, and what her mother's mother told her, and so on. But of course, that doesn't make it true. That's just an appeal to tradition. Appeal to tradition is particularly problematic in the realm of health because advances in health science have resulted in enormous changes in what we know about how to stay healthy, why we get sick, and what we should do about it when we do. For centuries, people believed that a healthy diet had to include meat, and plenty of it. Today there is growing evidence that meat should play only a relatively small role in Food choices are among the most frequent, and most important, our diets, and many experts recommend a health choices we make. How might an appeal to tradition affect vegetarian or even vegan diet. Appealing to what we eat? tradition, here, does not serve us well! The same goes for treating illness. The fact that a particular treatment—some mixture of herbs, for example—was used "for hundreds of years" within a particular culture doesn't prove that this treatment was effective; it merely proves that it was popular and perhaps that the people using it simply had no alternatives that were superior. It is also worth noting the sense in which evaluating health claims often amounts to a process very much like the one we described in Chapter 10 for judging scientific theories. Do WiFi signals (radiation given off by wireless Internet) cause health problems? In determining whether that theory is credible, we ought to ask whether that theory is testable and fruitful, whether it is broad in scope, whether it is simple, and whether it is conservative. It is worth noting that most so-called alternative medicines do very badly when evaluated in this way. Some of them fail the test of conservatism because they assume the existence of strange flows of "energy" through the human body, energy of a kind not known to modern physics and not detectable by scientific equipment. Others rest on theories that turn out not to be very broad in scope. Homeopathy, for example, is a form of alternative therapy that assumes that water has a "memory" of every molecule it ever came in contact with, and so medicines diluted beyond the point at which there is any active ingredient left can, supposedly, still have an effect on our bodies. Yet homeopaths assert that this effect only becomes relevant in the manufacture of homeopathic remedies: it supposedly has no implications whatsoever for the water we drink! (For more about homeopathy, see essay 8, "Unrepentant Homeopaths," in Appendix A.) Weird theories of all kinds are especially common with regard to health. And so it is particularly important to avoid the temptation, noted in Chapter 10, to leap to weird theories in the absence of evidence. In the face of unusual experiences, Roy Delgado/www.CartoonStock.com 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics 440 Part Four | Explanations Food For Thought Hey, Doc! Don't Look for Zebras! One particular critical thinking challenge faced by health professionals has to do with availability error, which we discussed in Chapter 4. Recall that the availability error has to do with the human mind's tendency, when evaluating various risks, to think first of the most exciting and exotic possibilities. We pointed out that most people think of shark attacks as a relatively common source of danger, despite the fact that shark attacks are actually incredibly rare, because when such attacks do happen they are so gruesome and frightening and easily remembered. As a result, it is easy for us to vividly imagine a shark attack when asked to close our eyes and imagine something dangerous. When this tendency is observed in physicians, it often takes the form of what is known as the "zebra problem." It is the reason that experienced physicians have come up with this diagnostic rule of thumb, often taught to medical students: "When you hear the beat of hooves, think 'horse' not 'zebra.'" In other words, when diagnosing a patient, don't think first of the most exotic possible explanation for the patient's symptoms—begin instead with the most common and likely possibilities. For instance, when a patient has a rash, don't think first of rare and exotic diseases like Legionnaires' disease or the bubonic plague! Work first to rule out simple, commonplace factors like chicken pox and poison ivy. That is very likely also to be good advice for the average individual: your headache at the end of a long and stressful day is probably not an indication that you've got a brain tumour. our "background knowledge" may let us down, and we may be tempted to jump to unwarranted conclusions. If you are not accustomed to getting headaches, the sudden onset of a headache may cause you to assume the worst: maybe it's a brain tumour! The fact that you can't happen to think of a more mundane explanation for your headache doesn't mean that no such explanation exists. Thinking Critically about the Law Nowhere is critical thinking more essential than in the application of law. The law represents the strongest rules of behaviour in any society, rules typically enforced by means of the full power and authority of government. When individuals are found to have violated the law, they may be subject to substantial fines or imprisonment. Taking away an individual's freedom is a very serious matter and should only be done in full light of the facts, evaluated according to the strictest possible standards of critical thinking. Critical thinking is relevant to many aspects of the law. Members of Parliament and their staff must think critically about the need for, and wording of, new legislation if they are to make sure that new laws are both clearly needed and clearly worded. Police officers must use critical thinking skills in applying the law. For example, police officers must apply the law without the kind of bias that results from hasty generalizations about people, in particular racial or 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics 441 socioeconomic categories. Citizens, too, must use their critical thinking skills with regard to the law. If the law forbids "vehicles" in the park, does that include toy vehicles or wheelchairs? In this section, however, we will focus on the application of critical thinking skills to deliberations in the courtroom. That is, we will focus on the need for critical thinking skills on the part of judges, lawyers, and members of juries in criminal proceedings. Critical thinking is particularly important in a court of law for a couple of reasons. The first reason has to do with the importance of such proceedings: as noted above, legal proceedings can result in individuals being thrown in jail, which means losing their freedom along with the ability to have regular contact with friends and family. The second reason has to do with the adversarial nature of our legal system. Under the current system, any time someone is charged with a crime, the court is faced with the challenge of evaluating two competing points of view. On one side is the Crown attorney, representing the government. His or her job is to attempt to convince the court that the accused is guilty and ought to be punished. On the other side are the accused and his or her defence counsel. Everyday Problems and Decisions Jury Duty One of the most important decisions any citizen can make, or help to make, is the decision to send a fellow citizen to jail. As a member of a jury in a criminal trial, you are part of a group of 12 citizens making just such a decision. If you serve on a jury in such a case, what factors should you take into consideration? More generally, a juror's job is to take into consideration all information presented during the trial and to formulate a conclusion about the accused person's guilt or innocence. And, importantly, that is all that should influence a juror. It is a juror's duty to do his or her best not to be influenced by other factors, such as prejudices or biases. A juror needs to use good judgment and common sense to evaluate the evidence presented. Of course, jurors are not experts in the law. (In fact, lawyers are not eligible to serve as jurors in Canada.) The lawyers for the two parties (the Crown prosecutor and the defence counsel) and the judge. It is the task of the prosecutor and defence counsel to present evidence and to explain to the jury what they take to be the key facts of the case and key aspects of the relevant laws. They will naturally do so in a way that is intended to persuade jurors. The prosecutor will try to convince the jury that the defendant is guilty, and the defendant's lawyer will try to convince the jury that the defendant is innocent—or, at least, that the prosecutor has not provided enough evidence to prove guilt. After all the evidence is presented, the judge will instruct the jury, in an impartial way, on what the relevant laws say, what the relevant standards of proof are, and on what factors they must—and what factors they must not—take into consideration. 442 Part Four | Explanations Conande Vries/www.CartoonStock.com The defence counsel's job is to attempt to convince the court that the accused is innocent, has been wrongly charged, and ought to be set free. Neither side is responsible for presenting a balanced view of the evidence. It is the job of the Crown to argue vigorously for a guilty verdict, just as it is the defence counsel's job to argue zealously for a finding of innocence. And in most cases, the truth of the matter will not be obvious. The court must hear the evidence, weigh it carefully, and reach a verdict. In some circumstances, that task falls to a judge, and in other circumstances it falls to a jury of 12 regular citizens. Either way, it is a task that requires the most serious attention to the demands of critical thinking. This decision needs to be supported by the best possible argument. How do courts use critical thinking skills to assess whether a particular explanation for the available evidence makes sense or not? Key Skills Of all of the critical thinking skills needed in a court of law, the most fundamental is a good command of the argument type referred to in Chapter 9 as "inference to the best explanation." Recall that inference to the best explanation is a form of inductive argument in which the arguer gives reasons for believing one explanation for a set of facts rather than another. And that, of course, is precisely what goes on in a court of law. In a criminal trial, various kinds of evidence are presented to the court: a body was found; the accused, Mr Levin, was found near the scene with blood on his hands; an eyewitness testifies to having seen Mr Levin arguing with the victim just a few hours earlier; DNA evidence suggests the involvement of some third party; and so on. After such evidence is presented, each lawyer—the Crown attorney and the defence counsel—will provide a story, an account of the events of the day that they will argue constitutes a good explanation for that evidence, taken as a whole. And the court—the judge or the jury—must evaluate those competing explanations to determine which is best. Recall from Chapter 9 that all instances of inference to the best explanation follow this pattern: Phenomenon Q. E provides the best explanation for Q. Therefore, it is probable that E is true. 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics In a criminal trial, "Phenomenon Q" would be the crime in question—the murder, the theft, or whatever. "E" would be one or another of the explanations offered by the competing lawyers—either that the defendant committed the crime or that she or he did not. The middle premise, then, would be the claim that E provides the best explanation for how the crime happened. And the conclusion of the argument—would either be that the defendant did commit the crime or that the defendant did not commit the crime. In most instances of inference to the best explanation, as we say, that the argument that presents the best explanation is inductively strong. But in a criminal trial, we are looking not just for a strong argument regarding whether the accused is guilty or innocent but for a compelling argument. During criminal proceedings, the burden of proof (a notion discussed in Chapter 5) rests squarely upon the prosecution. The accused, in other words, is "innocent until proven guilty" and in order to be punished must be found "guilty beyond a reasonable doubt." The reason for this high standard is clear. First, as noted above, the stakes in criminal trials are often very high. Second, our legal system is rooted in the principle that it is a heinous wrong to convict someone who is in fact innocent and that if errors are to be made, it is much better that they be made in favour of the defendant. As the eighteenth-century English judge William Blackstone famously put it, it is "better that 10 guilty persons escape than that one innocent suffer." Finally, note that the individual accused generally faces significant disadvantages. He is, after all, just one person with one lawyer, being prosecuted by a Crown attorney who is backed, in principle, by the very considerable resources of the entire government. The government, it is believed, has so many obvious advantages that the least we can do is ask it (as represented by the Crown prosecutor) to bear the burden of proof. Finally, it is worth noting that many aspects of legal reasoning involve categorical logic of the kind we studied in Chapter 6. In determining whether a person violated the law, we are essentially determining whether his or her actions fall into a particular category of prohibited behaviours. Look, for example, at the text of Section 221 of the Criminal Code of Canada, the section dealing with homicide: A person commits homicide when, directly or indirectly, by any means, he causes the death of a human being. Though it may not look like it, this is a categorical statement—specifically, a universal affirmative statement. An argument rooted in that section might look like this: Mr Levin indirectly caused the death of a human being. According to the Criminal Code, anyone who causes the death of a human being, even indirectly, is guilty of homicide. So Levin must be found guilty of homicide. 443 444 Part Four | Explanations Put into standard form, that argument might look like this: P1. All persons who are Mr Levin are persons who directly or indirectly caused the death of a human being. P2. All persons who directly or indirectly cause the death of a human being are persons who have committed homicide. C. Therefore, all persons who are Mr Levin are persons who have committed homicide. Simplifying, this becomes: All S are M. All M are P. Therefore, All S are P. And we can easily demonstrate, using a Venn diagram, that this is a valid argument. The key problem for the court to decide, of course, is whether the first premise—premise 1—is in fact true! The way convicted criminals are sentenced is also a matter of categorical logic. For example, according to Section 47 of the Criminal Code of Canada: Every one who commits high treason is guilty of an indictable offence and shall be sentenced to imprisonment for life. This, too, is a categorical claim of the universal affirmative variety, one that would serve as the foundation for a categorical argument regarding the appropriate punishment for a particular individual. Stumbling Blocks Most fundamental among the critical thinking challenges faced in modern courts of law is the difficulty implied by the need to evaluate competing theories—the one offered by the Crown and the one offered by the defence—in light of what may be an absolutely overwhelming quantity of evidence. But we can also identify a number of other, more specific, challenges. Judges and juries in particular must be on guard against the effect of many of the argumentative fallacies discussed in Chapter 5. Prosecutors, for example, might very often pose a false dilemma: you must either convict the accused or let a vicious killer go free. Prosecutors might be tempted to make ad hominem arguments. If they can make the accused seem like a bad person, or even simply unlikeable, this may make it easier for a jury to believe that he has committed the crime of which he is accused. But, strictly speaking, the character of the accused is not relevant. People with histories of wrongdoing are sometimes wrongly accused, and people of good character do, unfortunately, sometimes commit crimes. So character is beside the point; what matters is whether the facts about the present case support the 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics conclusion that the accused actually committed the crime in question. Jurors may also be tempted to beg the question against the accused. If the accused weren't guilty, they might wonder, why would he be accused of this vicious crime? After all, only criminals get arrested, right? But that, of course, is a premise that assumes the very thing we are trying to determine—namely, whether the accused should be considered a criminal or not. The accused, for his part, might attempt an appeal to emotion: please don't convict me because I've got a family to support. The judge and jury must of course do their best to avoid being influenced by such considerations; their job is to judge the evidence, to believe one theory or the other in proportion to the evidence, and to return the verdict that fits best. In legal contexts, we must also beware of the risks of faulty conditional reasoning. Look, for instance, at this imaginary (but not unlikely) bit of legal reasoning: Ladies and gentlemen of the jury, it is clear what has happened here. If Mr Alkoby committed this crime, we would surely find his fingerprints on the knife that killed Ms Swansburg. And his fingerprints were indeed found on that weapon! It is clear that Mr Alkoby committed this gruesome crime. This may sound like a compelling argument! But notice the argument's logical structure: it is a piece of propositional logic—more specifically, a conditional argument of a particular kind, first discussed in Chapter 3. If you look carefully, you'll see that this is an example of affirming the consequent, which we know is always invalid. Of course, the fact that the defendant's fingerprints were found on the murder weapon is not irrelevant. At the very least, it is likely to be an important part of a strong inductive argument for the defendant's guilt. But here, the evidence is being presented in the form of a deductive argument, which tends to suggest to our mind that the argument is much stronger than it actually is. The prosecutor's wording suggests certainty, while all his logic can provide is probability. Finally, criminal courts must also be wary of the limits on the reliability of eyewitness testimony. An eyewitness is someone who reports, in court, things he or she claims to know from personal experience. In Chapter 4, we learned about the worrisome effect of things like impairment and expectation on the reliability of personal experience. And, according to Toronto defence lawyer Jaki Freeman, Canadian courts have long been aware that eyewitness evidence is remarkably frail and fraught with problems. Such evidence has been identified as a major source of wrongful convictions in Canada. A number of factors influence the accuracy of an identification of a suspect by a witness, such as whether the suspect is known or a stranger to the witness, the circumstances surrounding the contact between the suspect and the witness, the individual make-up of the witness, and 445 446 Part Four | Explanations the nature and methods used during any pre-trial identification of the suspect. There are multiple reasons for this frailty including that the initial contact between witness and suspect is often made under traumatic and unexpected circumstances and when the observation conditions are not ideal. In addition to the factors present at the time of the observations and the personal characteristics of the observing witness, postevent identification procedures can influence the identification of a particular person. Pre-trial identification procedures may be flawed and designed—intentionally or unintentionally—to influence the witness to select the person whom the police have identified as a suspect is identified.2 In other words, courts of law do and should worry—for many of the same reasons discussed in Chapter 4—about relying on personal experience in the form of eyewitness testimony. Thinking Critically about Ethics "In matters of conscience, the law of the majority has no place." —Mahatma Gandhi Finally, we turn to the topic of ethics. Some will be surprised at the very idea of applying critical thinking skills to the realm of ethics. After all, ethics is about what is right and wrong from a moral point of view, and isn't that a personal matter? Don't we all have—and aren't we all entitled to—our own views on that? Shouldn't we respect each other's opinions on ethics rather than adopting a critical attitude? There is, of course, something right in this: we ought to adopt a respectful attitude to other people and take their points of view and their values seriously. But this doesn't imply any exception to the general need to think critically. We don't, after all, want to commit to the subjectivist fallacy discussed in Chapter 2. Recall that subjective relativism is the idea that truth depends on what someone happens to believe—that believing something is enough to make it true. But that view is no more credible with regard to ethics than it is with regard to other sorts of claims. It just doesn't make sense to think, as subjective relativism implies, that none of us is ever wrong about anything related to ethics. We are all fallible—capable of making mistakes—and that's as true with regard to ethics as it is with regard to anything else. Our claims about ethics deserve to be backed up by good arguments. And when confronted with new ethical claims, we need to be able to evaluate critically the arguments offered in support of those claims. If the arguments offered are not good ones, then the ethical claims in question should be doubted. Key Skills Ethics The critical, structured examination of how we ought to behave when our behaviour affects others. Ethics is the critical, structured examination of how we ought to behave when our behaviour affects others. The most fundamental critical thinking skill when it comes to ethics is perhaps the very basic ability, learned in Chapter 3 of this book, to identify the fundamental building blocks of which any argument, including 447 any ethical argument, is constructed. Ethical claims are often put forward with considerable passion, and so a systematic approach can help us to move past emotion to look carefully at the structure of an ethical argument. As with other sorts of arguments, the basic building blocks of ethical arguments are claims or statements. Ethical claims come in many forms. They may be claims about specific actions by specific people—"It was wrong of Janice to lie to Richard"— or they may be generalizations about entire categories of behaviour—"It is wrong to tell lies." Claims about how we ought to behave With regard to ethics, Socrates (469–399 BCE), in Plato's Republic, may take the form of claims about particu- notes that "We are discussing no small matter, here, but how we lar types of actions, the outcomes of our ought to live." What fundamental critical thinking skill leads to ethicoices, or the kinds of people we should ical decision-making? be. Such claims answer questions regarding what kinds of behaviour are right and what kinds are wrong and about what kinds of outcomes and what kinds of character traits are good or bad. Consider the following examples: • • • • • Serena should keep her promise to you. It's wrong to treat James so harshly. Racism is immoral. We ought to protect Liu from the angry mob. My father is a good man. Ethical claims can be differentiated from plain descriptive claims, such as the following: • • • • • Serena did not keep her promise to you. James was fired. Many people think racism is immoral. Liu was protected from the angry mob. My father is a good man. Most ethical arguments in fact feature some combination of ethical and descriptive claims. In one standard kind of ethical argument, the arguer puts forward a general ethical principle of some sort, then describes some action that principle applies, and then concludes that the action is either right or wrong. For example: Ethical Premise: It is unethical to take other people's belongings without their permission. Descriptive Premise: You borrowed my sweater without my permission. Ethical Conclusion: You did something unethical. © Brigida_Soriano/iStockphoto 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics 448 Part Four | Explanations Notice that this argument has two premises. One is about ethics, and one is merely descriptive—it describes the facts of the case under consideration. This is, in fact, an important thing to note about ethical arguments: every ethical argument must contain at least one ethical premise and one descriptive premise. Without a descriptive premise, we don't know the facts of the case under consideration; without an ethical premise, the argument has no ethical or moral foundation at all. As the eighteenth-century philosopher David Hume pointed out, mere facts alone cannot support an ethical conclusion. Or to put it another way, descriptive premises only tell you how the world is; an ethical conclusion tells you how the world should be. Logic won't take you from the former to the latter without an ethical premise to help. What does spelling out the premises and conclusions of an ethical argument accomplish? For one thing, we achieve a certain amount of clarity just by putting it all there in black and white. Keep in mind that in real conversation, ethical arguments will often have pieces missing. In many instances, arguers simply leave out ethical premises that they assume are widely shared and that they think are too obvious to state. By making those pieces explicit, we are able to examine them carefully to see if they really are plausible. Making the parts of an ethical argument explicit also help us to see its structure, the way its premises work to attempt to support its conclusion. Notice, for example, that the two premises in the argument above need each other. The fact that I took your sweater wouldn't prove that I had done something wrong, if taking people's stuff were not wrong. And, the fact that taking people's stuff is wrong wouldn't prove I had done something wrong, if it weren't for the fact that I took your sweater. Those premises are, in other words, dependent premises, something we learned about in Chapter 3. That means that if either premise fails to be plausible, then the entire argument falls apart. Notice also that the argument above is made up entirely of categorical claims—or, at least, claims that can be reworded slightly to make them into categorical claims. Put in categorical terms, the argument might look like this: All instances in which you took my sweater are instances of taking other people's belongings without their permission. All instances of taking other people's belongings without their permission are unethical actions. Therefore, all instances in which you took my sweater are unethical actions. Putting it this way is somewhat awkward, but it accurately reflects the meaning of the original argument. Further, we can go ahead and put that argument into standard form, as follows: All S are M. All M are P. Therefore, all S are P. 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics And of course, once we see the argument in this form, it is clear to us that we would any other categorical syllogism, for example, by constructing a Venn diagram. Categorical arguments of this sort are very common. In such an argument, the arguer tries to fit a particular action into a category of action that is generally acknowledged to be either ethical (e.g., keeping promises) or unethical (e.g., stealing). This also happens to be a kind of syllogism that is a valid argument. (Check for yourself and see!) This means that, presented with such an argument, you know that the logic is solid, and so you can proceed directly to evaluating the premises to determine if they are reasonable. Did the person in question really take the sweater without permission? Is it really true that taking things without the owner's permission is always unethical? Are there exceptions? Do the exceptions apply to this case? Next, consider the following ethical argument: Ethical Premise: If Earl was a good man, he would take care of his family. Descriptive Premise: But Earl has not taken care of his family. Ethical Conclusion: Earl is not a good man. Notice the structure of this argument. You might begin by noticing that the first premise—the ethical premise—is a conditional statement, a statement with an "if–then" structure. This suggests that the argument here can be evaluated using the tools of propositional logic, as discussed in Chapter 3. So we could, in principle, construct a truth table to evaluate this argument. But there's no need for that in this particular case. If you look closely, you'll see that the argument above is an instance of denying the consequent, an argument structure that is always valid. But compare that to this argument: Ethical Premise: If you're a good person, you keep your promises. Descriptive Premise: You keep your promises. Ethical Conclusion: So you're a good person. Notice that again, we have a conditional argument, an instance of affirming the consequent. And so again, there's no need for a truth table: you already know that arguments that affirm the consequent are always invalid. So much for the logical structure of ethical arguments. How can we tell whether the premises of an ethical argument are acceptable? Well, to begin, we noted above that every ethical argument has at least one descriptive premise, and we can evaluate claims just as we would evaluate the claims made in any other kind of argument. (For more on that, see Chapter 4.) But what about ethical premises? The evaluation of ethical claims, and the standards to which ethical claims should be held, is a vast topic, one that is the subject of extensive philosophical debates. We cannot delve into those debates in any detail here but we will provide just a couple of hints at how an assessment of ethical premises might begin. 449 450 Part Four | Explanations CALVIN AND HOBBES © 1989 Watterson. Reprinted with permission of UNIVERSAL UCLICK. All rights reserved. First, we can apply the ethical component of what we referred to in Chapter 4 as our background information—that huge collection of very well-supported beliefs that we all rely on to inform our actions and our choices. That background information includes not just descriptive information but also ethical rules and standards. The fact that it is generally wrong to lie or to intentionally hurt people is so well established that for most purposes it is unreasonable to doubt it. An argument that starts there is off to a good start. Another tactic we can apply is to look for certain structural features that good ethical claims generally think ethical claims ought to have. One such feature is universality. An ethical starting point ought to be one that could apply to all persons in the relevant circumstances. For example, "It is wrong to lie" is universal in the relevant sense. It doesn't claim to apply just to one or a few people—by default, it applies to everyone. (In fact, we could reasonably, though thought, though awkwardly, reword that claim as universal affirmative categorical statement: "All persons are persons who should not lie.") A claim that singles out a particular individual for special treatment is usually not acceptable as a foundation for an ethical Poor reasoning about ethics is unfortunately pretty common. Apply the principles and rules of thumb in this chapter to reason much better than most people. 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics 451 argument. We can, of course, arrive at conclusions about specific individuals, but those conclusions must be reached as the result of an argument rooted in an ethical premise that is universal in its scope. Another key feature to look for in ethical claims is consistency. This means that our ethical judgments should be the same for situations that have the same features. If someone proposes an ethical rule for one situation, it ought to apply also in relevantly similar situations. For example, if someone says "taking office supplies home is morally justified," we are justified in asking whether that person thinks that stealing is justified in other situations too. (Note that our skill at evaluating analogies is going to come in handy here.) To think that a particular kind of behaviour is permissible in one situation but not in situations that share the relevant characteristics is inconsistent. An ethical premise that demonstrates inconsistency need not be taken very seriously. Finally, we can gain some confidence in specific ethical premises if they are drawn from one or more of the great traditions of philosophical ethics. The Western philosophical tradition stretches back more than 2000 years, and during that time philosophers have proposed and debated an enormous number of ethical theories claiming to sum up everything that needs to be said about the topic. Today, no one theory stands out as having won that grand intellectual struggle. But a few contenders have stood the test of time and continue to be defended by at least a respectable subset of philosophers. We cannot discuss these theories in any detail here, but for our purposes it will be enough to point out that each of these theories represents a tradition of moral thinking that has stood the test of time. Each of them proposes a respectable set of principles or ethical reasons that can serve as premises for ethical arguments. These three grand traditions of ethics are as follows: • Argument from consequences. Arguments rooted in this tradition take as a starting point the idea that our fundamental ethical obligation is to produce certain kinds of outcomes. In other words, in making ethical choices, it is the expected consequences of our behaviour that matters. Arguments rooted in an appeal to consequences will generally point out that certain actions have a tendency to make people better off, to prevent harm, to make people happy, and so on. In philosophical terms, this tradition is known as consequentialism, and the most respected form of consequentialism is known as utilitarianism. This tradition is most famously represented by the English philosopher John Stuart Mill (1806–1873). • Argument from rights and duties. Arguments grounded in this tradition focus not on outcomes but on performing or avoiding certain kinds of actions. This tradition holds that there are certain actions that we must always avoid doing (like killing innocent persons) and certain actions that it is our duty always to do (such as, perhaps, keeping promises). It is from this tradition that we get the notion of human rights—the idea that humans are to be respected, and therefore there are certain ways they must be treated regardless of consequences. argument from consequences An ethical argument that takes as a starting point the idea that our fundamental ethical obligation is to produce certain kinds of outcomes. argument from rights and duties An ethical argument that begins with the notion that there are certain kinds of actions that we must always do or always avoid doing. 452 Part Four | Explanations to be treated. Philosophically, this tradition is referred to as deontology and is most famously associated with the work of the German philosopher Immanuel Kant (1724–1804). • Argument from character. Arguments rooted in this tradition start from the assumption that what really matters, ethically, is character. That is, the key is not so much the individual choices we make on particular occasions but the kinds of people we show ourselves to be through our actions. Arguments of this sort focus on whether specific behaviours—or more likely, patterns of behaviour—demonstrate one or another of various desirable character traits, such as honesty and bravery and compassion. To philosophers, this tradition is known as virtue theory and is associated historically with the highly influential work of the ancient Greek philosopher Aristotle (384–322 BCE). argument from character An ethical argument that proceeds from the assumption that what really matters ethically is character rather than the nature or outcome of particular actions. In contrast, there are ethical points of view that have not stood the test of time. These include ethical egoism (the theory that the only relevant ethical reason is self-interest) and ethical relativism (the theory that all that matters is the moral beliefs of your own society). Any ethical argument that begins with such premises is on very rocky ground. Finally, it is worth pointing out that well-grounded ethical arguments rooted in these different ethical traditions sometimes point to quite different conclusions. Arguments from rights and duties, for example, are often seen as providing a counterweight to reasoning that is rooted entirely in argument from consequences. It is easy to imagine a situation in which a police officer, for example, believes that doing something unethical (like torturing a suspect) could do some good—achieve some ethically good outcome—by framing an innocent man. When ethical premises from different ethical traditions conflict, there is no formula for settling the debate. We will generally need to ascertain our belief according to the available evidence, and the relevant evidence, here, consists not just in facts but in values and principles too. Food For Thought Ought Implies Can Philosophers are fond of pointing out that "ought implies can." This is a brief way of saying that whenever someone says that they ought to do something, this logically implies that they can do it. That is, to believe that someone ethically ought to do something, you must first believe that doing it is physically possible. This can be explained in terms of propositional logic. The claim that "ought implies can" can be expressed more clearly if we express it as a conditional claim: "If I ought to do something, then it is possible to do it." It can then be represented as follows: a→b 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics 453 Since "ought implies can" is understood as a claim about ethics, it is used most often in ethical arguments. To put it this way, the conditional a→b is most often used as a starting point for an argument to the effect that a (whatever b stands for) is in fact possible. It is not often that an ethical claim (about what you are obligated to do) is more certain than a factual claim (about what is possible). So it's more often used to argue in the other direction and to think of the claim "ought implies can" as a starting point for figuring out which things you are not obligated to do. It is typically used in arguments of that point out that because a certain behaviour is not possible, the individual is not ethically required to do it. Such an argument will have this form: a→b ~b ∴ ~a This is a valid deductive argument. We could easily prove this by constructing a truth table. But it's simpler still to point out that this is an instance of denying the consequent, an argument form that is always valid. In many cases, arguments of this form provide very good, common-sense advice. Imagine that a = "Ms O'Neill ought to refrain from causing any pollution at all" and that b = "Ms O'Neill can refrain from causing any pollution at all." The first premise above (a→b), plus the second premise, which is the negation of b (namely "It's not the case that Ms O'Neill can refrain from causing any pollution at all"), lead deductively to the conclusion that Ms O'Neill is not obligated to avoid causing any pollution at all. This of course leaves open the possibility that it would be good of her to reduce pollution; it merely shows that—because ought implies can—it's not true that she ought to achieve total pollution abstinence. Stumbling Blocks We have already noted that the subjectivist fallacy is perhaps the greatest barrier to clear thinking about ethics. It's the view that ethics is something about which we can't be wrong and so it is a waste of time to use critical thinking skills in assessing ethical claims. But even if we are to begin to apply the tools of critical thinking to various ethical claims, we must first get past the unhelpful notion that ethics is all just a matter of personal opinion. But of course, a number of other fallacies are likewise common in ethical arguments. Among the most common, perhaps, is the appeal to popularity. As we learned in Chapter 5, occurs when we cite the popularity of some idea—the sheer number of people who believe it—as evidence that it must be true. Historically, a kind of appeal to popularity was likely responsible for the perpetuation of injustices against women, minority groups, and members of the LGBTQ community. Prior to 1919, the year when Canadian women were granted the right to vote, it was sometimes argued that "everyone knows" that women have no ability to understand politics and would just vote for whichever candidate was the most handsome! Of course, critical thinkers recognize that the fact that many people "know" (or rather believe) something doesn't make it true. It's also worth pointing out that sometimes "everyone knows" is a fallacious appeal to tradition: "everyone knows" that Group 454 Part Four | Explanations X isn't worthy of being treated equally and "that's the way it's always been." A critical approach to ethics is dedicated to pointing out such fallacies and to questioning their factual basis. Another common fallacy found in arguments concerning ethics is the straw man fallacy. Recall that in a straw man, the arguer presents a distorted, weakened, or oversimplified version of someone's position so that it can be more easily attacked or refuted. Occurrences of the straw man fallacy happen very easily when discussing ethics. It is relatively easy to produce cartoonish versions of someone else's subtle ethical claims or arguments. If Mark argues that companies developing nations might be justified in not purchasing expensive safety equipment, an opponent might express horror at Mark's belief that "workers' lives have no value." And that criticism, of course, would be off-target. Similarly, if Josephine argues, out of concern for the effects of climate change, that Canada ought to consider reducing industrial greenhouse gas emissions, an opponent might be tempted to make her look foolish by accusing her of wanting to shut down Canada's industrial sector altogether, thereby wrecking our economy. Finally, we must also be on guard for instances of the slippery slope fallacy when discussing ethics. Recall that a slippery slope involves arguing, without good reason, that taking some particular step will inevitably lead to some further, highly undesirable step. Such arguments are common in discussions of ethics as we are often focused on what we should or should not do. Note also that ethics is generally about rules of behaviour, about drawing lines between acceptable and unacceptable actions. So it is often tempting for us to worry that some action that is on the other side of that line, especially if we don't look carefully at what the relevant differences might be between the two actions. Slippery slope arguments sometimes arise in discussions of physician-assisted suicide, for example. Advocates might argue that, under some circumstances, it could be reasonable for an individual with a serious, chronic illness to ask a physician for help in dying, and it could be reasonable for a physician to agree to help. Critics of such a view may suggest that if we allow physicians to help the seriously ill to commit suicide, what's to stop them from deciding on their own to start killing patients. "Next thing you know," the critic may conclude, "no one will be safe in a hospital." But of course, that doesn't obviously follow. Supporters of physician-assisted suicide typically argue for the availability of a fully voluntary process. They also often recommend safeguards, such as the participation of an entire committee of physicians and a requirement that the patient's desire to die be documented as persisting over a number of weeks. The slope from physician-assisted suicide to rampant murder by doctors, in other words, is not necessarily so slippery! But as with other kinds of arguments, we must recall that the fact that someone has offered a fallacious argument for a particular ethical point of view doesn't 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics mean that their view is incorrect. All it means is that the argument as presented does not work. As critical thinkers, we recognize that we can, and should, do better. Summary Health care, law, and ethics are among the most important topics that any of us deal with in our daily lives. Clear thinking about health is among our greatest challenges. Health is universally agreed upon as fundamental to a good life, an essential precondition to the enjoyment of whatever particular projects and pastimes bring us joy. Clear thinking in courts of law is essential to making sure that justice is served—that the guilty are punished and the innocent are not. And clear thinking about ethics is the foundation of a morally good life. The very best—that is, the most reliable—thinking in health care, in law, and in ethics relies heavily on the tools of critical thinking. Exercise 11.1 Review Questions Answers to exercises marked with an asterisk (*) may be found in Appendix B, Answers to Select Exercises. *1. According to the text, what is the most basic critical thinking skill when it comes to thinking about health? 2. Is causal reasoning treated as part of inductive or deductive logic in this textbook? 3. If the conclusion of an argument is false, does that mean that the argument is logically weak? 4. According to the study cited in this chapter, roughly what per cent of health claims reported in UK newspapers are supported by good evidence? 5. What is the most reasonable attitude to adopt toward health claims when experts disagree? 6. Name two key questions you should ask yourself when evaluating health claims published in the news. 7. When engaging in "inference to the best explanation" in criminal trials, what constitutes the phenomenon to be explained? *8. How does the concept of "burden of proof" apply to criminal trials? 9. What is one argumentative fallacy that is common in legal reasoning? 10. Why is subjectivism about ethics a mistake? 11. Why is subjectivism about ethics tempting? 12. What is the difference between an ethical claim and a descriptive claim? 13. What constitutes our background information with regard to ethics? *14. Name the three "grand traditions" of ethics discussed in this chapter. 455 456 Part Four | Explanations Exercise 11.2 On the basis of claims you already have good reason to believe, your background information, and your assessment of the credibility of any cited experts, indicate for each of the following statements whether you would accept it, reject it, or proportion your belief to the evidence. Give reasons for your answers. If you decide to proportion your belief to the evidence, state generally what degree of plausibility you would assign to the claim. *1. An apple a day keeps the doctor away! 2. Everyone should get at least a couple of hours of exercise every day to promote long-term health. *3. Dr Campagna, my physics teacher, says that WiFi radiation is very bad for human health. 4. Dr Fabro, who was found guilty of publishing fraudulent research, argues that smoking cigars increases a person's chance of contracting cancers of the mouth and throat. 5. Possession of cocaine is illegal in Canada. 6. Mr Abdolmalaki is a Crown attorney, and he says very few people in Canada go to jail for simple possession of marijuana. 7. Of course Bartkiw is guilty. It doesn't matter that his plane ticket shows he was in another country at the time—eyewitness described him almost perfectly as the one who stole the jewels! 8. Just ask my lawyer, and she'll tell you. I'm innocent. *9. Killing innocent people is wrong. 10. LeBron James says that professional athletes have a moral obligation to speak up on political issues. 11. Killing another human being is never ethically justified. 12. My ethics professor, Professor Li, says that he has studied the debate carefully and there simply are no philosophically sound arguments against allowing people to marry regardless of sexual orientation. Exercise 11.3 For each of the following arguments, point out any fallacies involved, if any. 1. Sugary treats make kids hyperactive. Every parent knows that! *2. I don't believe that a diet with lots of meat in it is bad for you. My family is German, and we've always loved lots of meat products—bratwurst, schnitzel, liverwurst, you name it! 3. Please, Your Honour, you can't find me guilty. If I have to pay this fine, I won't be able to afford to feed my kids! 4. How can we misrepresenting the truth in an ad be wrong? All companies do it! 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics *5. Shahram is obviously guilty of this crime. He's a notorious thug with a long history of criminal behaviour. 6. Wow, that herbal tea my neighbour recommended was awesome. I had a cold for a week, and then I drank a pot of that stuff and the cold was gone the next day! *7. Who do you think you are, telling me I shouldn't hit my kids? I'm entitled to my own morals, and that includes how to raise my kids! *8. I can't believe you think it's OK to download "pirated" music. I'm amazed that you think it's better for struggling artists to starve rather than being paid fairly for their music! 9. If you commit first-degree murder, you should go to jail. But you didn't commit first-degree murder, so you should not go to jail. Exercise 11.4 For each of the following arguments, construct a Venn diagram to assess for validity. If the argument is valid, give a brief outline of whether the argument's premises are acceptable. (Hint: you may need to supply a missing premise or conclusion.) *1. Anyone who smokes heavily is sure to get cancer. And you're a heavy smoker! 2. Skiing is dangerous. After all, people have died skiing. 3. Some falsehoods are lies, and some lies do great harm. 4. Anyone who takes office supplies home for personal use is a thief. That's exactly what Alison did. So . . . ! 5. Killing is wrong. So capital punishment is wrong. 6. You must avoid lying. Because you're a moral person and all moral persons must avoid lying. *7. Some people who lie have good reasons. So people who have good reasons are actually saints. So some people who lie are saints. Field Problems 1. Go online and find the Letters to the Editor section of the website for your local newspaper or a national (Canadian) newspaper (such as the Globe and Mail or National Post). Identify a letter to the editor that makes an ethical argument—an argument about some ethical issue. Does the writer commit any logical fallacies? Overall, is his or her argument a strong one? 2. Think of something you believe to be obviously true with regard to staying healthy—some claim either about what helps you stay healthy or about what would make you get sick. What reasons do you currently have for 457 458 Part Four | Explanations believing that claim? Go online and find at least two reputable websites that offer support for that claim. Is the support for it strong or weak? Next, go online and see if you can find any reputable websites that make the opposite argument. How convincing are those opposing arguments? Why or why not? 3. Imagine that you've been charged—falsely!—with a serious crime. Which critical thinking tools from this textbook would you most want your lawyer to understand? What critical thinking skills would be most important in order for your lawyer to help keep you out of jail? Self-Assessment Quiz 1. How should a critical thinker regard health claims over which experts seem to disagree? What sorts of questions can be asked to try to gain clarity? 2. According to the text, what form of reasoning is most important in reasoning about health? 3. Give one of the five questions the text says you should ask yourself when evaluating novel health claims made in news stories. 4. Explain the "zebra problem" in medical diagnosis. 5. Give one reason why the burden of proof should not be thought to lie with the defence in criminal cases in Canada. 6. According to the text, which weak form of additional reasoning is especially difficult in courtrooms? 7. What form might an ad hominem argument take? 8. Define ethics. 9. Why must all ethical arguments have at least one ethical premise? 10. Name one of the key features of any ethical claim. For each of the following claims, state whether it is (a) probably true, (b) probably false, (c) almost certainly false, or (e) quite uncertain. 11. Red wine consumed in moderation is good for you. 12. Eating lots of salty foods is bad for you. 13. Pomegranate juice prevents cancer. 14. My baby has been crying and has little red bumps. I'm sure she's got skin cancer! 15. Joon was found at the scene of the murder with blood on his hands. He committed the murder! 16. Mr Veltmeyer was in another city when the crime took place. He cannot be directly responsible. 17. Saying you're sorry when you aren't actually sorry is the same as lying. 11 | Contexts of Application: Thinking Critically about Health, Law, and Ethics 18. People always deserve to be treated the same. 19. It's unfair that the company refused to hire Sui because she's Chinese. 20. If someone attacks you, it is OK to kill them. Writing Assignments 1. Write a 250-word essay explaining which of the domains discussed in this chapter—health, law, or ethics—should be thought of as requiring the highest standard of evidence. Explain your answer. 2. Go online and find a website that supports one health-related myth. Write a 300-word essay explaining why you think this is a myth and providing one fallacious argument that tends to perpetuate that myth. Notes 1. Ben Cooper et al, "The Quality of the Evidence for Dietary Advice Given in UK National Newspapers," Public Understanding of Science (April 2011), 664–73. 2. Jaki Freeman, "The Supreme Court of Canada and Eyewitness Identification—R. v. Bruce, 2011 S.C.C. 4," Briefly Speaking 20, no. 2 (May 2011). 459 Appendix A Essays for Evaluation ESSAY 1* Deterrence by David M. Paciocco The theory of deterrence has two components. The first, known as "specific" or "individual" deterrence, is that punishment will discourage the offender from committing further offences in the future. The second, known as "general deterrence," is that punishment will discourage other like-minded people from committing offences. Based on its 1987 study, Sentencing Reform, the Canadian Sentencing Commission gave up on specific deterrence. It acknowledged that the claim that punishment is effective in reducing the tendency to reoffend is undermined by rates of recidivism (or repeat offending), the apparent "undeterrability" of certain groups of offenders, and the "acknowledged fact" that most prison inmates have been convicted on prior occasions.1 Anyone who has the time should sit in provincial court and watch offenders being sentenced. A quick look at the criminal record in the file that if there wasn't one, I would look around the floor to see if I had dropped it. In spite of our failure to intimidate offenders from reoffending by sentencing them, the system continues to rely on specific deterrence as a justification for punishment. If we are going to send a first offender to jail, our preference is *Source: David M. Paciocco, "Deterrence," in Getting Away with Murder: The Canadian Criminal Justice System (Toronto, Irwin Law, 1999). © Publications for Professionals, 1999. Reprinted by permission of Irwin Law, Inc. Appendix A | Essays for Evaluation to give a "short, sharp" sentence that will "send a message" to him or her. This practice shares a philosophical kinship with giving a child a sharp smack to the back of the head, and is probably about as effective. It is, however, a lot more expensive. General deterrence, the theory that punishing offenders will intimidate others into being law-abiding, is even more central to our theories of punishment. For the most hated crimes, those involving sexual assault, violence causing bodily harm, robbery, and drugs, the primary sentencing principle is general deterrence. Trial judges are overruled by appeal courts when they fail to give general deterrence sufficient weight in sentencing offenders. Yet, paradoxically, most of the crimes for which we emphasize this sentencing principle are the kinds of offences that are most resistant to general deterrence. The official position appears to be that we must accept the general deterrence theory as a matter of faith, but that we cannot put too much faith in it. The Canadian Sentencing Commission asked Professor Cousineau of Simon Fraser University to review the latest literature. He concluded that "there is little or no evidence to sustain an empirically justified belief in the deterrent effect of legal sanctions."2 In spite of this report, the commission could not bring itself to reject the intuitively appealing notion that if people know there is a heavy cost associated with their conduct, they will, as rational people, opt not to engage in that behaviour.3 But even the Sentencing Commission was guarded in its assessment. It cautioned that there is no reason to believe that legal sanctions can be used to deter specific crimes, or to believe that making an example out of a particular offender will have any effect on other potential offenders. It therefore concluded its discussion of general deterrence by saying that "deterrence is a general and limited consequence of sentencing."4 A moment's reflection will demonstrate why general deterrence is so ineffective. Deterrence is based on theories of rational decision making. It presupposes that actors weigh to a nicety the pros and cons of their acts before they act. The most dangerous criminals do not fit that model. They are not people renowned for their good judgment and moment action. So the rational process. In practice, the most horrendous crimes do not lend themselves to this kind of judgment. Sexual offenders give way to vile urges. Assailants strike out in anger. Homicide, in particular, is primarily a crime of passion. It is only rarely a contract hit or a neatly planned exercise. It is more often the worst result of the free reign of jealousy, rage, vindictiveness, hatred, and anger, the most powerful of human emotions. Even when not spontaneous, it is still most commonly done in the throes of extreme emotion. In 1995, by no means an exceptional year, 9 per cent of killers committed suicide, almost invariably immediately after they had killed.5 If these people are not afraid to inflict mortal violence on themselves as the price for their crime, what makes us think we can deter them by threatening them with a cell with a television? 461 462 Appendix A | Essays for Evaluation Some Canadians believe that the television in the cell is part of the reason that general deterrence does not work; we are not hard enough on criminals. If we ratcheted up the sentences, they believe, it would be different. We could treat criminals as criminals, we might just reduce crime. In fact, there is "a great deal of empirical research in the United States and elsewhere [that] has shown that crime rates are not greatly affected by changes to the severity of penalties imposed."6 The Canadian Sentencing Commission came to the same conclusion.7 This result has been effectively demonstrated in Canada with respect to the offence of murder. Murder rates did not rise with the abolition of capital punishment in 1976. They went down and stayed down. And the great American ironies is that many of the states with the highest murder rates are the same ones that invoke the death penalty most frequently. The Ontario Court of Appeal was recently asked to increase the typical sentencing range for men who attempt to murder their female partners. Sentences for that offence range around ten years. The court was right to reject the submission that imposing higher sentences would discourage men from trying.8 By definition, these men are attempting to succeed in killing their spouses. If they succeed, they will get life imprisonment, subject to lengthy parole ineligibility. How can anyone think that a man who knows he might get life if he succeeds is going to sit down and say, "OK. If I fail they are going to give me 12 years instead of ten, so I had better not do it." This is silly. Even at 20 or 30 or 40 years, there would be no difference. The violent among us are deterrence-resistant. Our prisons are full of people who were not deterred. The reasons have to do with the law... but the truth is that there are few laws more powerful than... Cesare Beccaria, sometimes called the father of criminology, was a proponent of general deterrence. He nonetheless sensed that employing brutal punishments would do nothing to reduce crime: "The countries and times most notorious for severity of penalties have always been those in which the bloodiest and most inhuman deeds were committed, for the same spirit of ferocity that guided the hand of the legislators also ruled that of the parricide and assassin."9 Savage punishments reinforce savage attitudes in some people. For the just, savage punishments defeat themselves. They can cause a humane public to rebel against the values demonstrated by the administration of justice, thereby undermining the educational effect of criminal prosecutions. Experience has shown that they can even cause courts to rebel by finding technical ways to prevent imposing the punishment.10 When felons were executed for minor felonies in England, judges became creative in finding ways not to convict. Even if the theory of general deterrence is sound, its promise is easily defeated in practice. It is universally accepted that to be effective systematically, general deterrence depends more than anything else on the certainty of punishment. That is why high-profile RIDE programs and high police presence in crime areas can help produce a reduction in crime rates, but an abstract fear of being caught is tremendously less effective. Some commentators have added that the punishment Appendix A | Essays for Evaluation must also be swift for general deterrence to work. For reasons we can do nothing about, punishment in our system is neither certain nor swift. In terms of the certainty of punishment, with the exception of homicide, where detection and conviction rates are high, only a very small percentage of offenders are ever brought to justice. We don't even learn about the commission of most offences, and partially because some crimes are simply not solved by the police. There are few more complaints tend not to get to trial, either because there is insufficient evidence, the complainants recant, witnesses disappear, the accused disappears, the matter is judged not serious enough to proceed, or the case otherwise falls through the cracks. Some cases end up in acquittals. A leading English academic, Andrew Ashworth, estimates that, in Britain, only 3 per cent of actual offences end up at the sentencing stage.11 The John Howard Society of Alberta estimated that the clearance rate by conviction in Canada in 1987 was unlikely to exceed 20 per cent.12 Even if both these figures are gross underestimations, they demonstrate how poignantly that we will never attain certainty of punishment, no matter how much money we throw at the system or how much we tinker with its rules. All indications are that general deterrence, in the form of creating conditions through the punishment of offenders that will make others decide not to offend, is woefully ineffective for most crimes. It is probably useful to treat crimes relating to people's livelihood, but it is unlikely we will do much to reduce crime by taking lives. Since it is not a crime of violence. If the marginal return of general deterrence was the only possible output of our sentencing practices, it would be hard to justify anything more than the most modest of sentences. In the meantime, I cannot imagine that we will make it any better. A policy of general deterrence is misleading and distorting. It creates a public expectation that cannot be satisfied. Notes 1. Canadian Sentencing Commission, Sentencing Reform: A Canadian Approach (Ottawa: Ministry of Supply and Services, 1987), 135. Between 1975 and 1985, 60 percent of those released on mandatory supervision were readmitted to federal penitentiary, while 49 per cent of those who had been released on parole were readmitted. 2. Ibid., 136. 3. Ibid., 136–7. 4. Ibid., 138. 5. Statistics Canada, Canadian Centre for Justice Statistics, Homicide in Canada—1995 16, no. 11 (1996): 5. 6. Julian V. Roberts, "New Data on Sentencing Trends in Provincial Courts" (1994), 34 CR (4th) 181: 194. 7. Canadian Sentencing Commission, Sentencing Reform, 137. 8. R. v. Edwards (1996), 28 OR (3d) 54 (CA). 9. Daniel J. Curran and Claire M. Renzetti, Theories of Crime (Boston: Allyn and Bacon, 1994), 13. 10. H.R.S. Ryan, The Theory of Punishment (1970), Study Note, reproduced in Don Stuart and R.J. Delisle, Learning Canadian Criminal Law, 5th ed. (Toronto: Carswell, 1995), 139. 11. Andrew Ashworth, Sentencing and Criminal Justice (London: Weidenfeld & Nicolson, 1992), 23. 12. Canadian Sentencing Commission, Sentencing Reform, 148. 463 464 Appendix A | Essays for Evaluation ESSAY 2* Whose Games Are These Anyway? The Olympic Spirit* Signals Their Success, But Now What? by Andrew Potter Has the Olympic movement run its course? Television ratings are soft across the board for these Games, with both the CBC and NBC prime-time broadcasts losing out to new programming from their competitors. Over in Turin, many supposedly glamorous events, notably figure skating, lead in half-empty arenas. Is this the beginning of the end for the largest sporting event in the world? The Wall Street Journal thinks so. In an editorial published just days into the Turin Games, the paper argued that the political appeal of the Olympics in the past was that, if all the proxy wars fought between the forces of freedom and the forces of totalitarianism, ice dancing and the luge were probably the most benignly entertaining. With the end of the Cold War and the rise of globalization, international events such as the Olympics are obsolete. But, if the Journal is right, then perhaps we shouldn't think of declining interest in the Olympics as a sign of the movement's failure, but as its success. The relationship between Olympism and nationalism has always been pretty confused. On the one hand, the fundamental principles of the Olympic movement sound like the lyrics to John Lennon's Imagine recast in bureaucratese. The Olympic Charter requires that the Games are "competitions between athletes in individual or team events and not between countries." The Olympic Truce, first declared in 1992, holds that athletic competition has the power to promote unity and peace by abolishing boundaries. You could have fooled me. The charter may endorse sport as "a way of life based on the joy found in effort," but it promotes that way of life through flag-waving, anthem playing, and a rank ordering of nations by medal count. The fact is, for all its hippyish ideology, the Olympic movement has always found raw nationalism convenient. It is all well and fine for everyone to routinely denounce Hitler for using the 1936 Berlin Games as a showpiece for Nazism, or to express horror at the 1972 Munich murder of 11 members of the Israeli team by Palestinian terrorists, but that's what happens when you allow sport to become the pursuit of politics by other means. As countries stop mattering at the Games, we shouldn't be surprised to find that fewer people are tuning in to watch. Many of the traditional events don't hold much weight as spectator sports, as evidenced by the absence of a serious luge league or Nordic combined circuit. More often than not, the athletes' skill or training or art is invisible to the untrained viewer, *Source: Andrew Potter, "Hurry! No One's Watching: The Olympics' Decline Signals Their Success, But Now What?" Maclean's, 16 March 2006, 8. Appendix A | Essays for Evaluation distinguished through microsecond differences in split times or hinted at in the inscrutable decisions of an anonymous politburo of judges. What makes the Olympics worth watching is not what the athletes are doing, but the uniforms they are wearing. Those of us who cheered on Pierre Lueders in the bobsleigh event did so because he's Canadian, not because we have the foggiest appreciation for why the sport even exists. There was always something rather ridiculous about the International Olympic Committee founder Pierre de Coubertin's idea that a fraternal gathering of leisured aristocrats would lead the way to a borderless world of peace and harmony. Unsurprisingly, commercialization and professionalization appeared at the modern Games almost immediately, along with other complications such as drug use and the participation of women. In his excellent book Olympics in Athens 1896, the British diplomat Michael Llewellyn Smith suggests that, instead of lamenting the tawdry affair that the Olympics has become, we should embrace it "as a triumph of modernity, capitalism, commerce, sporting prowess and celebrity culture." To really embrace the modern world, the IOC just needs to go an extra step and become truly cosmopolitan by doing away with countries at the Olympics altogether: get rid of the flags and make the Games a genuine competition between individuals under the Olympic banner. Or, if we must have teams, let's have teams. Many athletes already get the bulk of their funding from corporate sponsorships, so why not let corporations sponsor entire teams? I'd just as soon see Wal-Mart or Starbucks at the top of the medal standings as I would China or Sweden. One likely consequence of all of this would be a serious overhaul of the schedule of events: out with the old and aristocratic, in with the extreme and populist. This is in fact what the IOC is gradually doing, to a certain extent. The sports that got most of the attention (and fans) at Turin were the ones with all of the fancy branding and the hyper marketing. Events such as snowboarding and freestyle skiing ruled the Winter Games, just as beach volleyball is far and away the most popular sport at the Summer Games. Not only might such a move help revive the Games' sagging fortunes, but it would be more faithful to the transnationalist spirit of the Olympic movement. Meanwhile, nothing would prevent countries from continuing to put their own funding into sport. But since one of the fundamental principles of the Olympic movement—that "sport is at the service of the harmonious development of man, with a view to encouraging the establishment of a peaceful society"—has become anachronistic in a world without a Cold War, governments should invest in amateur sport simply because it makes better citizens, and if it doesn't, then it isn't clear why governments should be involved. If the Games can't survive a move to true commercialized cosmopolitanism, then Olympism is a more obsolete ideal than it already seems. 465 466 Appendix A | Essays for Evaluation ESSAY 3* Electronics in the Classroom—Time to Hit the "Escape" Key? by Shannon Dea With each new term and each new syllabus, a perennial question emerges: should I ban laptops in the classroom? The motivations for this question are understandable. Research shows that students learn better when they take notes by hand rather than typing them (www.scientificamerican.com/article/a-learning-secret-don-t-take-notes-witha-laptop/). Moreover, laptops (and other electronic devices) in the classroom distract not only the owners of the screens, but also all of the nearby students who can see the screens. A recent study found that not only electronic multi-taskers, but also students seated near them, experience a drop in grades. On the other hand, there are good reasons to let students use laptops in the classroom. While disabled students can get special permission to use laptops in courses in which such devices are banned, that very need to ask for the devices thereby "outs" them as having special needs. Violating their privacy in this way is, on my view, unacceptable. (It might also be illegal.) Moreover, whatever the pedagogical merits of hand-written notes, those of our students who go on to post-university work to work with words and ideas (a large proportion of Arts alumni, clearly) will likely do so with computers in front of them. Thus, to educate them in a computer-free zone is not only anachronistic, but arguably means missing an opportunity to train our students in the thoughtful, appropriate use of electronic devices. It's worth noting that university faculty and staff themselves spend a great deal of time multi-tasking on electronic devices. One need only attend a meeting of Senate or a university Town Hall to see university employees using their screens in ways very similar to those that we discourage among our students. So, what is to be done? I just need to put my laptop users in the last couple of rows of the classroom so that they wouldn't distract anyone behind or beside them. I've come to think that this is the way to address the reasons to lecture. Here's my new solution. At the first class meeting, I lay out all of these difficulties for my students. I discuss both the cognitive merits of writing notes by hand, and the distraction attendant upon using a laptop or sitting near someone who does. I discuss the important role that electronic devices can play for disabled students, *Source: Shannon Dea, "Electronics in the Classroom—Time to Hit the "Escape" Key?" The Chalkboard, electronics-classroom-time-hit-escape-key. Reprinted with permission of the author. Appendix A | Essays for Evaluation and the reasons to respect those students' privacy. Then, I instruct students to spend the remainder of the class getting used to the physical learning space, and developing some ideas about the most appropriate "zones" for laptop users. The only stipulations I make are that whatever zones the students develop cannot be exclusively at the back of the class, and must leave some portion(s) of the classroom free from the distraction of nearby laptops. After a couple of classes to get used to the space, the students themselves draw the boundaries of the distraction/no distraction zones in the class. Is this method perfect? Probably not. But it helps students to make empirically-supported decisions about what devices to bring to class; it keeps some spaces distraction free; it models inclusiveness; and it supports students' development of intellectual autonomy and metacognitive skills. ESSAY 4* What's Wrong with "Body Mass Index" by Samantha Brennan I'd like us to ditch all talk of Body Mass Index (BMI) as a meaningful measure when it comes to individuals. And please don't say it's better than weight because it's just weight + height taken into account. Insofar as weight is a problematic measure and BMI relies on weight, so too is BMI problematic. I've truly lost count of the times people are misled by BMI! One particularly effective critique of BMI is Kate Harding's project "BMI Illustrated" over at Shapely Prose (kateharding.net/ bmi-illustrated). She describes it this way, "I put together a slideshow to demonstrate just how ridiculous the BMI standards are." This isn't to deny that BMI talk is useful about populations and big picture trends, it's just that I think it's misleading and harmful when it comes to individuals. Some people are falsely reassured by their BMI, while lots of people with BMIs in the "overweight/obese" categories might be worrying with no good reason. Fit and fat are linked but not in the ways most people think. I worry that lots of fat people don't exercise because they worry what people will think especially if you exercise and don't get any smaller. Yet fat and fit people can be very healthy. “People can be obese yet physically healthy and fit and at no greater risk of heart disease or cancer than normal weight people,” say researchers. The key is being “metabolically fit,” meaning no high blood pressure, cholesterol, or raised blood sugar, and exercising, according to experts. Looking at data from over 43,000 US people they found that being overweight per se did not pose a big health risk,” reports the BBC (www.bbc.co.uk/news/health-19474239). I love my family doctor who cheered me up immensely when she looked at my chart and said, “This is the part of the visit when, given your weight, I should warn you about the health problems associated with overweight and obesity. However, given that you’ve got low to normal blood pressure, no sugar issues, and the best *Source: Samantha Brennen, “Fit, Fat, and What’s Wrong with BMI ,” Fit Is a Feminist Issue, 9 September 2012, . com/2012/09/09/fit-fat-and-whats-wrong-with-bmi. Reproduced with permission of the author. 467 468 Appendix A | Essays for Evaluation ratio of good to bad cholesterol we’ve ever seen at this clinic, I can’t in good conscience do that. You’re extremely healthy. Whatever you’re doing, keep doing it.” A few years ago I tried Weight Watchers—for probably the sixth time in my life, will I never learn?—and I was shocked at their weight range for my height. Weights I haven’t seen since Grade 6. And to give you some perspective they were also weights I never weighed even when at 5′ 7″ I wore size 8 clothing. The socalled “healthy” or “normal” weight range for me has never seemed plausible. I had an interesting experience recently. This summer I was measured in the BodPod at the Fowler Kennedy Sports Medicine Clinic which tells you exactly how much of your body is fat and how much is muscle, bone etc. I was happy to see that to weigh what Weight Watchers thought of as my ideal, I’d be allowed a mere 20 lbs of body fat. I won’t discuss exact weights today but I will tell you that I’m 122 lbs of not fat. It’s my goal as part of my “fittest at fifty” plan to improve my ratio of lean body mass. I plan to both develop my muscles and lose some body fat. I’d also like to lose pounds in absolute numbers too, mostly though to make running easier on my joints and to make it easier to get up hills faster on the bike! Hill climbing on the bike is all about power to weight ratio and so I’ll never be a climber but I hate to get dropped on hills on a regular basis. According to BMI, I’ll likely always be overweight or obese and I’ve made my peace with that. Marc Perry notes in Get Lean that according to BMI most American football players count as obese. So too do many Olympic athletes. You can find a list online of all of the gold medal athletes from the 2004 Olympics in Athens who count as overweight or obese according to BMI . We need to change our image of what athletes look like. Usually they don’t look like fitness models. ESSAY 5* How Ontario Ended up with “Cap and Trade” by Joseph Heath Like many people, I was encouraged to see the Government of Ontario finally stepping into the breach and taking action on the climate change issue, but I was very disappointed to see them choosing to go with a cap-and-trade system rather than a carbon tax. Prior to yesterday, there were two models out there: BC’s carbon tax and Quebec’s cap-and-trade system. Ontario joining Quebec probably represents a tipping point that will push the country as a whole in the direction of cap and trade, which is, as far as I’m concerned, a second-best outcome. How did we wind up here? This is all a consequence of what I consider to be the most important political shift to have occurred in Canada in the past two decades, which is the near-total collapse of moderate conservatism. Indeed, it’s not a surprise that the major spokespersons of the centre-right in Canada—Andrew *Source: Joseph Heath, “Ontario Chickens out, Chooses Cap-and-Trade,” In Due Course, 14 April 2015, . Reproduced with permission of the author. Appendix A | Essays for Evaluation Coyne, Tasha Kheiriddin, etc.—were lining up today to criticize the Ontario plan. And yet the problem, ultimately, stems from the failure of the centre-right in Canada to control their own political parties. And if they’re looking for someone to blame, they should be pointing the finger at Canadian prime minister Stephen Harper, not Ontario premier Kathleen Wynne. Right now, the policy space on climate change can be organized in the following way (starting with positions that involve the least government involvement in the economy, moving down to those that involve the most): 1. The Alberta fantasy. Under this scenario, we just keep on digging up bitumen and selling synthetic oil, investing in new mines, processing and pipeline infrastructure, subject to absolutely no constraints and a carbon price of zero. And people don’t have to pay taxes, because, yay! we’re digging money out of the ground. 2. Carbon tax. The government puts a price on carbon emissions, which raises the price of fossil-fuel derived energy relative to other forms. The price is adjusted until the desired quantity of emissions is achieved. 3. Cap and trade. Firms are issued permits to produce emissions. If their emissions exceed the quantity permitted, they must purchase additional permits on the market. If they are under their emissions quota, they can sell their unused permits. 4. The “planning and banning” fantasy. Here the government gets involved in micro-managing the transition, mandating specific technology for emitters, and subsidizing what it considers to be promising technologies. I think everyone can see why, for people who have a distrust of government, scenario 1 is the best and scenario 4 is by far the worst. But why is 2 (carbon tax) ahead of 3? It’s because cap and trade is so much easier for governments to fiddle around with. In particular, it allows the government to play around with the permit allocations, giving specific firms or industries special exemptions, or extra permits. That’s why the NDP supports it (keeping in mind that there is significant alignment of interest between the Canadian Auto Workers and the automobile industry—a major beneficiary of these fiddles). It also appeals to some of the worst political instincts of the Ontario Liberal Party, and of Kathleen Wynne specifically, who is constantly going on about how government needs to be a “partner” in all major economic activity in the province—which basically means subsidizing manufacturing in ways both subtle and gross. The nice thing about a carbon tax is that it’s really hard to fiddle. So while in practice cap and trade and carbon tax come to the same thing, in reality they don’t. This is Andrew Coyne’s major complaint. And yet he fails to note that if you survey the political landscape in Canada, you find that no major political party (with the exception of the BC Liberals), is willing to champion option 2. In other words, the centre-right in this country is missing in action. Both the Liberals and the NDP are now down into zones 3 and 4 (the Liberals having been pushed there 469 470 Appendix A | Essays for Evaluation by conservative rhetoric) while the federal Conservative party, not to mention the various provincial Progressive Conservative parties, including Ontario’s, remain resolute champions of option 1—the Alberta fantasy. There are two reasons for this. First, conservative political parties in Canada have largely been captured by ideological extremists. One can see this very clearly with the federal Conservative Party in Canada—up to and including the prime minister—which can best be described as “anti-environmental.” There is simply no one there willing to champion market-based approaches to solving environmental problems. One can see the same thing in the Ontario Progressive Conservative Party, where the idea of “promoting a market solution” to a public problem seems to be confused with “doing nothing” or “pretending that there is no problem.” The second reason is connected to the first, and it has to do with electoral strategy. Roughly speaking, the reason that ideological extremists have had such success in controlling conservative parties is that their particular brand of “common sense” conservatism produces a set of incredibly powerful electoral strategies (far better than anything the centre-right can come up with). For instance, the “job-killing carbon tax” sound bite is so powerful that it has taken on a life of its own, effectively tying the hands of the federal government on this issue. (One can see it as well in the current contest for the leadership of the Ontario PC party, where both candidates have locked themselves into supporting option 1, because of the power of the anti-tax sound bite.) In other words, the reason that option 2 winds up being a political orphan is that the people who champion this sort of an approach can’t win elections. Indeed, the Liberal Party of Canada started out supporting option 2, and got slaughtered by the Conservatives for it. (Indeed, there are striking similarities between the Conservative treatment of carbon taxes in Canada and the Republican approach to health care reform in the United States, where Mitt Romney wound up disavowing his own health care reform plan, because there was so much mileage to be had from demonizing “Obamacare.” As a result, conservatives in both countries have wound up taking positions that put them completely outside the space of reasonable policy disagreement, largely for reasons of electoral strategy.) The irony is that, by insisting on getting option 1—and by painting themselves into a corner with their rhetoric—what conservatives are winding up with is option 3. In fact, what they’re winding up with is even worse: first, they are getting a provincial patchwork rather than a more efficient national system. And second, they are getting cap and trade, a system that is more open to government meddling in the economy. It’s almost as though, what they need to learn to do is compromise, and speak out in favour of option 2. Unfortunately, in order to get option 2 onto the table, someone on the right in this country would need to figure out how to c ontrol—or even influence—Stephen Harper, and apparently no one is able to do that. I understand that it’s no fun being a moderate. But seriously, someone on the right in Canada needs to step up to the plate. Is there any politician in Appendix A | Essays for Evaluation Ontario—not a journalist, a politician—willing to stand up to the government and say, “we should have a carbon tax instead”? Because so far all I’ve heard from the opposition has been the same old fantasy, that all taxes are evil, and that we should be doing nothing about climate change. ESSAY 6* Raspberry Ketone, Pure Green Coffee Extract, Garcinia Cambogia, Weight Loss, and the Fallacy of Appealing to Authority by Tracy Isaacs My usually skeptical husband forwarded me an email message late last week with the subject “weight loss.” It contained a short video of Dr Oz endorsing pure green coffee bean extract as a miracle weight loss potion. My husband’s question to me: “What do you think?” The clip I watched showed an enthusiastic Dr Oz with the creator of the product. Oz declared it a weight loss miracle. When I went back to the link a few days later, the link led me to something different. This time, Dr Oz was interviewing someone about a different weight loss miracle: Garcinia Cambogia. Apparently it’s also an amazing fat burner! Like pure green coffee bean extract, this product is supposed to result in weight loss without any changes to diet or activity. Neither the green coffee bean extract page nor the garcinia cambogia page would let me leave them without not one but two pop-ups asking me if I was sure I wanted to leave that page. Dr Oz has also spoken highly of “raspberry ketone.” Available in pill form (because you’d have to eat NINETY pounds of raspberries to get the appropriate “dose”), raspberry ketone is no less than “a fat-burner in a bottle,” according to Dr Oz. His website states that “research has shown that raspberry ketone can help in your weight-loss efforts, especially when paired with regular exercise and a well-balanced diet of healthy and whole foods.” I love the addendum “especially when paired with regular exercise and a well-balanced diet. . . .” I think I will stick to the regular exercise and healthy whole foods and save myself the $180 for a 90-day supply. Most reviews of these products that I’ve read have questioned the research. A Globe and Mail article notes that the study on which the main claims about green coffee bean extract were based involved very few participants. Moreover, participants also lost weight during the placebo phase of the trial. *Source: Tracy Isaacs, “Raspberry Ketone, Pure Green Coffee Extract, Garcinia Cambogia, Weight Loss, and the Fallacy of Appealing to Authority,” Fit Is a Feminist Issue, 24 January 2013, . Reproduced with permission of the author. 471 472 Appendix A | Essays for Evaluation A Canadian Living article on raspberry ketone notes that so far mice have been the only research subjects. Both articles quoted credible MDs claiming that, surprise, surprise: There are no magic solutions! From the Globe and Mail: “Usually when studies break the physical laws of the universe, there’s usually something wrong with the study itself,” said Dr Yoni Freedhoff, medical director of Ottawa’s Bariatric Medical Institute, who writes Weighty Matters, a popular blog on nutrition issues. (www.theglobeandmail.com/ life/health-and-fitness/health/green-coffee-bean-extract-does-it-really-helpyou-lose-weight/article 6116816) I haven’t linked to Dr Oz’s website and I am not going to say a lot more about these products. Both his site and the products are easy to find on the Internet. What I do want to say is this: there is a well-known fallacy that we learn about in philosophy called “the appeal to authority.” Appealing to authority is not a good strategy for those seeking truth claims. Just because some authority like Dr Oz said it’s true doesn’t mean it’s true. Of course we do not need to dismiss the claims of experts. Good science is based on sound studies that have undergone peer review and are based on approved methodologies and ample evidence. Unfortunately, Dr Oz is not an expert in most of what he goes on about. And yet he is accepted as an authority by countless people. His stamp of approval on some product or health claim is taken as gospel by many people. It boosts sales the way Oprah’s endorsement of books used to (perhaps still does) have undue influence in the publishing industry. This is not to say that everything he says is false. It is only to say that just because he said it doesn’t make it true. We need more evidence than that. But the medical community has long told us that there are no magic pills for weight loss. Dr Oz’s claims about these miracle weight loss products are just plain irresponsible, given his level of influence. I’ve heard all sorts of claims about this and that miracle food or product. When I was a teenager, people took caffeine pills to lose weight. As an undergraduate, smoking cigarettes was the thing. At one time or another, the special powers of cabbage, grapefruit, and bananas took centre stage in the weight loss culture. Now it’s more likely to be raspberry ketone, pure green coffee bean extract, or garcinia cambogia. And I haven’t even touched on fad diets like eating for your blood type (based on totally ungrounded claims), the lemon–cayenne pepper–maple syrup–water detox, or any variant of a low carb/high protein plan (my first diet—circa 1980— was the Scarsdale diet, a high protein low carb plan that people loved because you got to eat “plenty of steak” for dinner). If healthy and sustainable weight loss is what you are seeking, none of these supplements or plans will work. They are not sustainable ways of eating for the rest of your life. And like the claim about raspberry ketone, pair anything with regular exercise and healthy eating and you’re good to go. Appendix A | Essays for Evaluation No magic and no surprises. As Globe and Mail reporter Carly Weeks says in her evaluation of raspberry ketone, the bottom line hasn’t much changed: “While the promise of the synthetic compound sounds alluring, the best way of losing weight hasn’t changed: it’s still diet and exercise.” I would only add that “diet” shouldn’t be taken to mean “diets,” those restricted eating plans designed to lose weight. Diets don’t work. In this context we should understand “diet” to mean simply the way we eat on a regular basis. We talk a lot on our blog about why weight loss alone is not a great measure of fitness and why we’re not big fans of dieting . . . . Just to reiterate: “Dr Oz said it” is not a reason on which you can base a strong conclusion. In philosophy we call that an appeal to authority, and it’s a fallacy. ESSAY 7* Yes, Human Cloning Should Be Permitted by Chris MacDonald Patricia Baird’s discussion of human cloning (Annals RCPSC , June 2000) challenges the prospect of nuclear-transfer cloning for the purposes of human reproduction. Baird reviews a long list of familiar worries about human cloning, but the most striking feature of her discussion is its frankness in placing the onus of justification on the shoulders of those who would permit human cloning. The reasons for permitting cloning, she argues, are “insufficiently compelling,” so cloning should be prohibited. The implication is that any new technology should be forbidden unless and until enough justification can be found for allowing its use. Baird is to be commended for her frankness. But the onus is misplaced, or at least too severe. One need not be a single-minded defender of liberty to think that, contrary to Baird’s implication, we need good reasons to limit the actions of others, particularly when those actions do no clear and specific harm. The fact that a portion of society—even a majority—finds an activity distasteful is insufficient grounds for passing a law forbidding it. For example, it is presumably true that at one point, roughly 90 per cent of the public (the same proportion that Baird says is against human cloning) was opposed to homosexuality. Does (or did) this justify action on the part of government to ban homosexual lifestyles? Surely not. There may be a flaw in my analogy. Human cloning, according to critics, has harmful effects (or at least risks). Indeed, Baird suggests that the arguments regarding potential physical and psychological harm to clones have been “well delineated.” In fact, a convincing case has yet to be made for the claim that the physical and psychological risks to clones are more severe than, or different in kind from, those faced by children produced in more traditional ways. Identical twins live with the psychological “burden” of not being genetically unique. *Source: Chris MacDonald, “Yes, Human Cloning Should Be Permitted,” Annals of the Royal College of Physicians and Surgeons of Canada 33, 7 (October 2000): 437–8. Reprinted with permission of the author. 473 474 Appendix A | Essays for Evaluation Children born to women over 35 are at an increased risk of genetic illness. Children resulting from in-vitro fertilization or other reproductive technologies live with the knowledge that their origins were unusual. They may even live with the knowledge that their genetic profile has been manipulated (for example, through pre-implantation selection of embryos). Human cloning for reproductive purposes is another novel—and as yet untested—medical technology. As such, it should be approached with caution. Thorough animal trials should be completed before attempts on humans are contemplated. But this is true of any new medical technology. Baird worries about the shift that human cloning might provoke in the way that we view children. This in turn would change the type of community that we are. The central worry is that human cloning “commodifies” children (i.e., that cloning may make us think of children as a commodity or product to be bought and sold). Why would cloning have this effect? Is it simply because it is likely to be expensive, so that it costs money to have children? Surely this is insufficient to worry us. Raising children already costs money—the statistics show us how many hundreds of thousands of dollars it costs to raise a child through to adulthood. Yet no one has suggested that we see our children as products, or love them any less. (In the mid 1940s—before publicly funded health care—my grandparents sold their car to pay the hospital bill related to my father’s birth, so “purchasing” the birth of a child is nothing new!) Baird argues that an “important part of human identity is the sense of arising from a maternal and a paternal line while at the same time being a unique individual.” Yet without supporting evidence, this sounds like pop psychology. And we can reply in kind: most people I know do not identify with both their maternal and paternal lineages. One of my friends, who was raised by a single mother, identifies with her maternal eastern European heritage, and not with the French paternal heritage implied by her surname. Another friend identifies with his father’s black heritage, rather than with his maternal Chinese lineage, despite his Asian physical features. Such patterns are not unusual. Dual heritage may be normal, but it hardly seems central to our conception of ourselves as humans. And identical twins seem none the worse for the knowledge that they are not genetically unique individuals. Claims about challenges to what makes us “human” may be powerful rhetorical devices, but they must be substantiated if they are to be convincing. Baird is correct to exhort us to look beyond harms to identifiable individuals, to the social implications that human cloning might have. As a comparison, think of fetal sex selection. Most of us think that sex selection is a bad thing—not because of any purported harm to the child, but because we worry about the social implications of valuing children of one sex over those of another. So Baird rightly reminds us that focusing on potential harms to individuals constitutes a “dangerously incomplete framing” of the problem. Furthermore, cloning (and genetic technology in general) is sufficiently new—and its implications sufficiently poorly Appendix A | Essays for Evaluation understood—to warrant a healthy respect, and even the allowance of a margin of safety. But this does not suggest the need for the ban that Baird (with others) proposes. What these worries suggest is a need for caution, for discussion, and for regulation. For instance, laws limiting the number of clones that might be created from one individual, restricting the combination of cloning with genetic modification, and defining lines of parental obligation, would alleviate many of the concerns associated with human cloning. (Françoise Baylis argues that cloning is so likely to be used in combination with gene transfer that we should think of cloning as an enhancement technology rather than as a reproductive technology, in her article “Human Cloning: Three Mistakes and a Solution,” which has been accepted for publication in the Journal of Medicine and Philosophy.) What I have said here should not be taken as an absolute defence of human cloning in all circumstances. (Indeed, there may be only a few circumstances in which cloning is appropriate.) Nor have I suggested that public monies should be spent on cloning research. All I have suggested is that a ban on research leading toward human cloning is unwarranted by the arguments raised thus far. Caution and discretion are warranted; a ban is not. Finally, I worry that Baird’s point of view exemplifies the way in which human reproductive cloning is being singled out, among cloning-related techniques, as a bogeyman. Almost in chorus, scientists are pleading with regulators not to place restrictions on cloning experimentation per se. At the same time, most scientists seem to be more than willing to swear off reproductive cloning, and indeed to wring their hands over the moral implications of its use. Yet this has the air of a too-hasty concession. The scientific community seems to be too willing to condemn one unpopular application of cloning technology, on the basis of too little convincing argumentation, to appease those who oppose cloning technology in general. But human cloning for reproductive purposes has legitimate, morally acceptable applications—for example, for infertile couples, and for gay couples. And none of the criticisms have been convincingly made. We should not let reproductive human cloning be abandoned as the moral sacrificial lamb of the cloning debate. ESSAY 8* Unrepentant Homeopaths by Scott Gavura Alternative medicine is ascendant in Canada. From the dubious remedies that are now stocked by nearly every pharmacy, to the questionable “integrative medicine” at universities, there’s a serious move to embrace treatments and practices that are not backed by credible evidence. Canada’s support for alternative medicine, and *Source: Scott Gavura, “Unrepentant Homeopaths Still Selling Sugar Pills to Prevent Infectious Disease,” Science-Based Pharmacy, 7 December 2014, �homeopaths-still-selling-sugar-pills-to-prevent-infectious-disease. Reproduced with permission of the author. 475 476 Appendix A | Essays for Evaluation for its “integration” into conventional health care, is arguably worse than many other countries. Canada’s drugs regulator, Health Canada, has approved hundreds of varieties of sugar pills and declared them to be “safe and effective” homeopathic remedies. Some provinces are even moving to regulate homeopaths as health professionals, just like physicians, nurses, and pharmacists. Given the regulatory and legislative “veneer of legitimacy” that homeopathy is being granted, you can see how consumers might be led to believe that homeopathic remedies are effective, or that homeopaths are capable of providing a form of health care. The reality is far uglier, and the consequences may be tragic. Canadian homeopaths are putting the most vulnerable in society at risk by selling sugar pills to consumers, while telling them that they’re getting protection from communicable diseases. CBC Marketplace, a consumer affairs show, recently used hidden cameras to record reporters asking homeopaths about vaccines. The show sent young mothers (with their babies) to speak with homeopaths about immunizations and vaccines in Toronto and Vancouver. Of the five homeopaths filmed, four warned the mothers against vaccines, and advised them to avoid giving basic vaccinations like MMR (measles, mumps, and rubella). Only brief clips are shown in the episode, but the standard anti- vaccination tropes and misinformation are all there, such as saying that vaccines “overwhelm” the immune system, or blaming autism on vaccines. After the fear is created, then the sales pitch comes. Homeopaths just happen to have a substitute for real medicine and its toxic vaccines. The solution is sugar pills. The homeopaths pull out their homeopathic “nosodes” and offer them as “risk-free” substitutes, claiming that they have effectiveness rates of “93–95 per cent.” It’s appalling and frightening. As I watched the sales pitch, I wondered how many times homeopaths have counselled parents against vaccines—and how many parents actually knew that they’d been sold an expensive placebo, with zero ability to protect their children from infectious disease. How did it ever come to this? If you’re new to the world of alternative medicine, you might think of homeopathy as a variation of herbalism. The marketing and labelling of homeopathic “remedies” encourages you to think this, describing it as a “gentle” and “natural” system of healing, and putting cryptic “30C” codes beside long Latin names. But with herbalism, at least you’re getting some herb. Homeopathy’s remedies contain no medicine at all—herbal, natural, or otherwise. They are inert. Homeopathy is the air guitar of alternative medicine, going through the motions of medicine, without actually providing medicine. How water and sugar pills are thought to heal is based on nonsensical, prescientific ideas about biology, biochemistry, and medicine itself. Homeopathy is based on the idea that “like cures like” (which is simply a form of magical thinking) and then performing successive dilutions of substances in water. Each dilution is believed to increase, not decrease, the “potency” of the final product. And these are serious dilutions. Think of putting one drop of a substance into a container of water. Only that container is 131 light-years Appendix A | Essays for Evaluation in diameter. That’s the “30C” dilution you’ll see on packages. Homeopaths believe that the water molecules retain a “memory” of the original substance (while somehow forgetting all the other products it has come in contact with). The final remedy is diluted so completely that most “remedies” don’t contain a single molecule of the original substance you started with. The CBC used a great image to illustrate the absurdity—a tablet the size of the Earth might contain a single molecule of the original substance. The rest is sugar. You might wonder how homeopathy could ever be approved as “safe and effective” by a drug regulator. It comes down to how you define “effective.” In the case of homeopathy, regulators diluted the standards just like homeopaths dilute their remedies. Health Canada was required to collect and evaluate some sort of evidence of effectiveness for each product it was responsible for regulating. But it realized that homeopathy could never meet conventional scientific standards of evidence. Consequently it allows citations about homeopathy from texts that date back to the 1800s as “evidence” that homeopathy is effective. To put this in perspective, this means that homeopaths can cite “evidence” that precedes germ theory. Forget about randomized controlled trials—this is anecdote-based medicine. Through this process, Health Canada approved 82 homeopathic “nosodes” for sale over the years. A “nosode” is a remedy that starts with infectious material, like polio, measles, or smallpox, and then it’s diluted sequentially until mathematically, there’s nothing left but water. Those appear to be the remedies the CBC caught the homeopaths selling as vaccine substitutes. Last year the advocacy group Bad Science Watch (www.badsciencewatch.ca) launched a public campaign against nosodes, and succeeded in getting Health Canada’s agreement to force commercial manufacturers to place a label on their products stating “This product is not intended to be an alternative to vaccination.” This was the warning CBC Marketplace was looking for on the packages sold on camera. The warning wasn’t there—because Health Canada apparently doesn’t require the warning when the remedy is produced by the homeopaths themselves, only when the products are commercially prepared. Rather than reflecting on CBC’s question and Health Canada’s intent, homeopaths are instead gloating about their supposed “victory” over a requirement to give consumers a fair warning. No regulator is going to stop Canada’s homeopaths from selling fake vaccines to Canadians, it seems. This isn’t the first time CBC Marketplace has scrutinized homeopathy. A 2011 episode asked if homeopathy was a “Cure or Con” and came to the expected conclusion. This episode had a similar reaction, with homeopaths outraged over the “bias” from CBC . (For LOLs, check out the Homeopathy and CBC Marketplace Facebook page, at www.facebook.com/HomeopathyandCBC.) CBC notes that not one of the five homeopaths filmed on camera was willing to go back on camera to defend their actions. Nor was any homeopathy spokesperson from the various homeopathy organizations that exist in Canada. But now that the show has been broadcast, several homeopaths are defending themselves in print. Their own 477 478 Appendix A | Essays for Evaluation words are further evidence that homeopaths do not appear to comprehend the risks they are taking with the health of children. While these homeopaths may genuinely believe their homeopathic “remedies” are effective, their customers are not receiving full disclosure of the scientific facts. This is where homeopathy can harm. Choosing homeopathy over a vaccine is a decision to forsake immunization, something a homeopath’s customers may not even realize—and seemingly something homeopaths have no intention of disclosing, even when they know the product should be labelled this way. Frustratingly, regulation has given homeopaths an opportunity, and now they’re exploiting it, suggesting that homeopathy may offer something valuable. It does not. Regulating homeopathy and its providers makes as much sense as regulating magic carpets and their vendors. Why is all this so important? Because vaccines work. And we need high vaccination rates to control or eradicate disease. Vaccines are one of the most remarkable health interventions ever developed. This fact has been written about countless times in this blog, so I won’t rehash that evidence. Millions of lives saved by an inexpensive and safe medical intervention. The potential that we’ll be able to eradicate a disease from the earth, like we did with smallpox. That’s what vaccines are doing. And that’s why the actions of homeopaths are so frustrating. With vaccine rates dropping in some areas (some Toronto public schools have up to 40 per cent of students with “exemptions” from the vaccination schedule), health professionals and public health advocates need to be prepared to recognize and address the antagonism against vaccines that’s fostered by homeopaths. Another image that really hit home for me recently was a photo series from Anne Geddes, whom you probably associate with photos of cute children. She recently did a photo session with the victims of meningococcal disease, an illness that can steal limbs and even kill within 24 hours. The photos are beautiful but heartbreaking, and speak to the catastrophic harm that this infectious disease can cause. Amazingly, this infection is now vaccine preventable. But you need to be vaccinated with medicine—not sugar pills. Anti-vaccine sentiment is ugly, and it’s even uglier when there’s a profit motive behind it. I commend CBC Marketplace for yet again taking a hard look at homeopathy from a consumer protection perspective, as it’s something that regulators like Health Canada seem to show little interest in. The evidence is unequivocal— homeopathy has nothing to contribute to immunization or public health issues. One thing that you can do to counter-balance the harms of Canadian homeopaths is to contribute to vaccine programs directly, like those coordinated by Bill Gates or by other organizations. I’ve just contributed to UNICEF ’s program and bought vaccines (which should prevent measles, tetanus, and polio in 139 children. The costs are modest, the risks are low, and the vaccines will save lives. If only this type of health care was supported by homeopaths. Appendix A | Essays for Evaluation ESSAY 9* What If You Could Save 250 Lives by Feeling a Little Disgusted? by Peter Jaworski Picture having to eat a mealworm. Mealworms are the slimy, crawling larvae of the mealworm beetle. They are perfectly safe to eat. But you and I would probably not eat them here or there, we would not eat them anywhere. Not on a canape, and not with a fox. Not in a house, nor in a box. Reflect for a moment on the feeling you get in your stomach at the thought of eating something so disgusting. That’s uncomfortable. Now suppose a large number of Canadians will suffer from that very same stomach-turning feeling for the next 24 hours. Let’s say a million of us will suffer from that feeling. That’s a lot of people feeling a great deal of repugnance. But imagine we could alleviate that stomach-turning feeling. All we have to do is let 256 people die. If we let 256 people die, a million of us will not have to feel repulsed or disgusted. Would you trade the lives of 256 people in order to ensure one million people won’t feel disgusted? In Canada, that’s what we do every year. Every year, we decide that we’d rather let about 250 people die than have to put up with feeling repulsed. There are about 4,500 people waiting for organs in Canada. Most of those waiting—nearly 80 per cent—are waiting for a kidney transplant. In 2012, 256 people died on the waiting list. In the U.S., there are now 120,990 people on a waiting list for organs. 99,201 are waiting on kidneys. Last year, 3,381 people died waiting on a kidney transplant. We have tried increasing altruistic donations. We have tried to get people to sign their organ donor card. But every year only about 2,000 transplants get performed, a number that has remained steady since 2006. In the U.S., about 16,500 people donate organs altruistically. We could fix this. But it would mean allowing a market in organs. It would mean letting people sell one of their kidneys, like they do in Iran. Iran still has a waiting list. But no one waits for organs. Instead, there is a waiting list of people who want to sell an organ. We already know that a market in kidneys would work. I know, I know: Gross! Repugnant! Repulsive! Disgusting! And so on. But this really is the choice. 250 lives in exchange for your not feeling disgusted. For every other concern, there is a simple fix. Some of you might be worried about economic exploitation. Very well, we can restrict the market to all and only those people who make a certain amount of money per year. We can prohibit the poor from selling their organs. *Source: Peter Jaworski, “What If You Could Save 250 Lives by Feeling a Little Disgusted?” HuffPost, 5 May 2014, peter-jaworski/organ-trade_b_5267905.html. Reproduced with permission of the author. 479 480 Appendix A | Essays for Evaluation If you’re concerned about exploiting those who don’t know enough, those who might regret their decision later, we can institute a waiting period of six to 12 months, coupled with a mandatory course. We can test how much people know about what they are getting into. If you pass the test, you get to sell a kidney, if not, then not. That waiting period and test could also be designed in such a way that any worries about coercion or insufficiently informed consent gets taken care of as well. If you’re worried that only the rich will be able to afford organs, no problem: we distribute the organs according to the current standard, or based on need. We have a third party, like the government, or a charity, pay for the kidneys. So no one on the waiting list would have to pay for the kidneys at all. Whether or not you get a kidney would not depend on how thick your wallet is. And if you’re concerned about the meaning of money, or the symbolism of the whole thing, we can change how people get paid. Instead of a cheque, we could pay with a tax credit, or a tuition voucher. We could also insist that people can only use the tuition voucher, for example, on someone other than themselves. That would preserve the altruistic component—you’re not selling the kidney to benefit yourself financially, you would be exchanging a gift of life for a gift of education for someone else. We can keep going like this for any worry you might raise, but I trust that you have enough imagination to figure out how to come up with a way to design the market to alleviate whatever concerns you can come up with. All that’s left is that uncomfortable feeling in the pit of your stomach. Would you really trade the lives of 256 people to avoid having to feel a bit uncomfortable? If a market in kidneys disgusts you, so much the worse for your dinner plans. Get over it. ESSAY 10* Christmas Is a Secular Holiday by Mark Mercer People who would ban Christmas decorations and celebrations from public places are moved by the thought that to celebrate Christmas publicly is to privilege one tradition and the constellation of values around it over all the other traditions and constellations of values current in Canadian society. Celebrating Christmas, they think, disparages other holidays or traditions of celebration, and that, in turn, marginalizes or excludes everyone outside the Christian tradition. One point we must keep in mind here, though, is that Christmas is not an exclusively Christian holiday. For at least a couple generations, Christmas has been evolving into a secular holiday, a holiday that for many of us has no religious *Source: Mark Mercer, “Christmas Is a Secular Holiday,” Ottawa Citizen, 24 December 2008. Reproduced with permission of the author. Appendix A | Essays for Evaluation significance at all. Christmas is a celebration of good will, generosity, and peace among nations. It is a time to appreciate and enjoy the company of family and friends. Children are central to Christmas—partly because it is to them that the future belongs, mainly because they are strange and clever people of whom we are fond. Now for the Christians among us, Christmas marks the birth of Jesus and, so, is also an occasion for worship. But it isn’t any such occasion for the rest of us. And while the activities and symbols through which we honour and celebrate good will, generosity, peace, family, friends, and children derive from Christian traditions, they now have a life of their own independent of those traditions. They don’t put us in mind of any values or doctrines specifically Christian. Christmas, that is, is for many who celebrate it an entirely secular holiday. So if public displays of Christmas trees or greetings of “Merry Christmas!” privilege or exclude, it is not in virtue of their privileging Christianity or excluding non-Christians. What we honour and celebrate at Christmas and through such things as Christmas trees, gift giving, and greetings of “Merry Christmas!”—good will, generosity, peace, family, friends, children—are important in many, if not all, traditions and ways of life current in Canada. Still, though a secular holiday that honours values to which almost all of us subscribe, Christmas is someone’s particular celebration of these values and, so, maybe not someone else’s. And that fact brings us to the question what sort of multicultural society we would like ours to be. In one sort of multicultural society, no celebrations or holidays are public celebrations or holidays. There are, perhaps, statutory holidays, or maybe each of us just gets a certain number of days off work each year to take when she chooses. Each of us congregates with others of her group when according to her traditions or authorities it’s time to honour something, and we do with members of our group whatever our traditions or authorities would have us do. Some of us might invite outsiders to be with us on our celebration day; perhaps we have a fair that anyone can attend. Others of us might instead just have one of our elders write an article for the paper about who we are and what we are honouring. We might make use of public money or public facilities in conducting our event. But in this sort of society, no celebration is by everyone for everyone. In another sort of multicultural society, some celebrations or holidays are public events—events funded and organized by or through civil authorities acting on mandates from the federal government. These holidays would, of course, have to honour values important to most people in the country and to honour them in ways the people find congenial, or else they would attract few participants. In this second sort of multicultural society, a few holidays, maybe only two or three a year, belong to all the people. They are times when everyone gets together to enjoy themselves and to enjoy each other. The second sort of multicultural society is much more attractive than the first sort. The people in it enjoy whatever group identities they have and they are free 481 482 Appendix A | Essays for Evaluation and welcome to honour them. But they also see themselves as citizens of a country and view their neighbours as fellow citizens. In the first sort of multicultural society, though, people see themselves merely as residing among their neighbours, not as connected to them through projects of citizenship. What might be a holiday that all of us can celebrate together simply as Canadians, a holiday whose values touch us all? An obvious candidate is the secular holiday known as Christmas. If we want to have a few holidays that belong to all of us and that all of us can enjoy, I say we make Christmas one of them. Christmas has been evolving into a secular holiday for decades. Sadly, not everyone has received the news. Some people would have us say “Season’s greetings” rather than “Merry Christmas” and not have us put Christmas trees in public areas, wrongly thinking that Christmas in Canada is a Christian affair. They would undo the good work people have been doing over the decades to transform Christmas into a celebration that’s moving and fun for everyone. They would return Christmas to the Christians. Willingly or not, these people are helping to make all celebrations in our country small, sectarian, private affairs. I say we instead take up the noble task of continuing to offer Christmas to all as a delightful secular holiday that we enjoy together and at which we honour values we all cherish. So let us say “Merry Christmas” to each other and decorate Christmas trees in public places. And let us explain to anyone who worries that our behaviour will offend or exclude someone that while Christmas does have its origins in Christian traditions, the Christmas we celebrate is not at all a Christian or a religious holiday. Christmas now belongs to all of us, it privileges no particular religious or other tradition, and no one is excluded from it. Appendix B Answers to Select Exercises CHAPTER 1 Exercise 1.1 1. Critical thinking is the systematic evaluation or formulation of beliefs, or statements, by rational standards. 4. Critical thinking operates according to rational standards in that beliefs are judged by how well they are supported by reasons. 5. The critical in critical thinking refers to the exercising of careful judgment and judicious evaluation. 8. A statement is an assertion that something is or is not the case. 11. An argument is a group of statements in which some of them (the premises) are intended to support another of them (the conclusion). 14. In an argument, a conclusion is a statement that premises are intended to support. 17. No 19. Indicator words are words that frequently accompany arguments and signal that a premise or conclusion is present. 23. Look for the conclusion first. Exercise 1.2 1. Not a statement 4. Not a statement 7. Statement 10. Not a statement 484 Appendix B | Answers to Select Exercises Exercise 1.3 1. Argument Conclusion: Nachos are the perfect study food. 7. Not an argument 11. Argument Conclusion: Don’t outlaw guns. 15. Argument Conclusion: Canada should pursue its trade negotiations with the United States on the assumption that Mr Trump is aiming for another grand, empty gesture. Exercise 1.4 1. Argument Conclusion: Raising the price of our shoes is sure to dampen sales. Premise: It’s a law of economics that if prices go up, demand will fall. 4. Argument Conclusion: The flu epidemic on the east coast is real. Premise: Government health officials say so. Premise: I personally have read at least a dozen news stories that characterize the situation as a “flu epidemic.” 7. Not an argument 10. Not an argument Exercise 1.5 3. Premise 1: Freedom to seek out food to sustain oneself and one’s family is a basic moral right. Premise 2: Treaties signed by the Canadian government state that Indigenous Canadians will always be able to hunt and fish. 6. Premise 1: MacDonald has admitted that he knows nothing about animals. Premise 2: The Society for the Prevention of Cruelty to Animals has declared MacDonald a dummy when it comes to animals. 9. Premise 1: The Internet has led to the capture of more terrorists than anything else. Premise 2: The attorney general of Canada has asserted that the Internet is the best friend that anti-terrorist teams have. 12. Premise 1: Many top TV critics agree that The Walking Dead is the greatest series in television history. Premise 2: I have compared The Walking Dead to all other TV series and found that the show outshines them all. Exercise 1.6 2. Conclusion: Several Canadian cities can expect to see an overall decline in smoking. Appendix B | Answers to Select Exercises 4. Conclusion: As a married person, you are happier than people who aren’t married. 8. Conclusion: Canadian society doesn’t care about its children. Exercise 1.7 1. Argument Conclusion: Advertising isn’t manipulative. Premise: The main thing advertising does is provide information about products. Premise: Ads that don’t seem to provide much information are really just trying to entertain us, not manipulate us. 3. Argument Conclusion: There is no archaeological evidence for the [biblical] flood. Premise: If a universal flood occurred between 5000 and 6000 years ago, killing all humans except the eight on board the Ark, it would be abundantly clear in the archaeological record. Premise: The destruction of all but eight of the world’s people left no mark on the archaeology of human cultural evolution. CHAPTER 2 Exercise 2.1 1. For critical thinking to be realized, the process must be systematic, it must be a true evaluation or formulation of claims, and it must be based on rational standards. 5. We take things too far when we accept claims for no reason. 7. You are most likely to let your self-interest get in the way of clear thinking when you have a significant personal stake in the conclusions you reach. 11. Group pressure can affect your attempts to think critically by allowing your need to be part of a group or your identification with a group to undermine critical thinking. 14. A world view is a set of fundamental ideas that helps us to make sense of a wide range of issues in life. 17. Critical thinking is concerned with objective truth claims. 21. Reasonable doubt, not certainty, is central to the acquisition of knowledge. Exercise 2.2 1. Self-interest 4. Face-saving 7. Group pressure 10. Self-interest 485 486 Appendix B | Answers to Select Exercises Exercise 2.3 1. a. The charge comes from a single source who is a known liar. c. Important evidence that would exonerate Father Miller was not mentioned in the newspaper account. 3. d. Janette has a degree in criminology. 6. No good reasons listed. Exercise 2.4 1. Better-than-others group pressure. Possible negative consequence: Failure to consider other points of view; discrimination against people who disagree with Marie-Eve. 3. It’s not entirely clear what the group’s motivations are. This passage could easily be an example of better-than-others group pressure. 7. Appeal to popularity. Possible negative consequence: Overlooking other factors that might be a lot more important than popularity. Exercise 2.5 1. Face-saving. Possible negative consequences: Continued poor performance due to misidentifying problems; alienation of workers. 2. Self-interest. Possible negative consequences: Wasting taxpayers’ money; being thrown out of office for misconduct. CHAPTER 3 Exercise 3.1 4. Deductive 8. Sound 12. No Exercise 3.2 1. Step 1: Conclusion: She has a superior intellect. Premises: Ethel graduated from McGill University. If she graduated from McGill, she probably has a superior intellect. Step 2: Not deductively valid. Step 3: Inductively strong. Step 4: Does not apply. 6. Step 1: Conclusion: Thus, every musician has a university degree. Premises: Every musician has had special training, and everyone with special training has a university degree. Step 2: Deductively valid. Step 3: Does not apply. Step 4: Does not apply. Appendix B | Answers to Select Exercises 9. Step 1: Conclusion: So some actors who sing also play a musical instrument. Premises: Some actors sing, and some play a musical instrument. Step 2: Not deductively valid. Step 3: Not inductively strong. Step 4: Intended to be deductive. 15. Step 1: Conclusion: So it’s impossible for androids to have minds. Premises: If minds are identical to brains—that is, if one’s mind is nothing but a brain—androids could never have minds because they wouldn’t have brains. Clearly, a mind is nothing but a brain. Step 2: Deductively valid. Step 3: Does not apply. Step 4: Does not apply. Exercise 3.3 3. Valid 8. Valid 14. Valid 18. Valid 23. Invalid Exercise 3.4 I. 1. The honourable member from Algoma-Manitoulin-Kapuskasing was caught misusing campaign funds. 5. She’s not incompetent. 10. Only someone who is pro-American would fail to criticize US military action in the Gulf War or in the war in Afghanistan. II. 3. Sixty per cent of the teenagers in several scientific surveys love rap music. 6. Assad’s fingerprints are on the vase. 9. Add a premise to the effect that the murder rates in almost all cities in central Canada are very low too. Exercise 3.5 1. Valid; modus tollens 6. Valid; modus tollens 9. Valid; modus ponens Exercise 3.6 2. If Lino is telling the truth, he will admit to all charges. Lino is telling the truth. So he will admit to all charges. 487 488 Appendix B | Answers to Select Exercises 5. 9. If Lino is telling the truth, he will admit to all charges. He will not admit to all charges. So he is not telling the truth. If religious conflict in Nigeria continues, thousands more will die. The religious conflict in Nigeria will continue. Therefore, thousands more will die. If religious conflict in Nigeria continues, thousands more will die. Thousands more will not die. Therefore, the religious conflict in Nigeria will not continue. If solar power can supply six megawatts of power in Vancouver (which is certainly not the sunniest place in the world), then solar power can transform the energy systems in sunnier places like Edmonton and Calgary. Solar power can supply six megawatts of power in Vancouver. So solar power can transform the energy systems in sunnier places like Edmonton and Calgary. If solar power can supply six megawatts of power in Vancouver (which is certainly not the sunniest place in the world), then solar power can transform the energy systems in sunnier places like Edmonton and Calgary. But solar power cannot transform the energy systems in sunnier places like Edmonton and Calgary. So solar power cannot supply six megawatts of power in Vancouver. Exercise 3.7 The sample answers below are some possible solutions. Remember, you’ve been asked to use the counterexample method, which means there are lots of possible answers that are correct (but also lots that are incorrect). 4. Not possible to construct a counterexample. This is a valid argument (denying the consequent). If ~a, then b. ~b. Therefore, a. 5. One possible counterexample: If Stephen Harper was the prime minister of Canada in 1970, then he would be a Canadian. Stephen Harper was not prime minister of Canada in 1970. Therefore, he is not a Canadian. If a, then b. Not a. Therefore, not b. (That’s denying the antecedent, an invalid argument form.) 7. One possible counterexample: If Vaughn is a dog, he is a mammal. He is a mammal. Therefore, he is a dog. If a, then b. Appendix B | Answers to Select Exercises b. Therefore, a. (That’s affirming the consequent, an invalid argument form.) 8. One possible counterexample: If ducks are sea turtles, then they are at home in the water. Ducks are not sea turtles. Therefore, ducks are not at home in the water. If a, then b. Not a. Therefore, not b. (That’s denying the antecedent, an invalid argument form.) 11. One possible counterexample: If Victoria is the capital of British Columbia, then Victoria is in British Columbia. Victoria is in British Columbia. Therefore, Victoria is the capital of British Columbia. If a, then b. b. Therefore, a. (That’s affirming the consequent, an invalid argument form.) Exercise 3.8 1. Any argument that provides three separate, stand-alone reasons supporting a single conclusion will do. For example: (1) The stores are closed. (2) We have no money. (3) And we have no way of travelling to any place of business. (4) Therefore, we are just not going to be able to go shopping right now. 1 2 3 4 4. (1) If the pipes have burst, there will be no running water. (2) The pipes have burst. (3) And if all the water is rusty, we won’t be able to use it anyway, (4) and all the water is rusty. (5) So we have no usable water at this point. 1 2 3 5 4 489 490 Appendix B | Answers to Select Exercises Exercise 3.9 6. (1) If Marla buys the house in the suburbs, she will be happier and healthier. (2) She is buying the house in the suburbs. (3) So she will be happier and healthier. 1 2 3 10. (1) The existence of planets outside our solar system is a myth. (2) There is no reliable empirical evidence at all showing that planets exist outside our solar system. 2 1 17. (1) There are at least two main views regarding the morality of war. (2) Pacifism is the view that no war is ever justified because it involves the taking of human life. (3) Just-war theory is the view that some wars are justified for various reasons—mostly because they help prevent great evils (such as massacres, “ethnic cleansing,” or world domination by a madman like Hitler) or because they are a means of self-defence. (4) I think that our own moral sense tells us that sometimes (in the case of the World War II, for example) violence is occasionally morally justified. (5) It would be hard for anyone to deny that a war to prevent something like the Holocaust is morally right. [Implied conclusion] (6) Just-war theory is correct. 5 4 6 Appendix B | Answers to Select Exercises 20. (1) The picnic will probably be spoiled because (2) there is a 90 per cent probability of rain. 2 1 Exercise 3.10 1. Conclusion: (9) You should skip the supplements. Premises: (2) There’s no persuasive evidence yet to suggest that collagen supplements help with joint pain. (3) Collagen is a specific thing (something unstated). (4) Collagen is absorbed in a certain (unstated) way. (5) Collagen is synthesized in the body in a certain (unstated) way. (6) It’s implausible that a small supplement of amino acids consumed daily will have any meaningful therapeutic effects. (8) Genacol, like other collagen supplements, appears to be little more than an expensive protein supplement. 3 4 2 6 5 8 9 CHAPTER 4 Exercise 4.1 4. We should proportion our belief to the evidence. 10. Two additional indicators are reputation among peers and professional accomplishments. 17. By making a conscious effort to consider not only information that supports what we believe but also the information that conflicts with it. 491 492 Appendix B | Answers to Select Exercises Exercise 4.2 4. Proportion belief to the evidence; the claim is not dubious enough to dismiss out of hand and not worthy of complete acceptance. Low plausibility. 6. Reject it; it conflicts with a great deal of background information. 10. Proportion belief to the evidence; the claim is not dubious enough to dismiss out of hand and not worthy of complete acceptance. Moderate plausibility. 14. Reject it; it conflicts with a great deal of background information. 17. Reject it; it conflicts with a great deal of background information. Exercise 4.3 3. Do not agree. Persuasive evidence would include the body of an alien or the alien craft itself, both scientifically documented as being of extra-terrestrial origin. 8. Do not agree. Persuasive evidence would include several double-blind, controlled trials demonstrating that meditation and controlled breathing shrink tumours. CHAPTER 5 Exercise 5.1 4. The fallacy of composition involves arguing that what is true of the parts must be true of the whole. The fallacy of division does the opposite: it involves arguing that what is true of the whole must also be true of the parts. 10. They are fallacious because they assume that a proposition is true merely because a great number of people believe it, but as far as the truth of a claim is concerned, what many people believe is irrelevant. 15. Yes. 19. A false dilemma may assert that there are only two alternatives to consider when there are actually more than two or assert that there are two distinct alternatives that may in fact not be mutually exclusive. People are often taken in by false dilemmas because they don’t think beyond the alternatives laid before them. Exercise 5.2 1. Composition 5. Genetic fallacy 10. Appeal to the person 14. Equivocation (the word desirable is used as if it means “capable of being desired” and also as if it means “worthy of being desired”). Alternatively: faulty analogy. 20. Appeal to the person. Appendix B | Answers to Select Exercises Exercise 5.3 4. False dilemma 6. Hasty generalization 10. False dilemma Exercise 5.4 3. Jones says that Mrs Anan deserves the Nobel Prize. But he’s a real jerk. Clearly, then, Mrs Anan does not deserve the Nobel Prize. 6. In light of ethical considerations, Scouts Canada should allow LGBTQ kids to be members. The reason is that banning LGBTQ kids from the organization would be in conflict with basic moral principles. 11. Newfoundland’s fisheries are a mess because the Department of Fisheries and Oceans—a federal department—has too much power over them. Nobody likes intrusive governments! CHAPTER 6 Exercise 6.1 1. S = scientists, P = Christians; universal negative; E. 5. S = theologians who have studied arguments for the existence of God, P = scholars with serious misgivings about the traditional notion of omnipotence; universal affirmative; A. 8. S = people who play the stock market, P = millionaires; particular negative; O. 12. S = terrorists, P = Saudi citizens; particular affirmative; I. 16. S = new Canadians, P = immigration reform supporters; universal negative; E. Exercise 6.2 1. All Canucks fans are fanatical fans (or, are people who are fanatical). A. 5. All good investments in cellphone companies are investments in cellphone companies that keep up with the latest technology. A. 9. All intelligent thoughts are thoughts that have already happened. A. 13. Some things are things meant to be forgotten. I. Exercise 6.3 1. 4. 5. 8. All people who test the depth of the water with both feet are fools. A. All androids like Commander Data are non-humans. A. No things that satisfy the heart are material things. E. Some treatments said to be part of “alternative medicine” are unproven treatments. I. 493 494 Appendix B | Answers to Select Exercises 12. All days that give her any joy are Fridays. A. 15. All pictures identical with the one hanging on the wall are things that are crooked. A. 20. All nations without a conscience are nations without souls. A. Exercise 6.4 1. No persons are persons exempt from federal income tax. S = persons; P = persons exempt federal income tax. S P 5. No things are things more useless in a developing nation’s economy than a gun. S = things; P = things more useless in a developing nation’s economy than a gun. S P 8. Some good talkers are good listeners. S = good talkers; P = good listeners. S P X Appendix B | Answers to Select Exercises 12. All corporations are corporations with social obligations. S = corporations; P = corporations with social obligations. S P Exercise 6.5 1. No S are P; No P are S. S P S No P are S. P No S are P. Equivalent. 3. All S are P; All P are S. S P All S are P. Not equivalent. S P All P are S. 495 496 Appendix B | Answers to Select Exercises 6. All S are non-P; All P are non-S. S P All P are non-S. S P All S are non-P. Equivalent. 9. Some S are not P; Some P are not S. S P S P X X Some S are not P. Some P are not S. Not equivalent. Exercise 6.6 2. All horses are mammals, and no mammals are lizards. Therefore, no lizards are horses. S = lizards P = horses M = mammals All P are M. No M are S. Therefore, no S are P. 6. Some DVDs are not film classics, but all black-and-white movies are film classics. Therefore, some black-and-white movies are not DVDs. S = black-and-white movies P = DVDs M = film classics Some P are not M. All S are M. Therefore, some S are not P. Appendix B | Answers to Select Exercises 9. No elm trees are cacti. Some tall plants are elm trees. So some tall plants are not cacti. S = tall plants P = cacti M = elm trees No M are P. Some S are M. Therefore, some S are not P. Exercise 6.7 2. All P are M. No M are S. Therefore, no S are P. M S P Valid. 6. Some P are not M. All S are M. Therefore, some S are not P. M X S Invalid. P 497 498 Appendix B | Answers to Select Exercises 9. No M are P. Some S are M. Therefore, some S are not P. M X S P Valid. Exercise 6.8 1. Some “alternative medicines” are cancer treatments, for all herbal medicines are “alternative medicines” and some herbal medicines are cancer treatments. Some herbal medicines are cancer treatments. All herbal medicines are “alternative medicines.” Therefore, some “alternative medicines” are cancer treatments. Some M are P. All M are S. Therefore, some S are P. M X S Valid. P Appendix B | Answers to Select Exercises 3. All SUVs are evil vehicles because all SUVs are gas guzzlers and all gas guzzlers are evil vehicles. All gas guzzlers are evil. All SUVs are gas guzzlers. Therefore, all SUVs are evil vehicles. All M are P. All S are M. Therefore, all S are P. M S P Valid. 8. No wimps are social activists because no wimps are people of honest and strong conviction. And all social activists are people of honest and strong conviction. All social activists are people of honest and strong convictions. No wimps are people of honest and strong convictions. Therefore, no wimps are social activists. All P are M. No S are M. Therefore, no S are P. M S Valid. P 499 500 Appendix B | Answers to Select Exercises CHAPTER 7 Exercise 7.1 1. Conjunction. Components: The Liberals raised taxes, The Conservatives cut programs; & 5. Conditional. Components: Taslima can read your mind, You’re in trouble; → 7. Conditional; Components: God is all-powerful, He can prevent evil in the world; → Exercise 7.2 1. p ∨ q 4. e & f 8. ~g & ~h 14. ~~p Exercise 7.3 2. False 6. True 8. False Exercise 7.4 2. False 5. True 10. True Exercise 7.5 2. Either John is not home or Mary is not home. 5. If the sun is shining, then we will go outside. 9. If the day goes well, then we will not regret our efforts. Exercise 7.6 2. p ∨ q 5. ~a → ~b 9. p → q Appendix B | Answers to Select Exercises Exercise 7.7 2. Alligators are reptiles and dogs are reptiles. a d a&d T T T T F F F T F F F F 6. Either dogs are not mammals or snakes are reptiles. [Hint: To avoid confusion, you can add columns after the guide columns, such as the one for ~d in this truth table. This extra column reminds you that the truth values for ~d are the flip side of those for d.] d s ~d ~d s T T F T T F F F F T T T F F T T 8. Alligators can bark, and dogs are not reptiles. a d ~d a & ~d T T F F T F T T F T F F F F T F Exercise 7.8 1. Valid p → q p ∴ q p q p→q p q T T T T T T F F T F T T T F F T F F T F 501 502 Appendix B | Answers to Select Exercises 7. Valid p → q ~q & r ∴ r p q r ~q p→q ~q & r r T T T F T F T T T F F T F F T F T T F F F T F F T T F F T F F F T T T T T F F T F F F T T F F F p q r ~p p→q ~(q r) ~p T T T F T T F T T F F T F T F F F F F F T T T T F T T F T F T T T T F T T F F T F T T T T 14. Valid p → q ~(q ∨ r) ∴~p Exercise 7.9 3. This is either olive oil or canola oil. And it’s not olive oil, so it must be canola oil. o ∨ c ~o ∴ c Appendix B | Answers to Select Exercises o c o c ~o c T T T F T T F T F F F T T T T F F F F T F Valid 11. Either the herbal remedy alleviated the symptoms or the placebo effect alleviated the symptoms. If the placebo effect is responsible for easing the symptoms, then the herbal remedy is worthless. The herbal remedy alleviated the symptoms. So the herbal remedy is not worthless. h ∨ p p → w h ∴~w h p w h p p→w h ~w T T T T T T F T T T F T T T T F F T T F T F F F T T F F F F T F F F F T F F F F F F T Invalid Exercise 7.10 3. p ∨ q p ∴~q T p ∨ q T T Invalid T F p ~q T T 503 504 Appendix B | Answers to Select Exercises 10. p → q ∴ p → (p & q) F F p → q p → (p & q) T F T T F Valid 15. (d ∨ e) → (d & e) ~(d ∨ e) ∴~(d & e) T F F (d ∨ e) → (d & e) ~(d ∨ e) ~(d & e) T T T T T T T Valid CHAPTER 8 Exercise 8.1 1. Target group: Canadian adults; sample: several thousand horse owners; relevant property: being in favour of banning horse meat. The argument is weak because the sample is not representative. 4. Target group: Decembers in Vancouver; sample: many years of Decembers in Vancouver; relevant property: receiving over 150 millimetres of rain. The argument is strong. 8. Target group: dentists; sample: dentists who suggest that their patients chew gum; relevant property: recommending Brand X gum. The argument is weak because the sample is not representative. 12. Target group: Canadians; sample: adults with an annual income of $48,000–$60,000; relevant property: being happy and satisfied with one’s job. The argument is weak because the sample is not representative. (Middle-income workers are likely to have attitudes toward job satisfaction that are different from those of workers in other income brackets, especially lower ones.) Exercise 8.2 1. Weak. To ensure a strong argument, draw the sample randomly from the entire Canadian population, not just from horse owners. 4. Strong. To make this into a weak argument, rely on a much smaller sample, such as “the last few Decembers.” 8. Weak. To ensure a strong argument, draw the sample randomly from the set of all dentists, not just the dentists who recommend gum. 12. Weak. To ensure a strong argument, draw the sample randomly from the set of all Canadian workers, including respondents representative of all income groups. Appendix B | Answers to Select Exercises Exercise 8.3 1. Does not offer strong support for the conclusion. The problem is non- random—and therefore non-representative—sampling. Exercise 8.4 1. a, b Exercise 8.5 1. More likely to be true. Exercise 8.6 1. Individual: Barb; group: people who ride their bikes to work; characteristic: riding recklessly; proportion: almost all. 4. Individual: next meal eaten at the Poolhouse Café; group: meals eaten at the Poolhouse Café; characteristic: being wonderful; proportion: almost every. 5. Individual: your car; group: Fords; characteristic: work poorly; proportion: most. Exercise 8.7 1. Statistical weakness (given weak anecdotal evidence). 2. Non-typical individual (being a professor makes Professor Norman unusual; professors are more likely than most people to have read Plato). 4. Statistically weak (53 per cent might technically be “most,” but just barely). Exercise 8.8 2. Literary analogy. 5. Argument by analogy. Two things being compared; relevant similarity: working with numbers; conclusion: “he’ll be a whiz at algebra;” weak argument. 7. Argument by analogy; four things being compared; relevant similarity: being beef; conclusion: “I will like tongue;” weak argument. 11. Argument by analogy; two things being compared; relevant similarity: being foundations; conclusions: “no lasting reputation worthy of respect can be built on a weak character;” weak argument. Exercise 8.9 1. Instances being compared: the economic joining of newlyweds, on one hand, and the countries of Europe on the other; relevant similarities: linked economic fate; optimism; seeing benefits; likelihood of tough times together; diversity among cases not a significant factor; conclusion: the countries of Europe may regret linking their economies; weak argument (because of 505 506 Appendix B | Answers to Select Exercises several unmentioned dissimilarities—including very different reasons for joining together and different degrees of linkage). 5. Instances being compared: having terminal cancer and being threatened by an assailant; relevant similarities: being threatened with death or great pain; diversity among cases not a significant factor; conclusion: “suicide must sometimes be morally justified when it is an act of self-defence against a terminal disease that threatens death or great pain.” This is a strong argument—if all the relevant similarities and dissimilarities have indeed been taken into account. A critic could argue, though, that killing oneself in self-defence is just not relevantly similar to killing another human in self-defence. The critic, then, would have to specify what the significant difference is. Exercise 8.10 2. Conclusion: “Research suggests that eating lots of fruits and vegetables may provide some protection against several types of cancer.” Correlation. The argument is strong. The conclusion is a limited claim (“may provide some protection . . .”), which the stated correlation could easily support. 7. Conclusion: “Education increases people’s earning power.” Correlation. The argument is strong. 13. Conclusion: “Tune-ups can improve the performance of lawnmowers.” Correlation. The argument is strong. 16. Conclusion: [Implied] “Having a major war somewhere in the world causes the price of oil to hit $40 a barrel.” Method of agreement. The argument is strong if all relevant factors have been taken into account, which may not be the case. 19. Conclusion: Police presence has caused the reduction in crime. Method of difference. The argument is relatively strong. More information is needed in order to rule out other possible causes. Exercise 8.11 2. a, d (It may be that a diagnosis of cancer leads people to start eating healthier!) 7. a 13. a 16. a, b, d 19. a, b, d Exercise 8.12 1. a 4. b 9. a Appendix B | Answers to Select Exercises CHAPTER 9 Exercise 9.1 4. A theoretical explanation is an explanation that serves as a theory, or hypothesis, used to explain why something is the way it is, why something is the case, or why something happened. 8. A causal explanation is a kind of theoretical explanation. Like all theoretical explanations, causal explanations are used in inference to the best explanation. Exercise 9.2 2. The state of affairs being explained is the endangered status of the polar bear. The explanation is the thinning of Arctic ice, caused by global warming. 5. The state of affairs being explained is the “hot” water from your faucet not being very hot. The explanation is that your hot-water heater is old and can’t keep up. 8. The state of affairs being explained is the fact that your hands are shaking. The explanation is that you’ve had too much coffee. Exercise 9.3 4. Theoretical 7. Theoretical 12. Interpretive Exercise 9.4 2. 6. Theory 1: Jack’s house was burglarized. Theory 2: Jack’s dog went on a rampage. Theory 1: Alice was not exposed to any germs. Theory 2: Vitamin C supercharged Alice’s immune system. Exercise

9.6 2. The minimum requirement of consistency is the criterion that any theory worth considering must have both internal and external consistency—that is, be free of contradictions and be consistent with the data the theory is supposed to explain. 6. A theory that does not have much scope is one that explains very little— perhaps only the phenomenon it was introduced to explain and not much else. Exercise 9.7 2. The first theory is both simpler and more conservative. 4. The first theory is both simpler and more conservative. 7. The first theory is both simpler and more conservative. 507 508 Appendix B | Answers to Select Exercises Exercise 9.8 3. Theory 3 CHAPTER 10 Exercise 10.1 7. It means to ask yourself, “If this theory were true, what testable consequences would follow from it?” 8. Denying the consequent. Valid. 11. No. Hypotheses are tested together with other hypotheses. A hypothesis can always be saved from refutation by making changes in one of the accompanying hypotheses. Exercise 10.2 2. Hypothesis: Two guys are perpetrating a Bigfoot hoax. Test implication: If the two guys are perpetrating a hoax, then monitoring their behaviour day and night should yield evidence of hoaxing activity. 6. Hypothesis: Creatine dramatically increases the performance of weight trainers. Test implication: If creatine increases performance, then giving creatine to weight trainers in a controlled way (in a double-blind controlled trial) should increase various measures of performance in the trainers compared to weight trainers who get a placebo (inactive substance). Exercise 10.3 3. Theory: Local climate changes are melting glaciers. Competing theory: Heat from volcanic activity around the planet is melting the glaciers. Both theories are about equal in terms of testability, fruitfulness, and scope. The volcanic theory, however, is neither simple nor conservative. It’s not simple because it assumes an unknown process. It’s not conservative because it is not consistent with what is known about the effects of heat from volcanoes. 7. Theory: Poverty fosters crime. Competing theory: People commit crimes because they lack basic human values. Both theories are about equal in terms of testability, fruitfulness, scope, and simplicity. The values theory, though, is not conservative. It conflicts with what we know about those who commit crimes. Some crimes are indeed committed by people who lack basic human values (for example, sociopaths), but that is not true for most crime. Exercise 10.4 2. Test implication: If brighter street lights decrease the crime rate, then reducing the brightness of the lights (while keeping constant all other factors, such as police patrols) should increase the crime rate. The test would likely confirm the theory. Appendix B | Answers to Select Exercises 6. Test implication: If eating foods high in fat contributes more to being overweight than eating foods high in carbohydrates, then over time people should gain more weight when they are eating X number of grams of fat per day than when they are eating the same number of grams of carbohydrates per day. Exercise 10.7 4. The appeal to ignorance. 6. Something is logically possible if it does not violate a principle of logic; something is logically impossible if it violates a principle of logic. Exercise 10.8 2. 7. Theory 1: The aging of the building materials in the house caused creaking. Theory 2: The wind blowing against the house caused the creaking. Theory 3: A ghost caused the creaking. Theory 1: A coincidental matching between the dream and real events made the dream seem prophetic. Theory 2: Wayne had the same dream every night because he was concerned about his uncle, so there was a good chance that the dream would match something in reality. Theory 3: The dream was a genuine prophetic dream. Exercise 10.9 3. Alternative theory: As a prank, the little girls cut drawings of fairies out of a book, posed them in the garden, and took photos of themselves with the cutouts. Then they claimed that the photos showed actual fairies. Both theories seem to be about equal in testability and fruitfulness. The prank theory has more scope because faked photos can explain many other phenomena, including many different kinds of paranormal hoaxes. The fairy theory is neither simple nor conservative. Fairies are unknown to science, and claims about their existence conflict with many things that we know. CHAPTER 11 Exercise 11.1 1. The ability to carefully reason about causation. 8. The burden of proof is always on the prosecution, which means that the defendant is considered innocent until proven guilty. 14. Argument from consequences, argument from rights and duties, argument from character. Exercise 11.2 1. If taken literally, reject it. The idea that eating apples literally prevents the need to see a doctor conflicts with a great deal of background knowledge. 509 510 Appendix B | Answers to Select Exercises 3. Proportion belief to the evidence. The expert cited likely has relevant expertise. But the study of the effects of WiFi radiation is relatively new, and new technologies may change existing estimates of risk. High plausibility. 9. Accept it. Although we might be able to think of exceptions, the idea that killing innocent people is unethical is widely agreed upon and is an essential rule for a stable society. Exercise 11.3 2. 5. 7. 8. Appeal to tradition Ad hominem Subjectivist fallacy False dilemma; appeal to emotion Exercise 11.4 1. Anyone who smokes heavily is sure to get cancer. And you’re a heavy smoker! All smokers are people who will get cancer. All people who are identical with you are smokers. Therefore, all people who are identical with you will get cancer. [hidden conclusion] All M are P. All S are M. Therefore, all S are P. M S P Valid. The first premise is not acceptable. Many people who smoke get cancer, but not all of them do. 7. Some people who lie have good reasons. Some people who have good reasons are actually saints. So some people who lie are saints. Some people who lie are people who have good reasons (to lie). Appendix B | Answers to Select Exercises Some people who have good reasons (to lie) are saints. Some people who lie are saints. Some S are M. Some M are P. Some S are P. M X S Invalid. X P 511 Glossary abduction (abductive reasoning) The form of reasoning used when putting forward a hypothesis as to what would explain a particular phenomenon or set of circumstances. ad hoc hypothesis A hypothesis, or theory, that cannot be verified independently of the phenomenon it is supposed to explain. Ad hoc hypotheses always make a theory less simple—and therefore less credible. ad hominem See appeal to the person. affirming the antecedent See modus ponens. affirming the consequent An invalid argument form: If p, then q. q. Therefore, p. analogical induction See argument by analogy. analogy A comparison of two or more things alike in specific respects. antecedent The first part of a conditional statement (If p, then q), the component that begins with the word if. See conditional statement. appeal to authority The fallacy of relying on the opinion of someone deemed to be an expert who in fact is not an expert. appeal to common practice The fallacy of accepting or rejecting a claim solely on the basis of what groups of people generally do or how they behave (when the action or behaviour is irrelevant to the truth of the claim). appeal to emotion The fallacy of using emotions in place of relevant reasons as premises in an argument. appeal to ignorance The fallacy of arguing that a lack of evidence proves something. In one type of this fallacy, the problem arises from thinking that a claim must be true because it hasn’t been shown to be false. In another type, the breakdown in logic comes when you argue that a claim must be false because it hasn’t been proven to be true. appeal to popularity (or to the masses) The fallacy of arguing that a claim must be true merely because a substantial number of people believe it. appeal to the person (or ad hominem) The fallacy of rejecting a claim by criticizing the person who makes it rather than the claim itself. Ad hominem means “to the man.” appeal to tradition The fallacy of arguing that a claim must be true just because it’s part of a tradition. argument A group of statements in which some of them (the premises) are intended to support another of them (the conclusion). argument by analogy (analogical induction) An argument that makes use of analogy by reasoning that because two or more things are similar in several respects, they must be similar in some further respect. argument from character An ethical argument that proceeds from the assumption that what really matters ethically is character rather than the nature or outcome of particular actions. argument from consequences An ethical argument that takes as a starting point the idea that our most fundamental ethical obligation is to produce certain kinds of outcomes. arguments from rights and duties An ethical argument that begins with the notion that there are certain kinds of actions that we must always do or always avoid doing. background information The large collection of very well-supported beliefs that we all rely on to inform our actions and choices. It consists of basic facts about everyday things, beliefs based on very good evidence (including our own personal observations and excellent authority), and justified claims that we would regard as “common sense” or “common knowledge.” begging the question The fallacy of attempting to establish the conclusion of an argument by using that conclusion as a premise. Also called arguing in a circle. biased sample A sample that does not properly represent the target group. See also representative sample. burden of proof The weight of evidence or argument required by one side in a debate or disagreement. categorical logic A form of logic whose focus is categorical statements, which make assertions about categories, or classes, of things. categorical statement A statement or claim that makes a simple assertion about categories, or classes, of things. causal argument An inductive argument whose conclusion contains a causal claim. Glossary causal claim A statement about the causes of things. claim A statement; an assertion that something is or is not the case. cogent argument A strong inductive argument with all true premises. composition The fallacy of arguing that what is true of the parts must be true of the whole. The error is to think that the characteristics of the parts are somehow transferred to the whole, something that is not always the case. compound statement A statement composed of at least two constituent, or simple, statements. conclusion In an argument, the statement that the premises are intended to support. conditional statement An “if–then” statement; it consists of the antecedent (the part introduced by the word if) and the consequent (the part introduced by the word then). confidence level In statistical theory, the probability that the sample will accurately represent the target group within the margin of error. confirmation bias The psychological tendency to seek out and remember information that confirms what we already believe. conjunct One of two simple statements joined by a connective to form a compound statement. conjunction Two simple statements joined by a connective to form a compound statement. consequent The part of a conditional statement (If p, then q) introduced by the word then. conservatism A criterion of adequacy for judging the worth of theories. A conservative theory is one that fits with our established beliefs. copula One of four components of a standard-form categorical statement; a linking verb—either are or are not—that joins the subject term and the predicate term. criteria of adequacy The standards used to judge the worth of explanatory theories. They include testability, fruitfulness, scope, simplicity, and conservatism. critical thinking The systematic evaluation or formulation of beliefs or statements by rational standards. deductive argument An argument intended to provide logically conclusive support for its conclusion. denying the antecedent An invalid argument form: If p, then q. Not p. Therefore, not q. denying the consequent See modus tollens. dependent premise A premise that depends on at least one other premise to provide joint support to a conclusion. If a dependent premise is removed, the support that its linked 513 dependent premises supply to the conclusion is undermined or completely cancelled out. disjunct A simple statement that is a component of a disjunction. disjunction A compound statement of the form “Either p or q.” A disjunction is true even if only one disjunct is true and false only if both disjuncts are false. disjunctive syllogism A valid argument form: Either p or q. Not p. Therefore, q. In the second premise of a syllogism, either disjunct (either of the parts separated by “or”) can be denied. division The fallacy of arguing that what is true of the whole must be true of the parts. The error is thinking that characteristics of the whole must transfer to the parts or that traits of the group must be the same as traits of individuals in the group. enumerative induction An inductive argument pattern in which we reason from premises about individual members of a group to conclusions about the group as a whole. equivocation The fallacy of using a word in two different senses in an argument. ethics The critical, structured examination of how we ought to behave when our behaviour affects others. expert Someone who is more knowledgeable in a particular subject area or field than most others are. explanation A statement or statements intended to tell why or how something is the case. fallacy An argument form that is both common and defective; a recurring mistake in reasoning. false dilemma The fallacy of asserting that there are only two alternatives to consider when there are actually more than two. faulty analogy A defective argument by analogy. fruitfulness A criterion of adequacy for judging the worth of theories. A fruitful theory is one that yields new insights. gambler’s fallacy The error of thinking that previous events can affect the probabilities in the random event at hand. genetic fallacy The fallacy of arguing that a claim is true or false solely because of its origin. hasty generalization The fallacy of drawing a conclusion about a target group on the basis of a sample that is too small. hypothetical syllogism A valid argument made up of three hypothetical, or conditional, statements: If p, then q. If q, then r. Therefore, if p, then r. 514 Glossary independent premise A premise that does not depend on other premises to provide support to a conclusion. If an independent premise is removed, the support that other premises supply to the conclusion is not affected. indicator words Words that are frequently found in arguments and signal that a premise or conclusion is present. inductive argument An argument in which the premises are intended to provide probable, not conclusive, support for its conclusion. inference The process of reasoning from a premise or premises to a conclusion based on those premises. inference to the best explanation A form of inductive reasoning in which we reason from premises about a state of affairs to an explanation for that state of affairs: Phenomenon Q E provides the best explanation for Q. Therefore, it is probable that E is true. invalid argument A deductive argument that fails to provide conclusive support for its conclusion. logic The study of good reasoning, or inference, and the rules that govern it. margin of error The variation between the values derived from a sample and the true values of the whole target group. mixed argument An argument that includes both inductive and deductive elements. modus ponens (affirming the antecedent) A valid argument form: If p, then q. p. Therefore, q. modus tollens (denying the consequent) A valid argument form: If p, then q. Not q. Therefore, not p. necessary condition A condition for the occurrence of an event without which the event cannot occur. peer pressure Group pressure to accept or reject a claim solely on the basis of what one’s peers think or do. philosophical skepticism The view that we know much less than we think we do or that we know nothing at all. philosophical skeptics Those who embrace philosophical skepticism. post hoc, ergo propter hoc (“after that, therefore because of that”) The fallacy of reasoning that just because B followed A, A must have caused B. predicate term The second class, or group, named in a standard-form categorical statement. premise In an argument, a statement or reason given in support of the conclusion. problem of induction The philosophical question as to whether the process of induction can ever lead to real knowledge. property in question See relevant property. propositional logic The branch of deductive reasoning that deals with the logical relationships among statements. quality A characteristic of a categorical statement, determined by whether the statement affirms or denies that a class is entirely or partly included in another class. A categorical statement that affirms is said to be affirmative in quality; one that denies is said to be negative in quality. quantifier In categorical statements, a word used to indicate the number of things with specified characteristics. The acceptable quantifiers are all, no, or some. The quantifiers all and no in front of a categorical statement tell us that it’s universal—it applies to every member of a class. The quantifier some at the beginning of a categorical statement says that the statement is particular—it applies to some but not all members of a class. quantity In categorical statements, the attribute of number, specified by the words all, no, or some. random sample A sample that is selected randomly from a target group in such a way as to ensure that the sample is representative. In a simple random selection, every member of the target group has an equal chance of being selected for the sample. red herring The fallacy of deliberately raising an irrelevant issue during an argument. The basic pattern is to put forth a claim and then couple it with additional claims that may seem to support it but that, in fact, are mere distractions. relevant property (property in question) In enumerative induction, a property, or characteristic, that is of interest in the target group. representative sample In enumerative induction, a sample that resembles the target group in all relevant ways. See also biased sample. sample (sample member) In enumerative induction, the observed members of the target group. scientific instrumentalism The school of thought that says the goal of science is to put forward theories that are useful in helping us to predict and control the world around us. scientific realism The school of thought that says the goal of science is to bring our understanding of the natural world closer and closer to the truth. scope A criterion of adequacy for judging the worth of theories. A theory with scope is one that explains or predicts phenomena other than that which it was introduced to explain. Glossary simple statement A statement that doesn’t contain any other statements as constituents. simplicity A criterion of adequacy for judging the worth of theories. A simple theory is one that makes as few assumptions as possible. singular statements In categorical logic, statements that assert something about a single person or thing, including objects, places, and times. slippery slope The fallacy of arguing, without good reasons, that taking a particular step will inevitably lead to further, undesirable steps. social relativism The view that truth is relative to societies. sound argument A deductively valid argument that has true premises. standard-form categorical statement In categorical logic, a categorical statement that takes one of these four forms: 1. All S are P. (All cats are carnivores.) 2. No S are P. (No cats are carnivores.) 3. Some S are P. (Some cats are carnivores.) 4. Some S are not P. (Some cats are not carnivores.) statement (claim) An assertion that something is or is not the case. stereotyping Drawing conclusions about people based merely on their membership in some group. straw man The fallacy of distorting, weakening, or over- simplifying someone’s position so it can be more easily attacked or refuted. strong argument An inductive argument that succeeds in providing probable—but not conclusive—support for its conclusion. subjective relativism The idea that truth depends on what someone believes. subjectivist fallacy Accepting the notion of subjective relativism or using it to try to support a claim. subject term The first class, or group, named in a standardform categorical statement. sufficient condition A condition for the occurrence of an event that guarantees that the event occurs. syllogism A deductive argument made up of three statements— two premises and a conclusion. See modus ponens and modus tollens. 515 symbolic logic Modern deductive logic that uses symbolic language to do its work. target group (target population) In enumerative induc- tion, the whole collection of individuals under study. testability A criterion of adequacy for judging the worth of theories. A testable theory is one for which there is some way to determine whether the theory is true or false—that is, it predicts something other than what it was introduced to explain. TEST formula A four-step procedure for evaluating the worth of a theory: Step 1. State the Theory and check for consistency. Step 2. Assess the Evidence for the theory. Step 3. Scrutinize alternative theories. Step 4. Test the theories with the criteria of adequacy. theoretical explanation A theory, or hypothesis, that tries to explain why something is the way it is, why something is the case, or why something happened. truth-preserving A characteristic of a valid deductive argument in which the logical structure guarantees the truth of the conclusion if the premises are true. truth table A table that specifies the truth values for claim variables and combinations of claim variables in symbolized statements or arguments. tu quoque (“you’re another”) A type of ad hominem fallacy that argues that a claim must be true (or false) just because the claimant is hypocritical. valid argument A deductive argument that succeeds in providing conclusive support for its conclusion. variables In modern logic, the symbols, or letters, used to express a statement. Venn diagrams Diagrams consisting of overlapping circles that graphically represent the relationships between subject and predicate terms in categorical statements. weak argument An inductive argument that fails to provide strong support for its conclusion. world view A philosophy of life; a set of fundamental ideas that helps us to make sense of a wide range of important issues in life. A world view defines for us what exists, what should be, and what we can know. Index

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