JEFFERY L. JOHNSON

Inferring AND Explaining

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CONTENTS

How is philosophy learned? A better question is how can thinking skills be acquired? The thinking in question involves attending to basic structures of thought. This can be done well or badly, intelligently or ineptly. But doing it well is not primarily a matter of acquiring a body of knowledge. It is more like playing a piano well. It is a "knowing how" as much as a "knowing that."

—SIMON BLACKBURN[1]

Practical Epistemology

This is a book about what I am calling practical epistemology. It reflects two of my most deeply held prejudices as a teacher. I believe that abstract questions in academic philosophy are intrinsically interesting not just to professionals but to smart, inquisitive students as well. I also believe that carefully reflecting on the great questions in Western philosophy (What is knowledge? Is it possible? Does God exist? Do we have genuine free will?—to say nothing of the equally important moral, political, and legal questions that philosophers have posed and attempted to

answer) improves one's general critical thinking skills. So I would claim that a good philosophy course is good for a lot more than just general education credits and will be of value no matter what your major is or career aspirations are.

The book begins with three classic questions in the theory of knowledge—What is the value of truth? Can we know anything? What is the nature of knowledge in the first place? It then introduces a little logic and a particular theory of evidence evaluation—inference to the best explanation. This view of argument analysis is the cornerstone of my entire discussion throughout the

book. We then turn our attention to some issues in the history and philosophy of science—the role of experiments, Semmelweis's discovery of the causes of childbed fever, and Darwin's theory of common descent by natural selection. The book concludes with discussions of capital punishment, evidence as narrative, and some thoughts about the nature of evidence and truth.

Critical Thinking

This brings me to my second, and even more deeply held, prejudice as a philosophy teacher. I am committed to the value of critical thinking—or, as it is sometimes called, practical, or informal, logic—as a tool for undergraduate and professional success. I pretend little modesty here. I have heard from too many students that the techniques developed in chapters 4 through 12 have proven not just useful but essential in their other undergraduate and graduate classes, and indeed, in their professional lives.

Where I do claim some modesty, however, is that I take little credit for discovering these techniques. They were all first articulated by my friend and mentor, Larry Wright. I had the honor of working with Larry as a teaching assistant when he was putting together his first published articulation of inference to the best explanation as a procedure for argument analysis.[2] That graduate school experience fundamentally shaped my perception of what it is to be a philosopher and what it is to be an effective undergraduate teacher. Inference to the best explanation has gone on to inform much of what I have done in my professional scholarship. It has also guided my own teaching career. To Larry, I owe a debt of gratitude that cannot really be expressed.

If this book accomplishes nothing else, I hope it at least tempts readers to utilize the somewhat structured, almost ritualistic procedure I am calling the inference-to-the-best-explanation recipe as a test of the quality of evidence presented in an argument. I do believe that you will be pleasantly surprised at how often it proves useful.

To My Student Readers

I want this book to be fun, interesting, and useful to you. Depending on your academic and intellectual personality, it may prove impossible to accomplish all these goals. But even if I fail in conveying the intrinsic interest in philosophical and intellectual questions, and even if you find my style boring or pedantic, I do hope you will discover the utility in the careful, systematic study and analysis of arguments. Inference to the best explanation is not the only approach to argument analysis (though I remain convinced it is the most valuable), but it is one that invites wide application to the kinds of arguments we find in our daily and professional lives and, of course, in the natural sciences and most of the rest of the typical undergraduate curriculum.

If I have any readers who are not in formal philosophy courses or who are using this book as a supplementary source, I'd like to extend a sincere invitation. Each chapter concludes with some exercises and what I am calling a quiz. If you'd like feedback on any or all of these, I would be happy to provide it. I should always be available at the following email address: jjohnson@eou.edu.

Please do feel free to contact me with any questions or requests for feedback. And, of course, I would welcome hearing about any mistakes,

typos, and the like. One of the joys of this form of publishing is that errors can be relatively easily corrected.

To My Fellow Philosophy Instructors

I have used earlier drafts of this manuscript in two pretty different courses. The most straightforward of these are courses in critical thinking. Although I'd like to think that all the material would be useful in such contexts, I can well imagine instructors who would choose to use only chapter 1 and chapters 4 through 12 or maybe chapter 13. This is the material that I have focused most of my critical thinking teaching on for the last forty years.

The course that the book was originally designed for, however, was an introduction to philosophy course. At Eastern Oregon University, the course I created was called Self, World, and God. The God part, of course, was issues in the philosophy of religion, and the self part was issues in philosophical psychology and cognitive science. World was a catchall for epistemology, philosophy of science, and a general methodology of analyzing arguments in terms of inference to the best explanation—the material sketched out in this book.

Two Further Debts

All authors need to acknowledge the help and support of their life partners. Understanding and sustenance from those one loves most are almost preconditions for successful writing. In my case, I have had the incredible good fortune to have a bright, talented, and unbelievably supportive wife for almost fifty years now. Colleen is not just a beautiful lady that I love more than I can express, but for almost thirty years, she was my closest colleague during exactly the time the material in this book was being tested in my courses and when I began to compose the earliest drafts of the chapters herein contained. We team-taught together and discussed inference to the best explanation so often that it is almost as hard to separate my thoughts on these questions from hers as it is to separate them from Larry Wright's. Thanks, Colly.

Finally, I need to acknowledge and thank the Library at Portland State University for awarding me a grant to complete this book as part of their PDXOpen: Open Access Textbooks initiative. In particular, I owe Ms. Karen Bjork, head of digital initiatives, a huge thanks and shout-out. Karen not only championed my project from the beginning but coached and cajoled to keep me on track in my writing and finally secured additional funding for professional copyediting. Thank you very much, Karen.

Notes

1 Simon Blackburn, *Think* (Oxford: Oxford University Press, 1999), 5.
2 Larry Wright, *Better Reasoning* (New York: Holt, Rinehart, Winston, 1982).

Valuing Truth

To say that democracy is a space of reasons is to say that the practice of democratic politics requires the giving and acting for reasons. That is, in a democratic state, disagreements between citizens ought to be handled in the arena of reason alone, and arguments legitimizing the uses of state power must be backed by reasons. And crucially, the "reasons" spoke of are reasons for believing what is true, *as opposed to reasons for what will win us the election, make us rich, or damn our enemies. In short, to think of democracy as a space of reasons is to see the ideals of democratic politics as requiring a commitment to the rational pursuit of truth.*

—MICHAEL LYNCH[1]

A Lofty Goal and a Practical Goal

This book has two major goals. One is to invite you—no, really to implore you—to enter what Michael Lynch calls the "arena of reason." Lynch's quote may suggest that politics is where reason and truth are most important. I completely agree with him that democratic politics is *one* area of our lives that requires attention to the ideals of truth and good reason. But I think he would agree with me that lots of other intellectual affairs—the pursuits of science and medicine, the demands of a profession, and the immensely complicated problems of a meaningful personal life, to name just a few—are equally dependent on the standards of the arena of reason.

The other goal is to give you a tool for navigating within the arena of reason. I wish I could give you a magic bullet for discovering the truth, but I think we all know that's only a fairy tale. What I do believe, however, is that there are some very useful techniques for approaching, if not discovering, the truth. This book will emphasize one of these methods. It has the technical name *inference to the best explanation*, but more on that later. Right now, I'll simply describe it

as a procedure for distinguishing good evidence from poor, weak, or even nonexistent evidence.

There is something almost paradoxical about both my goals. I'm going to spend the next couple of hundred pages laying out this approach to evidence and truth and hopefully luring you into the arena of reason by showing you that it's fun, interesting, and valuable. The potential paradox lies in my absolute conviction that you are already firmly ensconced in the arena of reason—that you already value truth and that you are already an accomplished evaluator of evidence.

So why bother writing my book? Consider an analogy. You are skilled at something—playing the piano or playing golf. But you are also frustrated. You are not as good at it as you'd like to be. You decide to go to a music teacher or golf pro to improve your playing. If you are lucky enough, you'll find someone who can take that skill you already have and hone it, help you break some bad habits, show you some new tricks, encourage you to practice, and voilà, significantly improve your game. I'd be a joke as a golf instructor, and I don't play music at all, but I guess I'm arrogant enough to think I might be a pretty good critical thinking coach.

The Skills and Values You Already Have

Perhaps you abhor politics, think that history is boring, or believe that contemporary science is completely beyond you. I hope to change your mind about all that. But even if I fail, you're still stuck in the arena of reason. You care about the truth or, in less pretentious jargon, what is true and what is not. Someone tells you your lover is unfaithful. Is he right, maliciously lying, or simply misinterpreting quite innocent remarks and actions? You certainly care about the answers to those questions. Your doctor tells you not to worry about the symptoms you describe and that you'll be just fine. You'd be crazy not to care if she's an expert in that area of medicine or if she has misdiagnosed your condition. A friend tells you that class is canceled today, but if a good grade matters to you, you'll care a lot whether he knows what he's talking about.

Consider the case of poor Connie. She thinks her boyfriend is—in the kind of innocent sense of 1950s high school—cheating on her. He claims he's innocent. She cares a heck of a lot whether her theory is true. But her suspicions are not simple paranoia; she believes she has some good evidence and is so sure she's right that she is going to break up with him. She lays out her case in a poem (well, really a corny pop song).

Lyrics to "Lipstick on Your Collar" can be found here: https://www.azlyrics.com/lyrics/conniefrancis/lipstickonyourcollar.html. Connie Francis performing her song can be found here: https://youtu.be/YMlALAaEwfA.

Here's her story in a nutshell. She and her boyfriend had gone to a record hop. He excused himself, saying he wanted to get a soda. But he was gone for a half hour. When he returned, Connie spotted a lipstick stain on his shirt collar. He told her that it was her lipstick. She thought about this but realized that her lipstick was baby pink, while the stain on his shirt was bright red. Just as she was figuring this all out, her best friend, Mary Jane, walked in, and Connie saw that Mary Jane's lipstick was all messed up. Connie concludes that her boyfriend and Mary Jane

had been making out—smooching—during the half-hour absence.

Connie's no lawyer, no rocket scientist, nor even a college student yet, but she's no fool either. She's smart enough to read the signs, diagnose what's going on, and lay out a persuasive case. Connie's skills are precisely the skills that all intelligent human beings possess, and these are the skills we will be building on in this book.

Truth and the Contemporary Academic Culture

The scholarly community sends us lots of signals that we don't value truth or at least that we should not value it. A lot of serious scholarship in philosophy, the history of science, sociology, literary criticism, and more tells academics like me that all truth and knowledge is relative to who we are—our race, sex, age, ethnicity, and historical circumstances—and that there's no such thing as the "absolute" (real?) truth. Consider the thoughts of Richard Rorty:

We need to make a distinction between the claim that the world is out there and the claim that truth is out there. To say that the world is out there, that is not our creation, is to say, with common sense, that most things in space and time are the effects of causes which do not include human mental states. To say that truth is not out there is simply to say that where there are no sentences there is no truth, that sentences are elements of human languages, and that human languages are human creations.

Truth cannot be out there—cannot exist independently of the human mind—because sentences cannot so exist, or be out there. The world is out there, but descriptions of the world are not. Only descriptions of the world can be true or false. The world in its own—unaided by the describing activities of human beings—cannot . . .

The world does not speak. Only we do. The world can, once we have programmed ourselves with a language, cause us to hold beliefs. But it cannot propose a language for us to speak.[2]

I believe that Rorty is on to something very important here but that his insight is seriously mischaracterized—that he is, if you will, saying something that is both true and false at the same time.

Connie is a human being with a brain, central nervous system, and sense organs. She sees things—the lipstick stain, its color, and the color of her own lipstick. She hears things—her boyfriend's lame excuse. And she forms a theory about what's been going on. Her theory is, to use some loaded language, "in her head," and the facts that make her theory true or false "are out there." How do we link up the theory (what Rorty calls the "mental states," "sentences," or "descriptions of the world") with the facts? Things would be bad enough if all we had to do is propose an account of how brains and sense organs can allow us to see and hear things. Philosophers have been working on these problems for 2,500 years, and I have to report to you that there's still a lot of work to do.

But there are other serious problems as well. All Connie's neural occurrences give rise to beliefs—"your stain is red, but my lipstick is baby pink." Some of her beliefs are true, but others are false. Connie's brain and sense organs seem to play a central role in helping her distinguish the true beliefs from those that are false. The story so far is one of nature. But Rorty's

central insight is that there is a whole other story to be told in terms of Connie's nurture. All her attempts to discover the truth, to find evidence for what is true, are colored by who she is, and that is both a help and a hindrance. We don't just see and hear the world; we *learn* to see and hear the world. We are endowed with a remarkably powerful central nervous system by natural selection (or perhaps as a gift from God). We all have this simply by virtue of being human beings. But we are also the product of our backgrounds, our learning, our experiences, and our prejudices. It's a sad fact but still a fact, I think, that men and women, blacks and whites, and young and old are doomed to think in somewhat different ways. How can there be a truth about whether climate change is real or whether universal health care is a wise policy when you and I are fated to see things differently because of our differences in age, ethnicity, and gender—to say nothing of political affiliations and religious convictions?

Though once an enthusiastic proponent, I've come to reject this relativistic view for two reasons. Rorty tells his nurture story persuasively but sort of forgets about the nature story. Connie's central nervous system isn't just there; it's there for a reason. Its whole purpose is to provide her with data about that world out there. And human central nervous systems seem to be doing their jobs pretty darn well. It's not just that we have survived as a species but that we have survived so successfully that we have become the only species capable of altering the entire world. So, yes, we have a problem with cultural relativism, and it is a problem we will be forced to deal with for the remainder of this book. But we also have exquisitely designed physical apparatus that allow us to form pictures of the world out there (perhaps as it really is).

All the very abstract academic stuff also has a very unfortunate spillover. It is sometimes used as a discussion stopper, even among academics themselves. If the only people I can talk with, productively disagree with, and maybe even reason with to some shared view are exactly like me, the world is going to be a pretty lonely place. Connie is certainly a product of who she is. Her age, sex, race, and socioeconomic class inevitably influence what she sees and what she thinks about. I take that as a given. But what she's thinking about is not just "in her head," even if her sentences, beliefs, and theories are. You and I can think about her theory, make judgments about its cogency, and oftentimes come to agreement about all this, regardless of the countless differences in who we are, how and when we were born, and our unique social and educational backgrounds. Since there is a world "out there" with boyfriends, best friends, and osculation (even if those descriptions are the products of our shared culture), I think it makes perfectly good sense to ask what *really* happened when he was gone that half hour or more. And that's really just another way of asking whether her theory is true.

Truth and the Popular Culture: The Need to Respect Differences

You may well ask what all the abstract philosophy, social science, and evolutionary biology has to do with our concerns in this book. Well, I've already given you one reason for including it. The problem of cultural expectations and biases is real and infects evidence evaluation down to

its core. Furthermore, a lot of your teachers and other intellectual authority figures are products of this academic culture, and I think you need to know where they're coming from. Finally, these theoretical considerations have found their way into the popular epistemological culture.

A lot of my students are unapologetic relativists in two very different ways. One is quite laudable. Many of you embrace diversity. You admire the fact that we bring different perspectives to discussions and investigations. You are loath to disparage those who think differently about religion, politics, or other things that matter deeply to you and your peers. You recognize that lots of thoughtful and decent people see things very differently than you do when it comes to abortion rights, the death penalty, or even climate change. One very understandable reaction to this is to think everyone has a right to his or her own beliefs.

In the sense of a First Amendment right to freedom of thought and speech, I completely agree with this sentiment. It's one thing, however, to have the right to think what you think or believe what you believe; it's quite another to have the right to be correct about what you think and believe. My students sometimes say things that I find paradoxical. They tell me that their truth is simply different from mine. Sure, I believe that natural selection is spot-on, so it's true for me. But they believe that it's godless and silly to think that "man came from monkeys," so evolution is false for them. That's just another discussion stopper. It forecloses any real shared dialogue and investigation of which one of us is right. We won't spend much time in this book (though in another book I hope to write, it will be central) on purely moral disputes such as

the pro-life/pro-choice controversy or the case for and against animal rights. We will spend some time a little later on the constitutionality, if not the morality, of the death penalty. And we will spend a fair amount of time looking at the evidence for descent with modification by natural selection. Consider the disagreement about climate change. There's a lot of passion on both sides. That's obvious. People certainly have a right to not be persecuted because of their beliefs on questions such as these—not to be downgraded by their professors. But do these rights mean that there's no correct answer to the ultimate question of whether human cultural and industrial practices are contributing to climate change? Or even whether climate change is really occurring? Being tolerant of other's views is a good thing, but being unwilling to seek some common ground or even find a correct answer is either laziness or intellectual cowardice.

Truth and the Popular Culture: "Fake News" and "Alternative Facts"

This leads to my students' second reason for their relativism, if not outright skepticism. None of us are climate scientists, so we are reliant on outside sources for most of our information. But outside sources seem to tell us different things. The "liberal" press tells us one story about climate change, while "conservative" media tells a very different one. The president of the United States tells us that mainstream media are guilty of feeding us "fake news." I believe he is very wrong about this. But whom should you believe—your philosophy professor or the president? My guess is that the way you answer this question has relatively little to do with who I am,

my credentials, or even with the president and who he is. It's more likely that your confidence in either of us is shaped by the media sources you listen to, who you voted for in the last election, and what your friends and family tell you. In a way, this is just the problem of cultural relativism all over again. But something seems to have changed just in the short time between my generation and yours.

I am really nervous about where this discussion must proceed. Every generation seems to look at the younger generation not just with puzzlement but with a funny kind of judgment. They're going to hell in a hand basket! My parents couldn't really understand the music I listened to or why I opposed the war in Vietnam. I'm still trying to get my head around hip-hop, and I'm baffled about why climate change is a real controversy. But the cultural change I'm focusing on now is not generational.

Let me see if I can make this clearer by telling you about how I learned to enter Lynch's arena of reason. School played a huge role, of course, but there were other important shared sources that united my generation with that of my parents. My friends, my parents, and my teachers all read the *Los Angeles Times*, watched the evening news on one of the three major networks, and basically shared a common stock of information about what was going on in the world around us. We disagreed plenty about how to interpret the data, but at least, we all had the same basic collection of facts to disagree about. Of course, there were plenty of critics and skeptics about these sources. Some saw the *Times* and *CBS News* as lackeys of the capitalist corporate culture. Others claimed they were nothing but liberal, antireligious propaganda. But these complaints were directed

more at "editorial policy"—what stories were run, how much time and line space were devoted to them, and the like—and, yes, at the political views endorsed on the editorial pages. But almost everyone agreed about what the basic facts reported in the stories were. Now, I don't want to overstate the confidence we had about all this. We worried that we weren't getting the whole story about the war or that the Warren Commission lied to us about the Kennedy assassination. But these were the exceptions, not the rule.

Your generation, however, often gets its information about what's going on from very idiosyncratic web sources. And be they liberal or conservative, they often seem to disagree not just about how to interpret the facts but as to what the facts are in the first place. I can't remain neutral here. *Some sources are more reliable than others! Some sources are completely unreliable!* If you are serious about the truth, if you care about reason, you must find some trustworthy sources of information about what's going on around you—the worlds of politics, science, and everything else that matters. I'm perfectly happy to share the sources that most inform my beliefs about what's going on in the country, the world, and other areas that I care about, including sports, movies, music, and even science. They are without question the *New York Times* and National Public Radio, particularly *Morning Edition*. This is partly a matter of habit, preference, and convenience. It's also a matter of trust. Some of you are, no doubt, aghast. Of course those are his sources! He's a liberal, and they're blatantly liberal sources. That's probably true, but my best friend hates both of these sources because he believes that they have sold out the search for truth because of a false need to appear fair

in their coverage. But my sources don't have to be your sources. I'd be genuinely happy if all my students came into my courses truly informed about what's going on via information they gained from equally conservative sources such as the *Wall Street Journal* or the *Economist*.

A Plea for Critical Thinking

My entire professional life has been dominated by courses in critical thinking. When I began graduate school, I had the privilege of working with Professor Larry Wright as one of his teaching assistants in his course on critical thinking. This was truly a life-changing experience. It was in his course that I first learned of inference to the best explanation, and it is this method of evidence evaluation that informs much of my teaching and much of my professional research. I have re-created much of what I learned from Professor Wright in countless critical thinking courses that I have taught and in some cases created. All this forms the heart and soul of this book.

As I think about it, however, perhaps the most important lesson I learned was not the details of a particular approach to critical thinking but just the value of taking a little time out of a busy undergraduate career focused on the details of majors, minors, and career training and pausing to reflect on the more general questions of reason, truth, and logic. I take great gratification that some of my most satisfied critical thinking customers have been not marginal students who needed to be taught how to think correctly, whatever that's supposed to mean, but truly excellent students who already possessed all the necessary skills and tools for academic success. To return to an earlier analogy, even great pianists and golfers benefit from devoted practice and a little coaching now and then.

So welcome to the arena of reason, which, of course, you've been in almost the entirety of your life. And welcome to critical thinking. If you give it half a chance, I can almost promise you that you will find the things we explore together in this book interesting and fun. I also remain confident that most of you will find the central approach to evidence and the discovery of truth that we will be developing personally, academically, and professionally useful.

EXERCISES

1. Generally speaking, do you think Connie has good evidence for her theory that her boyfriend was smooching Mary Jane during his absence at the record hop? Why?
2. What do you think is the strongest argument for the claim that truth is always relative to whom people are, their background, their experiences, their age, their sex, their race, and so on?
3. What do you think is the strongest argument against this relativist view?

QUIZ ONE

Every other quiz in this course will focus on course content. The majority of the quiz grade will be determined by how successfully you demonstrate your mastery of the material presented in the readings and lectures. This first quiz, however, is a little different. Here, I am asking you to honestly reflect on yourself as a thinker. The grade on this quiz will be determined by how sincere and self-reflective your essay is.

I am asking for a short—no more than three double-spaced pages—essay that addresses the following three questions:

1. How much of your thinking about important issues—political, moral, religious, *and so on*—do you believe is determined by your individual background? Your age, sex, race, family political leanings, and the like?

2. To the degree that at least some of your thinking about these kinds of issues is partially determined by these cultural facts about yourself, do you believe that you can "transcend" them and reach a more "objective" evaluation of the way things "really are"? How might you do this?

3. What are *your* major sources of information about politics, moral controversies, and these sorts of things?

I fully expect the grades on this first quiz to be quite high. All you need to do to receive full credit is to take just a little time to truly reflect on these questions.

Notes

1 Michael P. Lynch, "Democracy as a Space of Reasons," in *Truth in Politics*, ed. J. Elkins and A. Norris (Philadelphia: University of Pennsylvania Press, 2012), 158.

2 Richard Rorty, *Contingency, Irony and Solidarity* (Cambridge: Cambridge University Press, 1989), 4–5, 6, 27, 51–52.

Skepticism

I will suppose then, that everything I see is spurious. I will believe that my memory tells me lies, and that none of the things it reports ever happened. I have no senses. Body, shape, extension and place are chimeras. So what remains true? Perhaps just one fact that nothing is certain.

—RENÉ DESCARTES[1]

Descartes and the Arena of Reason

It's hard to imagine a thinker more committed to the arena of reason than René Descartes. In addition to being one of the most important philosophers in the entire history of Western philosophy, he was a groundbreaking mathematician (remember those dreaded "Cartesian coordinates" you hated in high school algebra?), one of the most prominent physicists of his era, and a committed theologian. He counts as one of the true giants of Western thought.

He begins his most important work, *The Meditations on First Philosophy*, by sharing a nagging worry.

Some years ago I was struck by the large number of falsehoods that I had accepted as true in my childhood, and by the doubtful nature of the whole edifice that I had based on them.[2]

When he speaks of falsehoods he accepted in his childhood, I don't think he's speaking of Santa Claus or the tooth fairy but simply things that he believed uncritically, on the basis of authority and common sense, that eventually turned out to be false. The problem wasn't just that he had been misled by the authorities and tricked by common sense but that his life's missions—philosophy, mathematics, physics, and theology—were all built on them.

So what to do? He continues with his construction metaphor:

> *I realized that it was necessary, once in my life, to demolish everything completely and start again right from the foundations if I wanted to establish anything in the sciences that was stable and likely to last.*[3]

Epistemological demolition just for the sake of demolition is a pretty silly project. But Descartes is interested in demolition, like much of contemporary urban renewal, for the sake of new construction. He wants new foundations that will allow him more confidence in his philosophical and scientific thinking. He's immediately confronted with two serious problems. What is going to be an efficient method for his demolition (a wrecking ball, bulldozers, or dynamite?)—he has an awful lot of beliefs, after all—and what is going to be his standard for stability once he has cleared the ground and begins his new construction? He answers these questions with a radical proposal.

> *Reason now leads me to think that I should hold back my assent from opinions that are not completely cer-*tain *and* indubitable *just as carefully as I do from those that are patently false. So, for the purpose of rejecting all my opinions, it will be enough if I find in each of them some reason for doubt. And to do this I will not need to run through them all individually, which would be an endless task. Once the foundations of a building are undermined, anything built on them collapses of its own accord; so I will go straight for the basic principles on which all my former beliefs rested.*[4]

Confidence-Undermining Possibilities

Your car is in the shop, but a friend has graciously loaned you her pickup. As you are driving along a long desolate stretch of rural highway, you suddenly think about gas. Fortunately, when you look down at the gauge you see that you have almost three-quarters of a tank. You continue your drive peacefully contemplating your planned trip over Christmas break. The next morning your friend calls you with some unsettling news: "I forgot to tell you yesterday when you picked up the truck that the gas gauge is all screwed up. It always reads three-quarters of a tank."

Two things follow pretty directly from this little story. Your reassurance last night on the highway was ill-founded. It may have been psychologically comforting to read the gauge as saying that you had plenty of gas, but you now know that there was no good reason for your confidence. It was merely good luck that you had enough fuel to get home. In addition, reading the gauge in the future will never produce the kind of conviction you felt last night—nor should it.

There are people with a certain kind of intellectual temperament who are called skeptics. A skeptic might have the fleeting worry about having enough gas, look at the gauge, and feel relieved but then start to wonder: "How do I know this gauge works properly?" Even without the friend's call the next morning, the skeptic can work herself into a state of doubt where reading the gauge does not produce the desired intellectual confidence.

One way of reconstructing the skeptic's reasoning is as follows:

1. I can be confident that so-and-so because of such-and-such.

   I can be confident that I have plenty of gas because the gauge reads three-quarters of a tank.

2. If this-and-that were true, however, such-and-such would no longer justify my confidence in so-and-so.

   If the gauge were broken, however, its reading three-quarters of a tank wouldn't justify my confidence that I have plenty of gas.

3. This-and-that is possible, and I cannot prove that this-and-that is not true.

   The gas gauge could be malfunctioning, and I have no proof that it is not.

4. Therefore, since such-and-such cannot be ruled out, I can no longer be confident that so-and-so.

   Therefore, since the gauge's being broken cannot be ruled out, I can't be sure that I have plenty of gas.

There are many circumstances where this kind of skeptical thinking is demanded. A salesman calls you on the phone and offers to sell you stock worth more than one thousand dollars a share for only a hundred. You damn well better go through something such as the following reasoning:

1. I can be confident that the stock is a good deal because the salesman told me so.

2. If he's lying, however, I can't trust him.

3. It's possible that he's lying, and I cannot prove that he's not lying.

4. Therefore, since his lying cannot be ruled out, I can no longer be confident that the stock is worth so much.

One of the oldest questions in philosophy is whether this kind of skeptical reasoning can be generalized across the board. Should our intellectual confidence in so-and-so—what our senses tell us, the word of scientists, or whatever—be undermined by our failure to rule out some confidence-undermining possibility?

Dreaming and the External World

Here's a general purpose skeptical argument—a confidence-undermining possibility—that may well have already occurred to you. What if you're not really reading this but just having a vivid dream about reading it? Doesn't the possibility of life's being a dream or any particular instant of it being a dream rule out the possibility of any kind of knowledge? Some philosophers have suggested that it might.

One whole school of philosophy claims that the senses must be the ultimate source of all substantive knowledge. Other schools do not insist that the senses must produce all knowledge; there may be other sources as well. All parties agree, however, that the senses are directly involved in most of what we claim to know. That's what makes the dream hypothesis so serious. In one fell swoop, it shakes our confidence in everything the senses have to say. You believe that you're in trouble in your philosophy class because of the poor grade at the top of your term paper. But if it

is just a dream, your dream experiences tell you nothing about what your term paper looks like. Concrete examples can be multiplied endlessly. It seems imperative that we find a way of circumventing the dream hypothesis.

Folk wisdom, of course, provides tests for distinguishing waking from dreaming. You can check your conscious state by pinching yourself or seeing if your visual experiences are in color. Unfortunately, these tests are psychologically inaccurate. Surely you have enough imagination to pinch yourself within a dream. I have often had dreams where something bad or embarrassing was happening, and in the dream, I would say to myself, "I wish this was just a dream."

If there are no sure methods for distinguishing waking states from dreaming, as many philosophers have claimed, then the following argument is both seductive and worrisome.

1. I can be confident that there is an external world outside of my mind because of what my senses tell me.
2. If I were dreaming, however, my sense experiences would no longer justify my confidence in the external world.
3. It is possible that I am dreaming now, and I cannot prove that I am not dreaming.
4. Therefore, since all this being a dream cannot be ruled out, I can no longer be confident that there is an external world.

As bad as all this seems, there's worse to come.

The Evil Computer Scientist

We know that you think you are reading a book about epistemology, considering weird possibilities such as life's being a dream, and worrying about how you are going to get tested on this stuff. We apologize for the ruse. We simply couldn't think of any other way to tell you. This has gone on too long; you need to know the truth.

Three years ago last summer, you were a passenger on a motorcycle and there was a terrible crash. The driver was killed and you were brought to the hospital alive but just barely. The doctors quickly determined that you didn't have much of a chance, but you were put on life support while relatives were notified and decisions could be made.

We need to tell you now about Dr. Malgenius. He was an eccentric polymath with expertise in medicine, neurophysiology, and computer science. He happened to be spending a year on a fellowship at the hospital to which they brought your mangled body. After it was determined that you would not survive—the injuries were simply too severe—your family was approached about the possibility of harvesting some of your organs for transplants and medical research. At this point, Dr. Malgenius came forward with a most unusual request. It turned out that your brain had survived the crash unscathed, and Malgenius wanted to use it to test his new hypothesis. Just before the life support was shut down, your brain was surgically removed and placed in an artificial environment. It sits in a vat of circulating nutrient liquid to this day!

We won't go into the details of your former life, the promising poetry or the joy in mountain climbing; it's all too sad. What you need to understand is your current situation. Everything—your memories of your childhood or yesterday; your thoughts, feelings, and

emotions; your wishes, hopes, and fears; all of it—is a computer-driven illusion. Dr. Malgenius's hypothesis was that a healthy human brain could be attached to his supercomputer and that a "virtual life" program could be simulated on the brain-computer system. You are "living" proof of his theory.

All of us involved with this project are sorry. We now see how wrong it was. Just tell us what to do; we will respect your wishes. Dr. Malgenius is dead and gone. No one here in the lab plays jokes anymore—making you think you see with intuitive clarity that 2 + 3 = 5 or that there are no even primes greater than two and the like. We can simply let your life program continue, or we can wipe the memory banks clean. It's your call.

The so-called brain-in-a-vat hypothesis is what we might call the ultimate confidence-undermining possibility. It is an updated version of a possibility first considered by Descartes. He worried about a godlike "evil genius."

> I will suppose therefore that not God, who is supremely good and the source of truth, but rather some malicious demon of the utmost power and cunning has employed all of his energies in order to deceive me. I shall think that the sky, the air, the earth, colours, shapes, sounds and all external things are merely the delusions of dreams which he has devised to ensnare my judgment.[5]

Whether it is stated in a contemporary, science-fiction voice or in that of sixteenth-century academic philosophy, the reasoning here fits the familiar pattern.

1. I can be confident of anything—science, mathematics, or the existence of the external world because of processes of sense experience and logical reasoning in my mind.
2. If I were a brain in a vat tricked by a team of evil computer scientists, any reasoning or experience would no longer justify my confidence in anything.
3. It is possible that I am just a brain in a vat, and I cannot prove that I am not a brain in a vat.
4. Therefore, since I cannot rule out my being a brain in a vat, I can no longer be intellectually confident of anything.

In one sense, there is absolutely no reason for believing that you are a brain in a vat. I would bet few of my readers have ever considered such a possibility. But in another sense, the hypothesis is a possible one and one for which there is no way of demonstrating its falsity. How could you ever tell? What tests could you conduct? Dr. Malgenius is so tricky that he might cause you to think you've come up with some sound argument to defeat this possibility, but that reasoning might itself be one of his tricks. You seem stuck, and so does every other person who has gone through this bit of skeptical reasoning.

Can I Know Anything?

The conclusion to the above argument was that "I can no longer be intellectually confident of anything." Have we really managed to call everything into doubt? Dr. Malgenius can cause us to have any sense experience he wants; he can cause us to think 2 + 3 = 5 when it really equals 7. He seems to have the power to trick us about virtually anything he chooses.

Descartes noticed that virtually all our beliefs about ourselves were open to doubt.

Dr. Malgenius tricked you about almost every detail about yourself in the little story above.

> *I shall consider myself as not having hands or eyes, or flesh, or blood or senses, but falsely believing that I have all of these things.*[6]

Could the trick be so perfect that he fools you into believing that you exist, even when you don't? We have already seen that he can fool you about *how* you exist—you're just a brain in a vat after all. But could he cause you to be mistaken about the very fact of your existence? Descartes thought not.

> *But I have convinced myself that there is absolutely nothing in the world, no sky, no earth, no hands, no minds, no bodies. Does it not follow that I too do not exist? No: if I convinced myself of something then I certainly existed. But there is a deceiver of supreme power and cunning who is deliberately and constantly deceiving me. In that case I too undoubtedly exist, if he is deceiving me; and let him deceive me as much as he can, he will never bring it about that I am nothing so long as I think that I am something. So after considering everything very thoroughly, I must finally conclude that the proposition, I am, I exist, is necessarily true whenever it is put forward by me or conceived in my mind.*[7]

The confidence-undermining possibilities discussed above, I hope, were somewhat compelling. But so is the following bit of reasoning. If I am mistaken about what the gas gauge is saying, there must be a "me" who is mistaken. If I am having a dream about all this stuff, there must be a "me" who is doing the dreaming. If I am a brain in a vat being tricked by a perfect computer illusion, there must be a "me" who is fooled by this illusion. In a different work

on these same topics, Descartes expressed this insight in the famous Latin phrase *Cogito ergo sum*—I think, therefore I am. There must be a "me" who is doing the thinking any time I engage in skeptical thinking, and so it appears that one thing remains immune from the confidence-undermining possibilities of skeptics.

Skeptics might respond to this last consideration in a couple of ways. The dyed-in-the-wool skeptic might remind us that Dr. Malgenius was able to trick us about things such as 2 + 3 = 5 and all bachelors being unmarried. Maybe he is causing us to think that it is self-evident that there must be a "me" in order for Malgenius to fool us when in fact this thought is utterly fallacious. I, personally, am willing to concede Descartes's point that complete skepticism is ruled out by the *Cogito* argument. But we must remember that we have gained damn little, a technical victory over the skeptic, at best. If all that I can claim to know is that I exist, then all mathematics, science, and the everyday world are closed off. But these are precisely the areas where questions about what we know are the most interesting and the most important.

The Quest for Certainty

It is time to take stock of the arguments so far. Have the skeptics really forced us to abandon most of what we previously thought we knew? If you are like me, you're not very happy with this conclusion. Unfortunately, logic and good evidence often lead us to conclusions that we don't like but have to accept. Is there any hope for salvaging science and common sense as reliable sources of knowledge? Maybe, but first, we have to concede some ground to the skeptic.

The intellectual standards of certainty and indubitability have the advantage that the person who insists on them will never be mistaken. Descartes's procedure—sometimes called methodological doubt—is a very effective way of avoiding intellectual error. It may be, however, that the demand for absolute certainty comes at too high of a price. It strikes most of us as extreme to reject all of what the senses tell us or all mathematics and logic because we were able to imagine bizarre confidence-undermining possibilities. Perhaps the lesson that we should learn from the skeptic is to set our standards a little more realistically. If insisting on certainty leads to skepticism, and I am willing to provisionally concede that it does, then we should not insist on certainty.

I am not suggesting that we should not demand some very exacting intellectual standards for those things that we really know. We need stringent criteria for knowledge, but they must be realistic enough to produce some nontrivial examples of genuine knowledge. In the remainder of this book, I will argue that a fleshed-out concept of good evidence will allow us to distinguish many instances of genuine knowledge from other intellectual temptations for which we should reserve a healthy skeptical attitude.

EXERCISES

1. What is a confidence-undermining possibility? How does the possibility of one lead to skepticism?
2. Could it be that you are not really considering this exercise but merely dreaming that you are? How could you tell one way or another? What does all this have to say about knowledge?

QUIZ TWO

In chapter 2, I make a big deal about Dr. Malgenius. Explain what this little story (or example or thought experiment) was—that is, how it works. What is the epistemological point the story makes? What does it tell us about the nature of knowledge? Explain my suggested view about the nature of knowledge that attempts to negate the influence of Dr. Malgenius and other similar stories such as the dream hypothesis.

Notes

1 René Descartes, *Meditations of First Philosophy*, trans. John Cottingham (Cambridge: Cambridge University Press, 1986), 16.
2 Descartes, 12.
3 Descartes, 12.
4 Descartes, 12.
5 Descartes, 15.
6 Descartes, 15.
7 Descartes, 16–17.
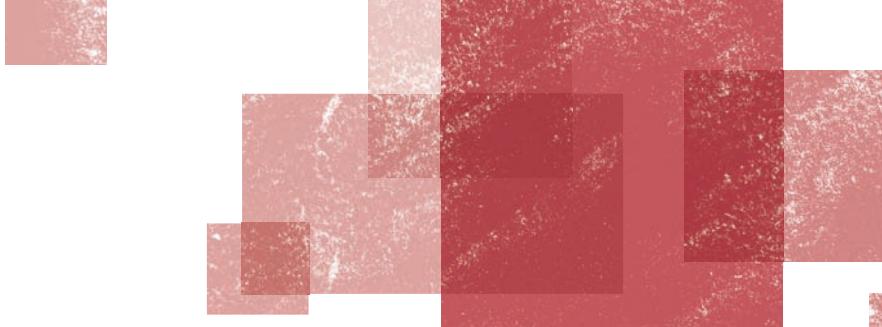
The Concept of Knowledge

So when a man gets hold of the true notion of something without an account, his mind does truly think of it, but he does not know it, for if he cannot give and receive an account of a thing, one has no knowledge of that thing. But when he has also got hold of an account, all this becomes possible to him and he is fully equipped with knowledge.

—PLATO[1]

Definitions and Word Games

Suppose that we are concerned with the question of economic justice—the fact that a few are ridiculously wealthy, while many are pitifully poor. We might convene an academic conference to discuss the issue and suggest some sort of coherent social policy. Economists might tell us about how income distribution is empirically related to national productivity. Political scientists might tell something about relative tax rates and the amount of government services. Sociologists could address the social effects of long-term poverty. Historians could give us some sense of whether the problem is better or worse than it was a hundred years ago. It would not be at all surprising if a philosopher contributed a paper on the meaning of economic justice. In one way, such a contribution seems necessary and foundational. After all, how can we reasonably construct some social policy aimed at greater economic justice if we are not crystal clear as to what we mean by this concept? In another light, however, the philosopher's contribution seems frivolous and even counterproductive. If there is wide agreement that there is a problem that needs to be solved, the philosopher's concern

with long-dead thinkers such as Plato, Adam Smith, and Marx may strike us as an irresponsible waste of time and intellectual energy. To carry this example just a bit further, suppose the philosopher's paper offers a definition of economic justice that suggests some kind of tension with other widely held values and social policies and goes so far as to suggest that we will never have a concept of economic justice that everyone will feel comfortable with. Now the philosopher's concern with theory and the definition of terms may strike us as subversive. It may be difficult and controversial to articulate a theory about the nature of economic justice that everyone will agree with. Nevertheless, we know injustice when we see it. And to suggest that we spend our time defining terms and teasing out subtle philosophical arguments rather than offering constructive solutions to the obvious problems that plague our society is both dangerous and immoral. But all this is quite unfair. No sane philosopher is going to suggest that we spend all our time and energy in academic theoretical pursuits. Obviously, there are crises that call for immediate action, and we all recognize the need to make decisions on less than perfect information. But there is also a need for abstract theoretical work. It does seem crazy to propose significant social changes that will affect all of us without some kind of clear understanding of what we are trying to bring about. Pausing to reflect on the nature of economic justice—defining our terms, as they say—may be worthwhile even in a time of some urgency.

Please excuse the above digression. I have included it because I believe that many beginning students see much of traditional epistemology in the same uncharitable light that our

philosopher was portrayed. Every reader of this book is a mature speaker of English. The verb *to know* and the abstract noun *knowledge* are fairly normal words within the English language. Obviously, we must know what they mean. We will discover, however, that it proves exceedingly difficult to articulate a clear and coherent definition, or theory, of knowledge.

The Myth of Definition

This chapter discusses the prospects for offering a helpful analysis, or definition, of the concept of knowledge. As a starting point, we need to take a little time dispelling a common misunderstanding about the importance of definition in everyday contexts, as well as philosophical contexts. It is widely believed that people do not know the meaning of the words they use—they do not know what they are talking about—unless they can provide adequate definitions for all those words. This is simply a mistaken view of meaning.

Someone can be an excellent athlete—a hitter in baseball, for example—yet be a very poor coach or teacher of how to hit. Surprisingly, perhaps, others can be mediocre hitters but turn into outstanding hitting coaches. The reason these things are possible is that there is all the difference in the world between doing something and describing, or explaining, how to do something. Think for a moment about those things that you are most skilled at doing—shooting free throws, playing a musical instrument, riding a bicycle, and so on. How confident would you be that you could teach someone else how to be skillful at these activities? Could you write a manual for them on how to do any one of these?

Speaking a language is much more like hitting a baseball than being a good hitting coach. Language is a skillful activity that human beings master with remarkable facility in ways that philosophers, psychologists, and linguists are only beginning to appreciate. I can safely assume that any reader of this book is an accomplished enough user of English that you know full well the meaning of almost every word that philosophers have spent a great deal of time and energy trying to analyze or define. You all know the meaning of terms such as *beauty*, *justice*, and *knowledge* because you can use sentences such as the following to communicate with other English speakers.

1. That's a beautiful painting.
2. Simple justice demands that all the kids get to play.
3. You don't really know that the Dodgers will win the pennant; you just hope they will.

All this is important because it is so easy to forget in the middle of philosophical battles. We are going to analyze the concept of knowledge in this chapter. We will see that this task is difficult, controversial, and perhaps in the end, impossible to complete satisfactorily. This doesn't mean for a second that you or the great minds of Western philosophy do not know how to use words such as *know* and *knowledge* for the purposes of clear communication.

The Need for Conceptual Clarity

Although I stand 100 percent behind what I said previously, this doesn't mean that careful conceptual analysis is not important. People sometimes make remarkable claims about knowledge. We have just seen how the skeptic can put together plausible and disturbing arguments that we know next to nothing. The arguments of the last chapter are classical examples of the sorts of intellectual concerns that occupy the attention of professional philosophers. Disputes about knowledge are not limited to philosophers, however. We often hear that modern scientists do not know that evolution by natural selection is true. Many claim that it is only a "theory." This is sometimes backed up with an argument. Science, so this line of thinking goes, is only concerned with what can be directly observed or proved with laboratory experiments. But evolution, it is sometimes claimed, cannot be directly observed, both because it is too slow of a process and because the most interesting observations would have needed to take place in a time before there were human observers. Furthermore, creationists claim that no controlled laboratory experiment can prove that evolution is true.

If we are to make any progress in understanding, let alone resolving, these kinds of intellectual disputes, we are going to need to be much clearer in our own minds as to what counts as knowledge. I claim to know that I am at my computer composing this chapter. The skeptic tells me I don't know this after all; it might only be a dream. I am quite sure that I know that natural selection is true. Creationists claim that I don't and that my "faith" in the theory is no different from religious belief. How can we possibly hope to make progress toward resolving these disputes without some fairly specific agreement as to what counts as genuine knowledge?

For some, the kind of conceptual analysis in which we engage in this chapter can be fun and

exciting in its own right. Most of you, however, should see it as a necessary means to an end. I assume most of you care about whether scientists know what they are talking about. If you are like I am, you think they probably do. But to really feel confident about this, you need to have some answers to the philosophical skeptic who says it might all be a dream and the procedural skeptic who argues from a specific model of scientific knowledge to doubt about things such as evolution and climate change. To answer either of these skeptics productively, you need some agreement about the nature of knowledge.

Knowledge and Belief

Human beings seem to be a very credulous species; we believe an amazing variety of things. Our ancestors believed in witches, that the earth was flat, and in the divine right of kings. People today believe that their futures are foretold in horoscopes, that good writing can be accomplished in first drafts, and that their favorite sports team will finally get it together. From the perspective of history, it is easy to find countless beliefs that we sincerely held that strike us as foolish, dangerous, and immoral. But of course, not all beliefs fit into this category.

Other things we don't merely believe, we know. I, of course, believe that I am a philosophy professor, a one-time softball player, and a husband to a beautiful woman. But I don't just believe these things, I know them. The distinction between belief and knowledge is not like the one between being a sibling and being an only child—it is not an exclusive, either/or difference. It is rather like the distinction between an automobile and a convertible. To be

a convertible is to be a special kind of automobile. As logicians put it, being an automobile is a necessary condition of being a convertible. Not all automobiles are convertibles, but all convertibles are automobiles.

Traditional models, or definitions, of knowledge have attempted to articulate a list of necessary conditions that are jointly sufficient for having genuine knowledge. The abstract noun *knowledge* is kind of artificial. I think we will do better to use the more familiar verb. Our observations about knowing and believing suggest the first entry on our list of necessary conditions:

> *J* knows *P* only if:
> i. *J* believes *P*.

There is a fairly common way of talking that seems to call this into question. Suppose we have a friend who is headed for heartache partly because he refuses to take seriously the obvious evidence of his lover's infidelity. We might say, "Jake knows that she's untrue, but he can't bring himself to believe it." Or perhaps we have a colleague who is foolishly refusing to take heed of medical symptoms: "Sarah knows something is wrong but just won't believe it." How seriously should we take the claim that both Jake and Sarah have knowledge but lack belief? Not very.

Jake sees the obvious signs and has his moments of doubt. Sarah too. If they didn't, we wouldn't be inclined to say they knew. It is, of course, possible for people to be perversely dense. People can be totally oblivious to things that are perfectly obvious to others. Connie may genuinely believe that her lover is totally faithful despite the lame excuses and the lipstick on his collar. But we would never be tempted to say

Connie knows this, though perhaps she should. When we use the "knows but doesn't believe" idiom, we are getting at something interesting about Jake and Sarah. They seem to be engaging in what philosophers call self-deception. This is an important issue in both philosophy and psychology but really says nothing about how to define knowledge.

I take it to be settled that knowledge implies some kind of genuine conviction or intellectual confidence. Thus the first necessary condition of knowledge turns out to be relatively secure, uncontroversial, and philosophically straightforward. Would that we could say the same about the conditions to follow.

The Search for the Truth

You are the district attorney, and you've got a great case. The defendant is the kind of lowlife that society needs to do something about. You've got the goods on him too, lots of physical evidence, a clear motive, and witnesses. The case will be an easy one to try, and it will be a feather in your cap to be the one who put him away. You just "know" that the slime ball's guilty. There's only one problem with this scenario; the guy didn't do it. It does not matter how sincere your belief is nor how good the evidence seems to be—if what you thought you knew turns out to be false, it's back to the drawing board. Truth is an absolute precondition for knowledge. Unfortunately, truth is a philosophical mess.

Contemporary philosophy is about as far from consensus about the nature of truth as any issue in the field. Some believe that truth is correspondence with reality. Others believe that it is coherence with other widely held beliefs. Yet others

claim that the assertion that "snow is white is true" is just a fancy way of saying that "snow is white." All these theories of truth have plausible arguments in their defense, and all suffer from serious conceptual problems. Professional philosophy doesn't know what truth is. I don't know what it is either, but I will nevertheless say a little more about truth toward the end of this book.

In spite of all the confusion about the nature of truth, however, the relationship between truth and knowledge is as clear as could be. The only beliefs that we have that are viable candidates for being knowledge are those that are true. The surest way to defeat someone's claim that they know something is to show that what they claim to know is false. This suggests a work-around epistemological definition of truth:

truth $=_{df}$ not-false

Admittedly, this is a pretty trivial definition. It does, however, have the advantage of separating philosophical disputes about the nature of truth from the noncontroversial connection between truth and knowledge.

Thus truth supplies a second necessary condition for knowledge. We can expand our evolving model of knowledge as follows:

J knows *P* only if:
i. *J* believes *P*.
ii. *P* is true.

Epistemic Justification

Perhaps we already have all that we need. The concept of knowledge seems both subjective and objective. To believe something is to be in a

certain cognitive state that individual "subjects" find themselves in or fail to find themselves in. For that belief to be true (or not-false) it must be dependent on things entirely independent of those subjects—the way things "objectively" are. Condition *i* takes care of the subjective element, and *ii* covers the objective. What more do we need?

I have been hoping for a raise. Unfortunately, my latest evaluation left a lot to be desired, and the state's budget looks pretty bleak. Forever the optimist, I continue to think the best. I woke up yesterday and as I was having my morning coffee I glanced at my horoscope. The entry for Pisces was way cool: "You will receive something long overdue and well deserved. All the signs are positive." My raise! What could be clearer? I went to work with a smile on my face absolutely confident that I would get the good news. And I did! The governor decided that all state employees should get a modest salary adjustment, and that afternoon, we were all formally notified.

The two conditions for knowledge are satisfied. Johnson believes that he will get a raise, and it is true that he will get a raise. Does he therefore know that he will get a raise? Most of us would be very reluctant to say he possesses knowledge. What he believes turns out to be true but merely by coincidence or good luck. The subjective element of belief and the objective element of truth seem much too tenuously connected. What seems to be missing is some reason or evidence in support of my belief. Sure, the horoscope is a reason in the sense of providing a psychological explanation for why I happen to have this belief. But it's such a poor reason—it's so unreliable—that we attribute the belief's truth to good fortune and not the strength of the reason.

Epistemologists have adopted the idiom of normative obligation to get at the stronger connection between belief and truth that is required for genuine knowledge. You are *entitled* to claim knowledge, according to this way of thinking about things, only if your belief is *justified*—that is, just in case you have very good reason for thinking it is true. Thus on the so-called standard analysis of knowledge a third necessary condition of knowledge, one that completes the package and makes it jointly sufficient, is the justification condition.

> *J* knows *P* if and only if:
> i. *J* believes *P*.
> ii. *P* is true.
> iii. *J* is justified in believing *P*.

What Does It Take to Be Justified?

We have seen how skeptics can produce a formidable battery of arguments designed to show that we are never completely justified in believing anything. The problem concerns the connection between truth and justification. The only standard that completely eliminates the possibility of our beliefs being held in error is one of self-evidence or certainty. But as the Cartesian project has convinced most of us, epistemological certainty is unattainable. This means that whatever model of knowledge is finally endorsed will be committed to some sort of epistemic fallibility. This is not that serious a worry for most natural or social scientists but does run counter to the dominant tradition in Western epistemology.

Self-evidence and certainty may have set unrealistically high standards for knowledge, but these epistemic standards had the

superficial appearance of being clear and identifiable. Models of knowledge that substitute criteria for epistemic justification must be prepared to state some new criterion for distinguishing unfounded belief from a promising theory and from established knowledge. The contemporary literature offers many intriguing possibilities—some highly formal and some quite commonsensical—but none that have won anything approaching consensus.

I suggest that we understand the idea of epistemic justification in terms of evidence. The things that we know are those true beliefs for which we have *very, very, very good* evidence—what a lawyer calls proof beyond a reasonable doubt. Good evidence is something that we are all familiar with and something that we can learn to reliably spot. I will be offering in the chapters to follow a model of—or a kind of formula for testing for—good evidence. I hope to convince you that this model captures almost everything we care about when we assess the quality of a person's evidence or for that matter, their claims to knowledge.

Let's transform the standard analysis of knowledge in light of all this into the following:

> *J* knows *P* only if:
>
> i. *J* believes *P*.
>
> ii. *P* is true.
>
> iii. *J* has exceedingly good evidence for *P*.

An Unsolved Problem

If you were reading very carefully, you may have noticed a slight difference in the way I stated the standard analysis of knowledge at the end of preceding section and the section immediately before that one. You are all smart enough to see the obvious change in condition *iii*, but can you find the other difference? The way the philosophic tradition has defined knowledge is to articulate necessary and sufficient conditions for knowing something. The standard analysis of knowledge claims that the three necessary conditions are, taken together, sufficient for knowing something. In my statement of a "transformed" analysis, I wimped out a bit. I claimed that my three conditions were all necessary—that's what the "only if" signifies—but I left it open whether the three conditions were sufficient. Here's why.

Consider the following little thought experiment. My wife and I have spent the last hour collaborating on our special spaghetti sauce. Just as we are getting ready to serve dinner, we discover that we are out of Parmesan cheese. We divide responsibilities—she will toss the salad and serve dinner; I'll make the emergency run to the store. While at the store, I meet a colleague doing research in contemporary epistemology—she wants an example of knowledge. I suggest that I know there is a spaghetti dinner sitting on our dining room table right now. And as luck would have it, it's true that a spaghetti dinner is on the table. I believe it, it's true, and I'm justified in believing it. All is well. Well, maybe not. After I left, our German shepherd, Guido, got rambunctious and knocked the pot of simmering spaghetti sauce on the dirty kitchen floor. My wife considered violence against the dog, but before anything could happen, a neighbor arrived with a pot of leftover spaghetti sauce, announcing that she was leaving on vacation and it would surely spoil before she returned. Thus the spaghetti sauce that

made my knowledge claim true is unconnected to the spaghetti sauce that provided the justification for my belief. It is odd in the extreme to claim that I had knowledge of the pot of spaghetti sitting on my table. It is pure serendipity that my belief turned out to be true.

A lot of contemporary epistemology has been concerned with ruling out these kinds of "Guido" cases (actually, they are called Gettier examples, after the philosopher who first made them famous). Many philosophers have suggested that some fourth or fifth or sixth and so on condition must be added to our analysis of knowledge. I am not sure whether I personally agree. To be on the safe side, however, I will be content with the above transformed analysis. The epistemic action in this little book will focus on condition *iii* anyway. What the heck is it to have evidence or good evidence or exceedingly good evidence for something?

EXERCISES

1. What is the myth of definition? Does it show that the traditional philosophical quest of defining terms (analyzing them) is unnecessary? Why, or why not?
2. Explain why having a true belief that something is the case is not good enough for claiming to know that it is the case.
3. What does the "Guido" example show us about knowledge?

QUIZ THREE

Here's something I claim to know: climate change (global warming) is very real and very dangerous. How would the epistemological skeptic respond to this? Given the view of knowledge defended in this chapter, what would need to be true if my knowledge claim is correct?

Notes

1 Plato, "Theatetus," in *Plato: The Collected Dialogues*, trans. F. M. Cornford (Princeton, NJ: Princeton University Press, 1961), 909.

Arguments

When we give reasons for holding a view or reaching a conclusion, the process is intrinsically articulate. Giving reasons requires language, concepts and skill with words, not just a simple ability to talk. For two (or more) people to share their reasoning requires a kind of reflective articulateness, an ability to express reasoning in a way that is intelligible to a particular audience. . . . What we will call "argument" here is meant to capture everything we make explicit when we give reasons for a view or proposition. . . . Much of the difficulty in reasoning together comes from simply not understanding each other's arguments—from not understanding the significance of the words to express reasons and the views they support.

—LARRY WRIGHT[1]

The Importance of Arguments

I am in an unusual career, where arguments dominate my professional life. I am paid to teach my students what philosophers have had to say on a great array of topics. Almost always, these philosophers, whether they are the historical "biggies" or contemporary thinkers, support their theories with arguments. Obviously, if I am going to do my job, I need to help my students sort out the good arguments from the bad. As a professor, I also participate in what is called "shared governance," and as a consequence, I am required to vote and help decide policies, curricula, and other matters of university importance. Administrators and my colleagues consistently defend positions of great significance to the institution with impassioned arguments. Since I take this part of my profession very seriously, I find it essential to decide which of these arguments I find most persuasive.

Most of us are not simply consumers of arguments, we are producers as well. In my own professional work, I present and defend theories about privacy, the Constitution, the death penalty, the existence of God, and a number of other philosophically, politically, and legally controversial

topics. As an active participant in shared governance, I take sides, advocate positions, and occasionally lead the charge for particular causes. All this demands that I defend my views. In these cases, it is my name on the argument, and there is a heightened sense not just of ownership but of personal and professional responsibility. I need my arguments to be as strong as they can be not just convincing but plausible and hopefully pointing in the right direction.

Your life may not be as argument-intensive as mine, but if you stop to reflect a bit, I think you'll find arguments all around you. Advertisers make arguments for why you should buy their products and politicians for why they deserve your vote. You may need the advice from accountants and economists, hopefully backed up with arguments, to plan for a major business investment or your retirement. And you are a producer of arguments as well. That memo you wrote to your boss for a change in the way things are done or the case you just made to your partner about the need to buy a new car is an argument.

This book is about arguments and a suggested technique for distinguishing good arguments from bad ones. These general hints are intended to be of use both when you find yourself in the position of the consumer of an argument and when you must make some decision about the quality of its evidence as well as when you are the producer of the argument and desire to present the strongest evidence you can. I don't claim to have a magic bullet that will automatically show the truth about complicated issues. But I think you will be pleasantly surprised at how often this technique proves useful for thinking through these issues, finding out where you

stand, and even beginning the process of formulating your own arguments about them.

What Is an Argument?

One potentially misleading aspect in some of my previous examples is that when it comes to controversial issues such as abortion or the death penalty, tempers can be high. And trust me, debates about curriculum or university policy can be just as emotionally explosive. There is a perfectly fine use of the word *argument* that basically means a verbal fight. Joe and Sally got into a terrible argument about his failure to do his share of the house cleaning. That is not what we will mean by the term, however. Sure, there will be times when arguments are very important, and disagreements about their strength or weakness will touch our emotions as much as our reason. There will be many other times, however, when arguments are simply there for our consideration, and we can assess them free of any passion or personal commitment. Indeed, as much as is possible, I would recommend adopting the more dispassionate approach, even when you feel strongly about what is at issue.

It is useful to see an argument as a complex arrangement of three quite different things. There will be what logicians call a *conclusion*—some theory, hypothesis, or position that the argument seeks to defend. There will be *premises*—facts, data, or evidence that the argument uses to support the conclusion. And there will be a relationship between the premises and conclusion whereby the conclusion *follows from* the premises. We can schematically represent an argument as follows:

e_1. Premise

e_2. Premise

e_3. Premise

. . .

e_n. Premise

---

t_0. Conclusion

Let's begin at the bottom. Every argument will have a *conclusion*—that's part of the definition of an argument. When we put an argument in what we will be calling its *schematic form*, it will always come at the end, under the big, heavy line. But in the real world of arguments, we should treat the term *conclusion* as technical jargon. Conclusions don't always come at the conclusion of a person's argument. Sometimes they come at the beginning.

> Dick's cheating on Jane. *He told her he had to work late, but Sally saw his car at Joe's Bar. Not only that, he leers at other women, and the last three times she called him, he didn't answer.*

Sometimes they come in the middle.

> *Charlie's take-home exam was word-for-word identical to Sarah's. Clearly,* Charlie copied it from Sarah. *The guy's a loser, never comes to class, and doesn't know how to write very well.*

And, of course, some of the time, they are at the end.

> *The light from virtually every galaxy is "red-shifted." This shows that every galaxy is moving away from every other galaxy. Therefore,* the physical universe is expanding.

I have used the lowercase letter *t* in my schematic representation to stand for *theory*. The subscript "0" is used to do two jobs. Although there is only one theory defended in the argument's conclusion (though that single conclusion can be complicated and composed of many parts—"therefore, Jake did it or helped plan it, or someone read his diary"), we will need to keep track of other possible theories besides the one defended in the argument. So "0" can be understood as the number zero and starting a sequence of numbered theories. But the "0" can also be read as the letter *o* and standing for *original*—the original theory or conclusion in the argument.

To standardize things, we will use the lowercase letter *e* to stand for an individual bit of *evidence*. There are no set numbers of premises, or pieces of the evidence, in an argument. Sometimes there will be just a single datum, and sometimes, there will be quite a bit of supporting data. The previous examples illustrate not just that conclusions can come in many places in the statement of an argument but that the same holds true the statements of the evidence.

Let's recast our schematized argument in terms of evidence for a theory:

e_1. Evidence (datum)

e_2. Evidence (another datum)

e_3. Evidence (another datum)

. . .

e_n. Evidence (another datum)

---

t_0. Theory

Logical Connection

We've said a bit about the top and the bottom in our schematic representation of an argument. What about that conspicuous, big, fat line? In good arguments, the conclusion *follows from* the premises; the evidence *supports* the theory. What exactly is this relationship of support or following from? That turns out to be a very controversial issue in both philosophy and mathematical logic.

In some cases, the relationship is *semantic*. If we just understood enough about the meanings of all the words in the premises, we would see that the conclusion has to be true. Often the examples are pretty trivial.

> e_1. The number is even.
>
> e_2. The number is greater than seventeen.
>
> ———————————
>
> t_0. The number is not prime.

Other times, however, there's quite a bit of information hiding in the premises, and the conclusions are a little surprising and quite significant.

> e_1. The figure is a plane triangle.
>
> ———————————
>
> t_0. The interior angles of the figure equal exactly 180°.

Arguments of the previous type have a technical name. They are called *deductive arguments*. In a successful deductive argument, the relationship between the premises and conclusion (it's artificial here to call them evidence and theory) is a very special one. Logicians call it *validity*. Valid arguments are ones where *if* the premises

are true, the conclusion *has to be true*. Many colleges and universities have whole courses on deductive (or symbolic) logic. Very sophisticated techniques are developed for determining validity. We will not spend time reviewing this material because as interesting (and just plain fun) as it is, one almost never finds deductive arguments being put forward outside of academic philosophy and mathematics.

A second way of connecting premises to conclusions relies on the technical fields of mathematics and statistics. We cannot as conveniently ignore these arguments, since they play huge roles in contemporary science. Our approach to them, however, will be a little indirect. Rather than going through the basics of *probability theory* and then developing statistical tests for making sense of numerical data, we will treat these arguments as special cases of *inductive arguments*. This latter jargon simply means that the argument claims that the conclusion *follows from* the premises but *not* deductively—that is, it is possible for the premises to be true, yet the conclusion turns out to be false. Now, of course, it should be relatively rare that in good inductive arguments, the premises would be true and the conclusion false; otherwise these arguments will not be very useful. It is a matter of great controversy in logic, philosophy, and even the sciences as to how we describe this relationship between evidence and theories. The rest of this book is devoted to showing you one way of characterizing this relationship.
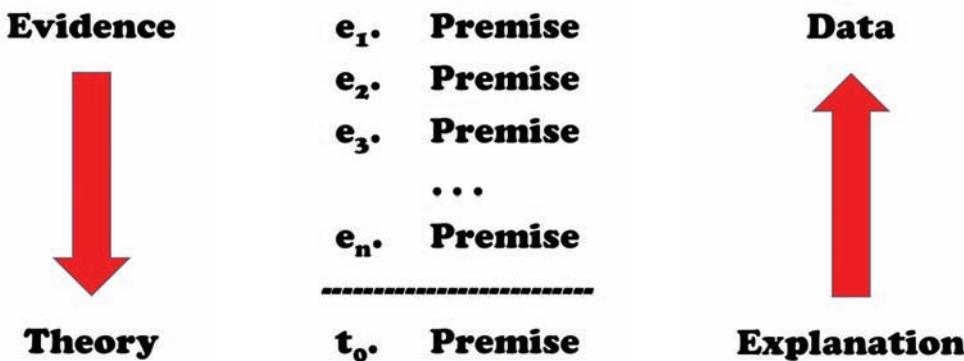
Inference to the Best Explanation

Consider the three short examples mentioned previously. We had purported evidence that

Dick was unfaithful—the leering, the excuse about being sick, the car outside the bar, and the missed phone calls. We had purported evidence about the copied take-home exam—the word-for-word identical submissions, Charlie's chronic absences, and his failures as a writer. Finally, we had the evidence about the expanding universe—the red-shifted light from distant galaxies. In each of these cases, the suggested theory *explains* significant parts of our evidence. Charlie being a cheater doesn't explain his bad writing, but it sure helps us understand how the two exams ended up being the same. Dick's cheating (in a very different way) would explain why he was at the bar when he said he was sick. And an expanding universe explains the Doppler shift we observe in the light from galaxies.

This suggests a generalization. Suppose we treat the theory being defended in an inductive argument as an explanation of the data (at least some of the data) contained in the evidence. We get the following very symmetrical picture of an argument:

Evidence

$e_1.$ **Premise**
$e_2.$ **Premise**
$e_3.$ **Premise**
$\cdots$
$e_n.$ **Premise**

$t_0.$ **Premise**

Theory

Data

Explanation

Inference to the best explanation assumes this general picture of inductive arguments. The relationship of *support* or *following from* becomes one of good explanation. Evidence for a theory is strong, or good or sound, if and only if, the theory *best explains* the relevant data that is being offered as evidence. This definition of good evidence gives us a very useful device for testing the quality of purported evidence.

In the next chapter, I intend to lay out a kind of practical test for answering questions about the strength of arguments, about the quality of evidence. Does Connie have *good evidence* that her boyfriend was smooching Mary Jane during his absence at the record hop? Is there a *strong argument* that Charlie copied the take-home exam? Do astronomers *really know* that the physical universe is expanding? We can only begin to answer these questions when we are in absolute agreement about what the argument is in the first place.

A Couple of Arguments from Sherlock Holmes

Let's look at a couple of examples of evidence that lead to some conclusions for Sherlock Holmes.

Here are the missing links of the very simple chain: 1. You had chalk between your left finger and thumb when you returned from the club last night. 2. You

put chalk there when you play billiards, to steady the cue. 3. You never play billiards except with Thurston. 4. You told me, four weeks ago, that Thurston had an option on some South African property which would expire in a month, and which he desired you to share with him. 5. Your check book is locked in my drawer, and you have not asked for the key. 6. You do not propose to invest your money in this manner.[2]

The beginning of *The Adventure of the Dancing Men* begins with a little case study in Sherlock Holmes's "deductive" method. Holmes's method, of course, is not deductive in the formal logician's sense but inductive, or better, abductive. It is an inference to the best explanation. Holmes possesses a fair amount of data.

> e_1. Watson had chalk between his left finger and thumb.
> e_2. He uses the chalk when he plays billiards.
> e_3. He only plays billiards with Thurston.
> e_4. He told Holmes four weeks ago that Thurston had an option on some South African property, which would expire in a month.
> e_5. Watson's checkbook is locked in Holmes's drawer.
> e_6. Watson has not asked for the key.

Holmes explains all this with the hypothesis that Watson has decided against the investment. Holmes goes on to explicate his reasoning with the metaphor of a chain.

> *You see, my dear Watson . . . it is not really difficult to construct a series of inferences, each dependent on its predecessor and each simple in itself. If, after doing so, one simply knocks out all the central inferences and presents one's audience with the starting-point*

and the conclusion, one may produce a startling, though possibly a meretricious, effect. Now, it was not really difficult, by an inspection of the groove between your left forefinger and thumb, to feel sure that you did not propose to invest your small capital in the gold fields.[3]

Although I think it is clear that Holmes exaggerates when he claims that the inferences follow in sequential lockstep, the insight that explanatory reasoning often proceeds in steps is important. Here is how I would schematize Holmes's inference.

> e_1. Watson had chalk between his left finger and thumb.
> e_2. He uses the chalk when he plays billiards.
> e_3. He only plays billiards with Thurston.
>
> ---
>
> t'_0. Watson played billiards with Thurston last night.
> e_4. He told Holmes four weeks ago that Thurston had an option on some South African property, which would expire in a month.
> e_5. Watson's checkbook is locked in Holmes's drawer.
> e_6. Watson has not asked for the key.
>
> ---
>
> t''_0. Watson has decided against the investment.

Each of these inferences is to an "alleged" best explanation. t'_0 explains the chalk on his hand and is consistent with Holmes's background knowledge of Watson's preferences in playing partners. t''_0 explains the lack of a request for the key and is consistent with Holmes's knowledge of what Watson told him four weeks ago and the location of the checkbook.
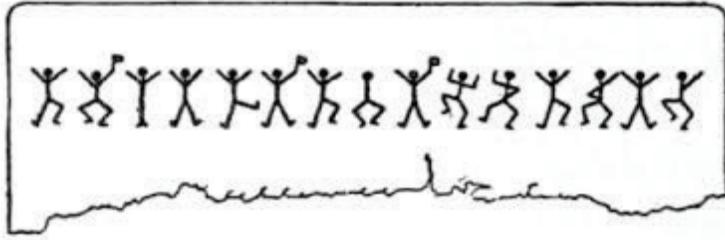
FIGURE 1. Dancing men cypher

Retrieved from Sir Arthur Conan Doyle, The Return of Sherlock Holmes, http://www.gutenberg.org/ebooks/108 (accessed June 26, 2018).

But *The Adventure of the Dancing Men* is not really about chalk and South African investments; it's ultimately about murder and a couple of other mysteries that lead to the murder and its solution.

Here's a link to a lovely webpage that includes the full text of the short story: https://etc.usf.edu/lit2go/178/the-return-of-sherlock-holmes/3228/chapter-iii-the-adventure-of-the-dancing-men/.

You'll enjoy the story, and it would be great practice if you paused here for a while and tried your hand at schematizing Holmes's argument for what happened at Ridling Thorpe Manor.

Consider, first, the mystery that gives the story its name. Holmes shows Watson a piece of paper with the above pencil markings.[4] This is our first piece of evidence.

e_1. The dancing men document

Watson immediately offers an account: "Why, Holmes, it is a child's drawing." Holmes thinks otherwise. The dancing men drawings "have a meaning," but they might be "arbitrary" (think "one if by land and two if by sea") or they might be "systematic" (a cipher). Holmes bets on the latter. His client, Mr. Cubitt, has provided more data:

e_2. Mr. Cubitt's wife, Elsie, received a letter from America that very much upset her.
e_3. Other dancing men inscriptions, on both paper and chalk applied to buildings, have turned up at Ridling Thorpe Manor.
e_4. Holmes has knowledge of the relative frequency of letters in the English language.

t'_0. The dancing men figures stand for letters. And the messages are in English.

Holmes breaks the code. He is now able to translate the different messages that have turned up.

This leads to the second mystery: Why is Elsie so reticent to tell her husband about her past? Why is she so upset and frightened by the dancing men messages? Why did she stop her husband from confronting the stranger they caught in the act of scrawling one of the messages? Holmes is in a position to answer many of these questions simply by decoding the messages he has. In addition, Holmes explains Elsie's reticence and fear in terms of some connection to criminal activities in her past, and he knows that the correspondent is named Abe Slaney. A cable to a colleague in the States confirms that Slaney is "the most dangerous crook in Chicago." Slaney is imploring Elsie to return to him and finally threatening her. Holmes and Watson have plenty of evidence that necessitates hurrying to the Norfolk countryside.

e_5. The contents of the messages
e_6. Slaney is the most dangerous crook in Chicago.
e_7. Slaney's threat to Elsie

t''_0. Elsie, and perhaps Mr. Cubitt's, lives are in danger.

- The study window was shut and fastened.
- The house was locked from the inside, and no one could have left.
- They were both conscious of the smell of powder from the time they awakened upstairs.

Sadly, they are too late. Immediately upon their arrival at the train station, they learn of the tragedy.

"It's a terrible business," said the stationmaster. "They are shot, both Mr. Hilton Cubitt and his wife. She shot him and then herself—so the servants say. He's dead and her life is despaired of."[5]

The stationmaster has, of course, not only introduced crucial new evidence but also offered an explanation. Holmes proceeds to the murder scene, interviews two servants, and examines the room where the bodies have been found.

e_8. Cubitt is shot dead, and Elsie is gravely wounded with a gunshot to the head.
e_9. A revolver is found, still containing four bullets.
e_{10}. The servants report several things:

- Both were awakened by the sound of a loud gunshot.
- A short while later, they heard a second shot.
- The victims were downstairs in the study.
- A strong smell of gun smoke in the study.

There are still several pages to go in *The Adventures of the Dancing Men,* but Holmes has now basically solved the case. His reasoning is classic inference to the best explanation (IBE). How and why did Mr. Cubitt and Elsie come to be shot? Why were the servants conscious of the smell of powder while upstairs? And what about the mysterious Slaney?

Holmes is particularly fascinated by the powder aroma upstairs—"I commend that fact very carefully to your attention."[6] Holmes's provisional hypothesis is that the window must have been open and the draft carried the smell. Careful examination of the study produces one last crucial bit of evidence.

e_{11}. A third bullet is discovered in the window sash.

A third bullet! Someone else is involved! They examine outside the window and discover important new data.

e_{12}. Trampled flowers, large masculine footprints, and a spent cartridge

But why only the sound of two gunshots? The first one was extremely loud. Might it "have been two shots fired almost at the same instant"?[7] Holmes concludes "it was undoubtedly so."[8]

Holmes proceeds to entrap Slaney, and he confirms that he was one of the authors of the dancing men messages and that he and Mr. Cubitt exchanged gunshots through the window. The story never tells us precisely what happened to Elsie, but we know, just as Holmes knew.

> t_0. Slaney sought to win Elsie back and was refused. He came to the manor and exchanged almost simultaneous gunshots with Cubitt. Elsie closed the window and either heartbroken at the death of her husband, guilt-ridden and feeling partial responsibility, or misguidedly seeking to preserve her husband's good name, shot herself in the head.

Schematizing the Argument

Let me state something explicitly. *The single hardest part of argument analysis or the IBE recipe may often be simply identifying what the argument is in the first place.* There are a number of reasons for this. First and foremost, people aren't always as clear as the might be when they state their arguments. But there are other complicating factors as well. My guess is that Conan Doyle would have said he wasn't presenting an argument at all but simply telling a story. Still, I think it's clear that the story is about Holmes's following the evidence and coming to a conclusion about what happened. Add to all that some arguments touch on deeply divisive moral and political issues and few of us read them and set our personal politics to the side. These unavoidable biases that we all carry with us will often tempt us to simply misread what the argument is. Finally, as we

get a hint of in this short story but becomes daunting when an argument is developed over the course of a whole book, the sheer number of words, thoughts, and sentences makes it extremely challenging to keep the structure of the argument clearly in mind.

Granted all this, the first step in the IBE procedure that we will develop in the next chapter is not only the most difficult; it is the most important. If we misrepresent what the argument is, then all our work in analyzing it will be a waste of time. Who cares if you show "the argument" to be a spectacular success or a dismal failure if it wasn't the real argument in the first place?

Useful schematization requires three virtues, all of which defy simple characterization. First and foremost, as we have just emphasized, you should strive for *copy fidelity*. Your task is to characterize "the other person's argument," a representation of his or her evidence. You may think of better ways to make the argument, or you may even think that the evidence points in a different direction. That's all fine and good and will be useful in later steps. Right now, however, your job is to faithfully represent the argument as it was stated. You want to also strive for *brevity*. We just saw how an argument might take up several pages of a short story but just imagine when we look in a later chapter at Darwin's "abstract" of his theory in *On the Origin of Species*[9] and try to keep straight all the evidence presented in more than four hundred pages. In order for your schematization to be useful to you, you will need to keep your representation of the evidence down to, say, no more than a page. Finally, and most difficult of all, you should strive for *charity*

in your schematized arguments. You want to present the argument in the strongest form you can. This is not because you are being nice or discounting the previous virtue of copy fidelity. It is because you want to avoid at all costs weakening the evidence in the way you choose to schematize it. This is particularly important when you are dealing with arguments with which you disagree. If you come to the judgment that the evidence is weak, you need to make darn sure that you've given the evidence its best shot.

Start at the Bottom (Find the Conclusion)

We've already discussed the fact that *conclusions* may come anywhere in a statement of an argument. Still, in the *schematic form* I am urging on you, they always come at the bottom; they are always are identified as t_0 ("0" to start a sequence of explanations and *o* as a reminder that this explanation is the original one), and they are always *explanations* of the data, not simply statements of the data. I strongly suggest that you begin your schematizing of the argument by trying to identify its conclusion.

Oftentimes, you will find hints in the statement that will guide you to the argument's conclusion. There are many words and phrases that are commonly used to alert readers or listeners that an inference is being drawn. Some of the classics you will find in any introductory logic book are as follows: "therefore," "hence," "so," "it follows that," and many others. But at other times, you are simply expected to pick out what the theory is that is supposed to be supported

by the evidence. The best advice in these latter cases is simply to ask yourself something very general and vague such as "What's the point of all this?" or, as suggested previously, "What the heck is going on?" Once you have a candidate, now see whether it explains some of the data in the argument. If it doesn't seem to, you might want to look for another candidate as the argument's conclusion.

Two other general comments are appropriate here. First, don't get discouraged. This is hard stuff. It will get easier and more natural as you get more experience using the recipe. And second, there will be times when you fail to discover a conclusion to begin your schematization because the passage of prose in front of you is not an argument in the first place. We obviously use language do lots of things—make simple assertions, push people's buttons, or simply vent—stating an argument is only one use of language.

Find the Relevant Evidence

In *The Adventure of the Dancing Men*, we learned a lot of stuff. Holmes enjoyed playing with Watson's head. Mr. Cubitt was "a tall, ruddy, clean shaven gentleman." And that Inspector Martin was a "dapper little man, with a quick, alert manner and a waxed moustache." This is just good literary technique. There's also the important information at the end of the story when Slaney is arrested and confesses. But these data are only tangential to solving the murder. The data in e_1 through e_{12}, however, are crucial to understanding what happened, and all of it should be included in a complete schematization of the argument.

Another Brokenhearted Teenager

Here's a sad story.

Lyrics to "It's My Party" can be found here: https://genius.com/Lesley-gore-its-my-party-lyrics, and Lesley Gore performing her song can be found here: https://youtu.be/acRMALrg1t4.

Lesley is in tears, and she assures us we would be too if something similar happened to us. So what the heck happened? She doesn't spell it out, but she knows and so do we. Take some time, now, and schematize Lesley's argument. What is her evidence that Johnny is no longer hers and has taken up with Judy?

EXERCISES

1. What is an argument? What are the three components of any argument?
2. How can you have a big argument, with lots of name-calling, without either party presenting an argument for why they feel aggrieved?
3. What do you think of the quality of Holmes's evidence for his theory that Watson had decided not to go ahead with the investment? Why?

QUIZ FOUR

The following article comes from the *New York Times*. Your task is to schematize the argument for the conclusion that William Henry Harrison died from enteric fever. The article "What Really Killed William Henry Harrison?" by Jan McHugh and Philip A. Mackowiak, March 31, 2014, is available here: https://www.nytimes.com/2014/04/01/science/what-really-killed-william-henry-harrison.html

Notes

1 Larry Wright, *Critical Thinking* (New York: Oxford University Press, 2001), ix.
2 Sir Arthur Conan Doyle, "The Adventure of the Dancing Men," in *The Return of Sherlock Holmes* (New York: W. R. Caldwell, 1905), http://www.gutenberg.org/files/108/108-h/108-h.htm.
3 Doyle.
4 Doyle.
5 Doyle.
6 Doyle.
7 Doyle.
8 Doyle.
9 Charles Darwin, *On the Origin of Species: A Facsimile of the First Edition* (Cambridge, MA: Harvard University Press, 2001).

Inference to the Best Explanation

In making this inference one infers, from the fact that a certain hypothesis would explain the evidence, to the truth of that hypothesis. In general, there will be several hypotheses which might explain the evidence, so one must be able to reject all such alternative hypotheses before one is warranted in making the inference. Thus, one infers, from the premise that a given hypothesis would provide a "better" explanation for the evidence than would any other hypothesis, to the conclusion that the given hypothesis is true.

—GILBERT HARMAN[1]

Inference to the Best Explanation

We have been treating the expression *inference to the best explanation* as technical jargon. It is a way of looking at evidence or at least purported evidence in an inductive argument. If we look at the component words in this expression, we will discover quite a lot. First of all, we are dealing with an *inference*. For most purposes, we can consider this as just another way of saying that we have an argument to be considered. This inference is to an *explanation*. But we are not dealing with just an inference to an explanation but to the *best* explanation. This implies two

very important things. First, in order for there to be a comparison, there must be other possible explanations of the data in the argument, *rival explanations*. And the argument is also committed to this original explanation being better than all these rivals. Therefore there seems to be some *rank ordering* of the explanatory candidates, even if this is not explicitly stated.

I will use all this as a way of articulating a test of the quality of evidence within an argument. This test will be most straightforward when you are what I have called a consumer of an argument. Connie thought she had evidence that her

boyfriend was smooching Mary Jane. Holmes had evidence about Watson's decision about the investment and about what happened at Ridling Thorpe Manor. We must decide whether these arguments are any good. Was the evidence for these hypotheses strong? What I am going to call the inference-to-the-best-explanation (IBE) "recipe" is a procedure for answering these kinds of evaluative questions.

Inference-to-the-Best-Explanation Recipe

1. Schematize the argument.
2. List some serious (hopefully challenging) rival explanations.
3. Rank order all the explanations—the original along with the rivals.
4. Based on the rank order, see if the original is the best explanation. If it is, the evidence has passed the test and looks pretty good. If it isn't, it's failed the test, and the evidence is weak and maybe nonexistent.

Let's first apply the test or recipe to the simple argument presented in the pop song "Lipstick on Your Collar" that we introduced in chapter 1.

Schematizing Connie's Argument

That fateful evening at the record hop, Connie was confronted with data, mainly her own simple observations, which cry out for explanation. Where did the lipstick stain come from? Why was he gone for so long? Why did he say it belonged to her when the stain was red and her lipstick was baby pink? Why when Mary Jane appeared was her lipstick all a mess? Although neither a trained natural scientist nor an experienced detective, Connie easily forms an explanatory hypothesis. When she then writes her sad song, she implicitly asks us to account for what happened. Here's how I would schematize Connie's evidence for her theory that her boyfriend had been smooching Mary Jane when he left her alone at the record hop.

e_1. He left Connie all alone at the record hop.
e_2. He was gone for half an hour or more.
e_3. When he returned, there was a lipstick stain on his collar.
e_4. When confronted, he claimed that the stain came from Connie's lipstick.
e_5. The stain was red.
e_6. Connie's lipstick was baby pink.
e_7. Mary Jane's lipstick was all a mess.

t_0. He had been smooching Mary Jane during the half-hour absence.

Rival Explanations (of Connie's Data)

For our purposes, *rival explanations* will be accounts of the data that flat-out *deny* the original explanation and substitute a completely different story of the data offered as evidence. It will be useful to imagine each truly rival account of evidence as starting out with a lengthy preliminary phrase—"*no, no, no,* he was not smooching Mary Jane during his absence from the record hop; rather . . ." This is important because the original explanation might be phrased in very different language.

t'_0. He and Mary Jane ditched Connie so they could make out.

Or an account might offer a more (or less) detailed account of what happened.

> t''_0. He headed for a soda pop but met Mary Jane and couldn't control himself.

Neither t'_0 nor t''_0 will count as rival explanations. If you were to challenge Connie with them, I don't think she would say, "Oh, yeah, maybe I was wrong," but rather she'd exclaim, "Exactly!"

So what else might have happened? Connie never suggests any rival explanations, but they are easy enough to formulate. He went out for a soda pop, just as he said. When asked about the lipstick stain, he responded that it came from Connie, since she was the only one he had been smooching. The laundry detergent his mother uses left a residue on his collar that chemically changed the baby pink lipstick to a bright red color. Mary Jane had been smooching a new guy she met at the record hop, and this messed up her lipstick. We can label this rival explanation t_1.

> t_1. The lipstick changed from pink to red because of a chemical reaction with his mother's laundry detergent.

Or the circumstances might be more sinister. He left Connie all alone because he was feeling ill but thought it more decorous to say he wanted a soda pop. Mary Jane has been harboring a grudge against Connie since the last student council meeting. She found him in the lobby, distracted him, and wiped lipstick on his collar. After he left to return to Connie, Mary Jane smudged her lipstick with the back of her hand. When he returned and was asked about the stain, he told Connie it was hers because she was the only one he had been smooching. Let's label this one t_2.

> t_2. Mary Jane staged the whole thing out of revenge.

t_1 and t_2 were the rival explanations that I came up with when I first used this example in a conference paper several years ago now. I subsequently used the example in quizzes in several of my critical thinking courses. Many of my students suggested a rival explanation that I now believe is much more challenging to Connie's original theory than either of my earlier attempts. Perhaps the stain really did come from Connie but not that evening at the record hop. She might have been wearing bright red lipstick when they smooched last weekend. He's not too hot at doing his laundry regularly and wore the stained shirt to the record hop.

> t_3. The stain came from a previous episode of smooching when Connie was wearing red lipstick.

Rank Ordering Explanations (for Connie's Argument)

We now have on the table four competing accounts of what happened at the record hop.

> t_0. He had been smooching Mary Jane during the half-hour absence.
> t_1. The lipstick changed from pink to red because of a chemical reaction with his mother's laundry detergent.
> t_2. Mary Jane staged the whole thing out of revenge.
> t_3. The stain came from a previous episode of smooching when Connie was wearing red lipstick.

Inference to the best explanation asks us to judge one of these explanations as better than all the rest. How in the world do we start the process of judging one explanation as superior to another? What counts and what doesn't count in such a comparison? We will address this in some detail in a later chapter, but for now, let's simply phrase the question as "*Which account makes the best sense of what we know?*"

I assume that both t_1 and t_2 would rank way down on your list, compared to t_0 and t_3. Isn't part of the reason for this, the fact that both of them introduce something "out of the blue" to explain the absence? Where did this mysterious laundry detergent come from? Or this whole grudge on the part of someone she had considered her best friend?

What about t_0 and t_3, however? They both seem reasonable enough. Let me simply assert some factors that do not count in rank ordering explanations. The *best explanation* is not necessarily the one we like the best, nor the one that best accords with our politics, religion, or moral perspectives. *It is the one that is most plausible.*

Here comes a scary fact! *You* have to make the judgment about which explanation is best. There is no "objective," "reliable" test or formula you can utilize that automatically identifies the best explanation. The whole recipe, therefore, rests on a step that is candidly, unavoidably *subjective*. When it comes to flavors of ice cream or styles of beer, being subjective means that people's preferences are relative to who they are and are, consequently, all over the place. If evidence evaluation is the same, we're done for, and I can stop writing my book and teaching my courses as I do. Fortunately, I believe, explanatory plausibility is very different from beer preferences. Even though

each of us, individual subjects, must rank order alternative accounts for ourselves, it turns out that in a great number of contexts—courts of law, the natural sciences, and even stories about suspicious lipstick stains—*subjective* judgments about plausibility can turn out to be *intersubjective*. When all is said and done, when we think about it as free from prejudice and bias as we can be, we discover widespread agreement about what the best explanation is. We are the most intelligent species that has ever existed, and part of being intelligent is being darn good at spotting the best explanation of what's happening around us.

I rank order our four explanations in the following order:

> t_0. He had been smooching Mary Jane during the half-hour absence.
>
> t_3. The stain came from a previous episode of smooching when Connie was wearing red lipstick.
>
> t_1. The lipstick changed from pink to red because of a chemical reaction with his mother's laundry detergent.
>
> t_2. Mary Jane staged the whole thing out of revenge.

I grant you that t_0 and t_3 are pretty close to one another, but I think Connie would not have been so surprised at all of this if she regularly wore bright red lipstick, and besides, the whole idea of Connie having red lipstick is sort of out of the blue as well.

Assessment of (Connie's) Evidence

The whole purpose of the inference-to-the-best-explanation recipe is to assess the quality of

evidence in an argument. We need to find the *best* explanation. The whole test depends on what is in first place. In my considered judgment, Connie's theory was the best explanation, and therefore, *her evidence is pretty good*. For all the talk about intersubjectivity, I fully realize that some of you will have ranked t_3 ahead of t_0. Those of you who have come to that judgment would say that since there is a better explanation of the facts at the record hop, *Connie's evidence is weak*.

I have been asking my students to use the inference-to-the-best-explanation recipe to assess the quality of evidence presented in an argument for more than three decades. *The single most common mistake that my students make, including some of the best and most intelligent, is to forget about the purpose of the recipe and neglect to offer an assessment of the evidence in the argument*. They often beautifully schematize it, come up with some challenging rival explanations, and offer subtle and insightful comments about how and why they have rank ordered as they have but then remain silent on the quality of the evidence. I am almost tempted to include a fifth step in the recipe saying something such as the following:

5. Conclude your analysis with one of the following two sentences: "*Since the original theory proved to be the best explanation of the data in the evidence, the argument's evidence is pretty good (strong, etc.)*" or "*Since there is a better explanation of the data in the evidence, the argument's evidence is weak (poor, nonexistent, etc.)*."

Step 4 *requires* an explicit evaluation of the evidence, as it was presented and schematized, in the original argument!

What about Ties?

Suppose you came to the conclusion that smooching Mary Jane and smooching Connie last weekend were equally plausible explanations of all the data you had? What happens in the recipe when the original and one of the rivals are tied for first place?

This is a classic half-full, half-empty kind of dilemma. You might say that since the original is tied as the *best explanation*, there's some evidence for that conclusion. You might also say, however, that since there's a rival explanation that's tied as the best explanation, the evidence is not so hot. I think that whichever way we go, the message is really the same. The original's being tied as the best explanation allows us to see why someone would offer the argument in its defense in the first place and why there is some evidence that seems to support it. A rival being tied as the best explanation tells us that the evidence is far from conclusive. Ideally, in such a case, we go out and do a little more investigating and see if we could discover some new data that would help break the tie. And indeed, the whole subject of new data is the topic for our next chapter. But before heading there, let's apply the recipe to scientific argument.

The Origins of Natural Language

The following comes from an article by two prominent cognitive scientists, Stephen Pinker and Paul Bloom:

> *All human societies have language. As far as we know they always did; language was not invented by some groups and spread to others like agriculture or the*

alphabet. . . . The grammars of industrial societies are no more complex than the grammars of hunter-gatherers. . . . Within societies, individual humans are proficient language users regardless of intelligence, social status, or level of education. Children are fluent speakers of complex grammatical sentences by the age of three, without benefit of formal instruction. They are capable of inventing languages that are more systematic than those they hear, showing resemblances to languages that they have never heard, and obey grammatical principles for which there is no evidence in their environments. . . . The ability to use a natural language belongs more to the study of human biology than human culture; it is a topic like echolocation in bats or stereopsis in monkeys, not like writing or the wheel. . . . We argue that language is no different from other complex abilities to such as echolocation or stereopsis, and the only way to explain the origin of such abilities is through the theory of natural selection.[2]

Pinker and Bloom's thesis is that our knowledge of syntax or grammar is not something we learn but is innate, something we are born with. Spiders don't learn to spin webs; they simply spin them. Bats don't learn to use echolocation; they simply use it to navigate. Babies don't learn grammar; they already possess it as they learn their native language.

Please take a moment to try your hand at schematizing Pinker and Bloom's argument before reading further.

The Argument Schematized

Pinker and Bloom are defending a scientific hypothesis about the origins of natural language and their conviction that its history lies in natural selection.

t_0. The only way to explain the origin of language is through the theory of natural selection.

They present a good deal of data in support of their theory. Here is how I would schematize their evidence:

e_1. All human societies have language.

e_2. They always have had language.

e_3. Language was not invented and did not spread.

e_4. Contemporary grammars are no more complex than those of hunter-gatherers.

e_5. Humans are proficient language users regardless of intelligence, social status, or level of education.

e_6. Children are fluent speakers of complex grammatical sentences by the age of three, without benefit of formal instruction.

e_7. Children are capable of inventing languages that are more systematic than those they hear, showing resemblances to languages that they have never heard and obeying grammatical principles for which there is no evidence in their environments.

t_0. The origin of language is explained through the theory of natural selection.

Rival Explanations (of Pinker and Bloom's Data)

A superficially similar theory was first introduced by Noam Chomsky in the late 1950s. He argued that natural selection produced larger brains and that the ability to master a natural language so easily was a happy by-product of this larger brain

size. He was quite emphatic that language was not "selected for" in our evolutionary history. Chomsky's view was expanded upon by the important evolutionary biologist Steven Gould:

Yes, the brain got bigger by natural selection. But as a result of this size, and the neural density and connectivity thus imparted, human brains could perform an immense range of functions quite unrelated to the original reasons for the increase in bulk. The brain did not get big so we could read or write or do arithmetic or chart the seasons—yet human culture, as we know it, depends upon skills of this kind. . . . The universals of language are so different from anything else in nature, and so quirky in their structure, that origin as a side consequence of the brain's enhanced capacity, rather than a simple advance in continuity from ancestral grunts and gestures, seems indicated. (This argument about language is by no means original with me, though I ally myself fully with it; this line of reasoning follows directly as the evolutionary reading for Noam Chomsky's theory of universal grammar.)[3]

> t_1. Natural selection produced larger, and more neurally dense, human brains. It was a "side consequence" that these brains gave us such remarkable language abilities.

My next rival explanation comes from my own teaching. Several years ago, I was teaching a philosophical psychology course, and as a part of it, I had my students read Pinker and Bloom's article and the one by Stephen Jay Gould from which I have taken the above quote. In a take-home essay exam, I asked my students to discuss the controversy and take sides on which argument was stronger. One of my students,

a philosophy minor who had taken several courses from me and knew all about inference to the best explanation offered a rival explanation of Pinker and Bloom's evidence, which she argued was better than either t_0 or t_1. I was so taken with the originality of her argument that I offered to coauthor with her and see if we could get her idea published. We were successful![4]

Joyclynn Potter is a committed theist. But she is also a good philosophy student. Her belief is a cornerstone of who she is and how she thinks. She is, however, intellectually curious and far from close-minded. She sympathetically read and understood Pinker and Bloom's argument and Gould's rival argument. She rejected both, not because they were both secular naturalist in spirit nor because they both endorsed evolution by natural selection, but because she felt that both had explanatory problems and that traditional theism offered a better account of what we know about language. Here's how I tried to express Joci's position.

What is the best explanation of these facts about human language? There is wide consensus that there is something innate and almost certainly biological, but a totally secular evolutionary account is maddeningly difficult to produce. Theists, however, can easily hypothesize that both a uniquely human ability to acquire and use a natural language as well as mental syntax that structures human thought in a quasi-linguistic manner (a language of thought) are the products of an infinitely wise and beneficent creator.[5]

> t_2. The uniquely human ability to acquire and use a natural language is a gift from God.

Ideal Agnostics

I want to share with you an idea that I am very taken with these days. It comes from a contemporary philosopher, as it turns out a very candid Christian philosopher, named Peter van Inwagen. He proposes an audience for arguments (at least those that occur in philosophical debates) that is psychologically impossible but is useful to imagine nonetheless.

> *The audience is composed of what we might call ideal agnostics. That is, they are agnostic as regards the subject-matter of the debate. . . . Each member of the of the audience will have no initial opinion about [the subject of the debate]. . . . My imaginary agnostics . . . would very much like to come to some reasoned opinion [on the debate] . . . indeed to achieve knowledge on that matter if it were possible. . . . They don't care which position . . . they end up accepting, but they very much want to end up accepting one or the other.*[6]

Ideal agnostics are absolutely indifferent—intellectually, personally, and in every way that might bias them—about what the best explanation is. But that doesn't mean they don't care. They are also passionately committed to figuring out which explanation is the strongest.

I'm no ideal agnostic and neither are you. But I think we are both well served in our discussions and investigations to pretend that we are. Indeed, I am suggesting that any time we evaluate another's potential evidence, we try as hard as possible to adopt the position of the ideal agnostic, knowing all along that we will fail in certain respects. When we are presenting our own argument, I would also suggest that we pretend our audience is not composed of partisans but rather ideal agnostics.

This whole little subsection might strike you as a tedious distraction. I am belaboring all this because we all carry with us biases that will inevitably affect some of our rank ordering of explanations. That is the position I find myself in with the current argument. I care very deeply about arguments in the philosophy of religion and cognitive science. I have great respect for all the scientists involved in the debate about language, and I also have great respect for Joyclynn Potter and the tradition she represents within natural theology. I have thought and written about these issues for my entire career. Certainly my lifelong skepticism about religion affected my evaluation of the evidence just as Joci's committed faith affected hers. In the end, we had to agree to disagree, but hopefully, we understood one another's arguments better, and we were ultimately in a position to share our joint thinking with a larger professional audience.

Rank Ordering the Explanations (for Pinker and Bloom's Argument)

While reading and grading Joci's exam and later while collaborating with her, I came to agree even more strongly with Pinker and Bloom. Here's how I rank order the three competing accounts of what we know about language.

t_0. The origin of language is explained through the theory of natural selection.
t_1. Natural selection produced larger, and more neurally dense, human brains. It was a "side consequence" that these brains gave us such remarkable language abilities.

> t_2. The uniquely human ability to acquire and use a natural language is a gift from God.

Chomsky and Gould would undoubtedly invert t_0 and t_1. Joyclynn was forced in the exam to commit herself on whether t_0 was better than t_1, and as I remember, she preferred t_0. But she dramatically disagreed with her teacher and ranked the three hypotheses as follows:

> t_2. The uniquely human ability to acquire and use a natural language is a gift from God.
>
> t_0. The origin of language is explained through the theory of natural selection.
>
> t_1. Natural selection produced larger, and more neurally dense, human brains. It was a "side consequence" that these brains gave us such remarkable language abilities.

Disagreements

What in the world do we do about passionate, but reasoned, disagreement? Stephen Jay Gould and Noam Chomsky were two of the most important scientists of the latter twentieth century. Steven Pinker and Paul Bloom are stars of the twenty-first century. Based just on their credentials, it's impossible to take sides. Joyclynn Potter is no natural scientist, but she's a very smart and thoughtful woman. What are we to make of the obvious fact that very intelligent and very honorable people disagree about where the evidence points?

Some might argue that all this shows a fatal flaw in the whole inference-to-the-best-explanation approach to evidence. How can

I continue to argue—as I already have and intend to even more vigorously in a later chapter—that we are skilled explainers when equally smart and committed people so disagree as to what the best explanation really is? The short answer is that this is simply the nature of evidence. Lots of times, it points in a clear direction, and we can expect something like intersubjective agreement. In these easy cases, which I believe constitute the vast majority of times when we consciously evaluate evidence, inference to the best explanation brings us close to the standard of knowledge we developed in chapter 3. The evidence for the hypothesis that smoking is a causal factor in lung cancer is so strong that we don't simply say that the evidence points in that direction; we rather say that we now know that smoking causes lung cancer.

We're probably not at that degree of certainty about what happened at the record hop nor do we yet possess the full story about the origin of natural language. Still, we possess lots of relevant evidence. Inference to the best explanation helps us reach our personal evaluation of the evidence and hopefully helps us understand the reasoning of those who see things differently. None of us—not our greatest scientists, Supreme Court justices, nor just the smart people we interact with regularly—possess the so-called God's-eye view, which would allow the simple "perception" of the truth. Since we don't, the best we can do is rely on evidence to help point us in the direction of the truth. And as the history of science or contemporary debates in jurisprudence and cognitive science tell us, we simply have to expect a certain amount of reasoned disagreement.

Don't Forget about the Final Assessment of the Evidence!

When I assess the evidence for Pinker and Bloom's hypothesis utilizing the inference-to-the-best-explanation recipe, my rank ordering in step 3 commits me to my final evaluation. For me, t_0 provides the best explanation of the evidence adduced in support of Pinker and Bloom's hypothesis. Therefore, *the evidence* they marshal *is very strong*.

Chomsky and Gould would come to a very different evaluation of the evidence. For them, t_0 fails to provide the best explanation of Pinker and Bloom's evidence; t_1 provides a better explanation. Therefore, *the evidence* presented in the article *is poor*.

Joyclynn Potter would agree with Chomsky and Gould but for a very different reason. She also believes that t_0 fails to provide the best explanation of Pinker and Bloom's evidence, but she is convinced that t_2 is the superior explanation. Therefore, she would also say that *the evidence* in their article *is poor*.

A Magical Encore?

Quite by accident, I discovered a glitch in the iPod software. On a Saturday night last year, my wife and I went to a banquet for the League of Oregon Cities. The entertainment was Pink Martini, a Portland band I like a lot. I had already planned that I was going to ask for two songs when they came back for an encore—"Lilly" and "Que Sera Sera." As it turned out, they did "Que Sera Sera" as part of their concert, and there was no chance to ask when they did their encore. On Sunday, as we drove back from Portland, I plugged in my iPod to listen to them again. I set the settings to "All" and to "Shuffle Songs." This meant that my iPod searched through both of their albums, found all thirty-six songs and played them in "random" order. That's the glitch! The last two songs were "Lilly" and "Que Sera Sera." The exact encore I had imagined the night before! What are the odds of this? My theory is that these two songs came up last, not randomly, but because of all the Pink Martini songs, I listen to these two the most often. I am thinking of writing to Apple to tell them about the problem.

This crazy philosopher has a theory that there is a glitch in the iPod software. For practice, and to make sure you've got the IBE recipe down pat, take a few minutes, and using all four steps in the inference-to-the-best-explanation recipe assess the quality of evidence he has for this theory.

EXERCISES

1. What is a rival explanation?
2. What are the four steps in the inference-to-the-best-explanation recipe? Why was I tempted to add a fifth step?
3. What is the advantage of imagining all argument analysis, or evidence evaluation, as a discussion between ideal agnostics?
4. At the end of chapter 4, I ask you to schematize Leslie's argument for her theory that Johnny had left her and taken up with Judy (p. 35). That was step 1 in the IBE recipe. Now use the other three steps to determine whether Leslie's evidence is strong, weak, or just so-so.

QUIZ FIVE

On July 20, 2013, an article appeared in the New York Times arguing that female family members can make males more generous. Here's a link to the article: https://www.nytimes.com/2013/07/21/opinion/sunday/why-men-need-women.html.

Use all the steps in the IBE recipe to assess the quality of evidence for the claim that "the mere presence of female family members—even infants—can be enough to nudge men in the generous direction."

Notes

1 G. Harman, "The Inference to the Best Explanation," *Philosophical Review* 74, no. 1 (1965): 89.

2 Steven Pinker and Paul Bloom, "Natural Language and Natural Selection," in *The Adapted Mind*, ed. Jerome H. Barkow, Leda Cosmides, and John Toby (New York: Oxford University Press, 1992), 451.

3 Stephen J. Gould, "Tires to Sandals," *Natural History*, April 1989, 8–15, quoted in Daniel C. Dennett, *Darwin's Dangerous Idea* (New York: Simon & Schuster, 1995), 390.

4 Jeffery L. Johnson and Joyclynn Potter, "The Argument from Language and the Existence of God," *Journal of Religion* 85, no. 1 (January 2005).

5 Johnson and Potter, 84.

6 Peter van Inwagen, *The Problem of Evil* (New York: Oxford University Press, 2006), 44.

New Data and Experimentation

We must trust to nothing but facts: these are presented to us by nature and cannot deceive. We ought, in every instance, to submit our reasoning to the test of experiment, and never to search for truth but by the natural road of experiment and observation.

—ANTOINE LAVOISIER[1]

The Crazy Philosopher's Evidence

As you will remember, Johnson thought he had discovered evidence that there was a glitch in his iPod software. His schematized argument was as follows:

e_1. Johnson went to a Pink Martini concert, planning to ask for a specific encore.

e_2. "Que Sera Sera" was played during the concert.

e_3. He never got a chance to ask for "Lilly."

e_4. On the ride home the next morning, he set his iPod to play all thirty-six of the Pink Martini songs.

e_5. He set the iPod to "Shuffle Songs."

e_6. He listened to all thirty-six songs.

e_7. The last two songs played were "Lilly" and "Que Sera Sera"—the imagined encore from the night before!

e_8. "Lilly" and "Que Sera Sera" are the two Pink Martini songs he listens to most often.

t_0. There is a glitch in the iPod software—rather than playing the songs in completely "random" order, it is weighing things according to how often songs are listened to.

There are thirty-six Pink Martini songs in Johnson's iPod. What are the odds of his imagined encore occurring on the drive home? Let's spend just a minute and figure that out. "Lilly" came up as the next to the last song played. The odds of this happening are straightforward. Any one of thirty-six songs could have come up here, so the odds are 1/36. But to have the encore, you had to also have "Que Sera Sera" come up last. So what are the odds of that happening? It's actually easy to figure out. We already know the odds of "Lilly," so it's a question of "Lilly" *and* "Que Sera Sera." Since "Lilly" has already been played, the odds of "Que Sera Sera" are 1/35, and the odds of "Lilly" *and* "Que Sera Sera" are 1/36 × 1/35, or 1/1,260. But of course, I would have also had my encore if the last two songs had been "Que Sera Sera" and then "Lilly." The odds of this happening figure out exactly the same—1/1,260. So the odds of my encore popping up—"Lilly" and "Que Sera Sera" *or* "Que Sera Sera" and "Lilly" are 1/1,260 + 1/1,260, or 1/630.

Certainly, one thing that would explain that 1/630 shot coming up on the ride home is that my imagined encore was composed of my two favorite (and most listened to) Pink Martini songs, and the program was illegitimately taking this into account in generating the "random" play order. But I hope it's obvious by now, it's easy enough to think of lots of rival explanations.

t_1. This was just a true, 1/630 coincidence.
t_2. This is not a software glitch; the iPod software is designed to do exactly this.
t_3. The iPod software is illegitimately weighing things, not by number of times played, but something else—length of the songs, where they occur in the album, and so on.

t_4. The philosopher set his iPod incorrectly.
t_5. The philosopher dozed in and out on the drive home and only thought that these two songs came up last.
t_6. The problem is in Johnson's iPod—the hardware, not the software.

My students have been worrying about what happened for the last several years on quizzes, ever since this really happened on a drive back from the Oregon League of Cities. They pretty generally rank the coincidence hypothesis as a much better explanation, though they are often surprised once they see the math that the odds are really 1/630. They also don't seem to have too much confidence in their professor, since explanations such as t_4 and t_5 are consistently ranked ahead of t_0. So according to the inference-to-the-best-explanation recipe, these students are committed to saying that Johnson's evidence for the glitch theory is pretty weak.

Why Don't You Just Test It?

I've told you this little anecdote for two very different reasons. One, of course, is I wanted a little exercise that would allow you to apply the inference-to-the-best-explanation test from chapter 5 to an argument. The other, though, is to tell you about a very common feature that my students have felt compelled to add to their discussions. There is almost a sense of frustration or least the need to lecture their professor. They suggest, indeed insist on, a very simple test of the glitch hypothesis.

Look, isn't there an obvious way to settle this matter? Turn off the iPod, reset everything, play

Pink Martini's songs again and see what happens. What is being proposed here is a classic little experiment—the kind of thing that some philosophers and scientists say is the defining condition of real science. I hope to convince you in the next couple of chapters that there is something brilliantly right about this claim but, at the same time, dangerously misleading.

A Pretty Picture of Science

Here is an idealization about the natural sciences. The scientist is really smart and is trained to go about her business in a very special, almost ritualized, way. She goes out and observes the world. Being smart and being trained to be a careful observer, she notices things. Sometimes she is puzzled by the things she observes and she asks questions, Why am I observing this? She starts looking for an *explanation*. Being smart and creative she thinks about this really hard and comes up with a possible answer—a *hypothesis* or a *theory*. This is all fine and good, but according to the pretty picture, it's only now that the rules of science kick in. It's not good enough to just have a theory; the theory must now be tested. The scientist must devise an experiment and let the results of the experiment determine the fate of her theory.

Bear with me for a bit of technical stuff in symbolic logic. Logicians talk about *conditionals*, "if . . . then" sentences. There are two *valid* inferences that follow directly from a true conditional.

1. *If* the figure is a plane right triangle, *then* the interior angles total 180°.
2. The figure is a plane right triangle.

3. The interior angles total 180°.

This inference is called *modes ponens*. A kind of mirror image inference is called *modes tollens*.

1. *If* the figure is a plane right triangle, *then* the interior angles total 180°.
2. The interior angles *do not* total 180°.

3. The figure is *not* a plane right triangle.

Finally, there is a tempting inference that is not valid but is rather a logical fallacy, *affirming the consequent*.

1. If the figure is a plane right triangle, then the interior angles total 180°.
2. The interior angles total 180°.

3. The figure is a plane right triangle.

You can easily spot the fallacy by noting that the figure might total 180° because it's a triangle, but, at the same time, not be a right triangle but rather, say, an equilateral triangle.

OK, so what does all this have to do with the pretty picture of science and maybe Johnson's iPod? Well, suppose the conditional sets up something we might expect to see in an experimental circumstance, given the theory we are testing is true.

1. If the theory is true, we will see . . . in the experiment.

By the inference of *modes tollens*, we will be able to *falsify* the theory by *disconfirming* it in an experiment.

1. If the theory is true, we will see . . . in the experiment.
2. We *do not* see . . . in the experiment.

---

3. The theory is *not* true.

Experiments, according to the pretty picture, provide tests that can show us that theories are false. They cannot, however, show us that theories are true. Remember, it is a fallacy to affirm the consequent.

1. ~~If the theory is true, we will see . . . in the experiment.~~
2. ~~We see . . . in the experiment.~~

---

3. ~~The theory is true.~~

A Better, But Untidy, Picture of Scientific Disconfirmation

Now, the theory about the iPod hardly counts as deeply scientific, but suppose we imagine an experiment nonetheless. The conditional that sets all this up looks something such as the following:

1. If there is a glitch in the software, so that when the iPod is set to play all the songs by an artist and is set to "shuffle" these songs, then rather than playing them in random order, it will play the most often listened to tracks last.

I could test my theory by reprogramming everything with the Pink Martini tracks, but since I've offered a general theory, let's test it with a different artist. I have lots of Lucinda Williams's albums, and I'm certain I listen to two of her songs, "Right in Time" and "Essence," the most. So if I set my iPod to play all her tracks and to shuffle them, I am predicting that the two songs will be played last.

Suppose I do all this with my iPod and listen to all her songs—more than a hundred, I'd say. We can imagine four different outcomes to the experiment. Focusing on the last two songs, we might observe any of the following.

e_n^a. The two songs come up as the last two played.
e_n^b. Neither song is in the last two.
e_n^c. Only "Right in Time" is in the last two.
e_n^d. Only "Essence" is in the last two.

Options e_n^c and e_n^d are interesting and deserve further study, but let's set them to the side and focus on the "pure" experimental outcomes. According to the pretty picture, e_n^b conclusively establishes that the glitch theory is false. But isn't that a little extreme? We've already honed our skills at rival explanations—surely we can imagine scenarios where the glitch hypothesis is (was) true but neither song played last.

t_1. Between the drive home and the experiment, iTunes downloaded a newer (debugged) version of the software.
t_2. The glitch only occurs in playlists shorter than fifty songs.
t_3. There is a countervailing glitch when any of the songs are classified as "country."

It's doubtful in the extreme that a negative experimental outcome can *falsify* a theory, though it certainly can provide strong evidence that there is something wrong with the theory.

The problem here goes back to the original conditional that set up the experiment in the first place. Remember the difference between a *sound* argument and a *valid* one? The if . . . then sentence that gets our inference going in the first place states an absolute connection between the glitch theory and the predicted outcome of the experiment. But the rival explanations we have just considered above seem to show that this connection is not so absolute after all. Almost always the conditional that sets up our experiment contains what Larry Wright calls a *weasel word*. A more modest, but also more accurate, statement of the predicted experimental outcome will look more like this:

> If the theory in question is true, then *all things being equal* we will see . . . in our experiment.

We predict that we will observe an as-yet-undiscovered planet at such-and-such location in the night sky, but certainly not if the observatory is socked in by clouds. We expect the solution to turn a certain color in our chemistry experiment but not if the test tube is contaminated.

When we include this suppressed, but understood, ceteris paribus clause,[2] our inference looks a little more problematic.

> 1. If there is a glitch in the software, so that when the iPod is set to play all the songs by an artist and is set to "shuffle" these songs, then, *all things being equal*, rather than playing them in random order, it will play the most often listened to tracks last.
> 2. "Essence" and "Right in Time" did not play last.

Two valid conclusions can be derived from these premises. One, of course, is that the glitch hypothesis is mistaken. But as a matter of pure logic, it is equally legitimate to infer that all things in our experimental circumstances were *not* equal.

Does any of this mean that the "scientific method" and the requirement that we experimentally test our theories is a waste of time? Nothing could be further from the truth. Let's go back to our original "evidence" for the glitch theory but add to it the new data from our experiment.

> e_1. Johnson went to a Pink Martini concert, planning to ask for a specific encore.
> e_2. "Que Sera Sera" was played during the concert.
> e_3. He never got a chance to ask for "Lilly."
> e_4. On the ride home the next morning, he set his iPod to play all thirty-six of the Pink Martini songs.
> e_5. He set the iPod to "Shuffle Songs."
> e_6. He listened to all thirty-six songs.
> e_7. The last two songs played were "Lilly" and "Que Sera Sera"—the imagined encore from the night before!
> e_8. "Lilly" and "Que Sera Sera" are the two Pink Martini songs he listens to most often.
> e_9. When Johnson tried the "shuffle all songs" routine for Lucinda Williams, his most listened to songs did not come up last.
>
> ----
>
> t_0. There is a glitch in the iPod software—rather than playing the songs in completely "random" order, it is weighing things according to how often songs are listened to.

We've already imagined some rivals to e_9, but I assume that you would all agree with me that t_0 has been seriously weakened by our experiment and that the random fluke hypothesis or the operator error rivals look even better.

The moral here is straightforward. When a theory suggests that we can expect to see something as yet undiscovered and we go out and look for this thing but don't find it, this is highly relevant *new data* that almost always hurts the status of the original explanation as being the best explanation of everything, including, of course, the experimental results.

A Better, But Untidy, Picture of Scientific Confirmation

None of what I have just told you is earthshaking nor is it unknown by careful scientists and philosophers. Still, the pretty picture, partly because it is so pretty, can allow us to lose sight of the subtleties of experimental design and protocol. Maybe even more problematic for the pretty picture is the evidential value of experimental confirmation.

Suppose I program my iPod to play all 116 Lucinda Williams tracks. I set the iPod to shuffle the songs and then sit back for a really long time and wait to see what the last two songs are. Sure enough, up pops "Essence" and "Right in Time" as the last two played. What do you think of my glitch hypothesis now?

According to the pretty picture, my theory has been put to the test and perhaps surprisingly, has survived the test. But it would be the fallacy of affirming the consequent to say that the experiment has confirmed my theory. We've already seen that if confirmation means

"logically derived" from the experimental setup and results, that's exactly right. But none of this means that the experiment hasn't produced very strong evidence that the songs are not playing in purely random order.[3]

What is the best explanation of e_1 through e_8 when we add the positive experimental result below?

> e_9. When Johnson tried the "shuffle all songs" routine for Lucinda Williams, his most listened to songs did indeed come up last.

All the rivals we thought of with Pink Martini are still possible, but hardly any seem plausible any longer. One of the most seriously misleading features of the pretty picture is that it sets up an asymmetry between experimental confirmation and disconfirmation. We've seen why as a matter of deductive logic this asymmetry exists. But no such asymmetry exists when we see experimental results as additional data that the tested theory and its rivals must explain.

The Significance of New Data

One of the remarkable things about the natural sciences is that we can devise experiments and go looking for highly relevant new data. But new data can cause us to rethink our evidence or feel even more confident about it in any of the arguments we've been thinking about, not just the scientific ones. If we find out that Dick's been in the hospital with pneumonia and that he loaned his car to his buddy, Sam, things are going to seem much more promising for Dick and Jane. And if we find a copy of Sarah's midterm on Charlie's laptop, the case for cheating is obviously strengthened.

Three very important things follow from all this. The first is that evidence evaluation is always relative to what we presently know. If we learn new things and assemble them in new arguments, there will be times when our original conclusion will be strengthened, times when it will be weakened, and times when it will be pretty much left untouched. The second is that new data are *always* possible. The fact that we could imagine rival explanations means that we can imagine new evidence for these rivals.

But this last fact leads to our third moral. Just because new data are possible, it does not mean that our assessment of the current evidence is unreliable. If all the rivals are farfetched, then the chances of finding new data that supports them are pretty slim. We do, of course, need a certain kind of intellectual modesty. We concede that things *could change* on the basis of new discoveries. But at the same time, for some kinds of evidence, we can be pretty confident that they *won't change*.

EXERCISES

1. According to the "pretty picture of science," why is it possible to disconfirm a scientific theory but never confirm one?
2. What kind of new data would strengthen Connie's evidence about what happened at the record hop? What kind of new data would weaken her theory?

QUIZ SIX

For the past few years, I have been forming an uncharitable hypothesis about one of my colleagues. He is Professor Hide-Smith-Jones, who teaches in the Department of Hermeneutic Metaphysics. I believe that he virtually gives away grades and demands almost no work from his students. His courses are wildly popular with students and have very high enrollments. What started my suspicions was a number of students who complained about the workload in my courses, who I later discovered were all hermeneutic metaphysics majors. A couple of my online students explicitly compared my course to Hide-Smith-Jones's courses, accusing me of being unfair and unreasonable. This past weekend, I went into the university's database and looked at the transcripts for all my advisees in the past five years. Many of them had taken at least one course with Hide-Smith-Jones. I discovered that on average, the grades they earned in his courses were .78 grade points higher than their total grade point averages.

1. Use the tools of inference to the best explanation to assess the quality evidence we have for Johnson's theory that Hide-Smith-Jones is an easy grader who doesn't demand much from his students.
2. Explain a test or experiment that could be conducted to test Johnson's hypothesis.
3. Using inference to the best explanation, show how new data could be discovered that would either help (confirm) or hurt (disconfirm) Johnson's theory.

Notes

1 Antoine Lavoisier, *Elements of Chemistry*, trans. Robert Kerr (Edinburgh, Scotland: Dover, 1790), xiii–xvii, http://www.iupui.edu/~histwhs/H374.dir/H374.webreader/Lavoisier.elements.html.

2 The online *Merriam-Webster Dictionary* defines *ceteris paribus* as "if all other relevant things, factors, or elements remain unaltered."

3 It is, of course, true that devices such as iPods do not truly generate anything randomly. But their random number generating algorithms simulate randomness for all practical purposes.

Semmelweis and Childbed Fever

A Case Study

As a simple illustration of some important aspects of scientific inquiry, let us consider Semmelweis' work on childbed fever. Ignaz Semmelweis, a physician of Hungarian birth, did this work during the years from 1844 to 1848 at the Vienna General Hospital. As a member of the medical staff of the First Maternity Division in the hospital, Semmelweis was distressed to find that a large proportion of the women who were delivered of their babies in that division contracted a serious and often fatal illness known as puerperal fever or childbed fever. In 1844, as many as 260 out of 3,157 mothers in the First Division, or 8.2 per cent, died of the disease; for 1845, the death rate was 6.8 per cent, and for 1846, it was 11.4 per cent. These figures were all the more alarming because in the adjacent Second Maternity Division of the same hospital, which accommodated almost as many women as the First, the death toll from childbed fever was much lower: 2.3, 2.0, and 2.7 per cent for the same years.

—CARL HEMPEL[1]

Childbed Fever

Just imagine what it must have been like to be young, poor, and pregnant in the early 1840s in Vienna and find yourself assigned to the First Division of the "lying in" ward at the Vienna General Hospital. Your chances of dying from a terrible disease known as childbed fever, or puerperal fever (*pere* in Latin for "child" and *parere* for "to bring forth"), was between 10 and 20 percent. The word on the street was that this was true, as in the halls of government that instituted a commission to study the problem, and of course the doctors were all too aware of the severity of the disaster.

Childbed fever was recognized and formally identified by Western medicine all the way back to ancient Greece. Although an obviously serious medical issue, it had only reached epidemic

proportions at the beginning of the nineteenth century. In order to appreciate the significance of Semmelweis's discovery of the cause and treatment of childbed fever, we need to imagine a time, surprisingly recent, in which the true nature of infection, the role of microorganisms, and the so-called germ theory of disease were completely unknown. Doctors had speculated about what was going on in these usually fatal cases, but in fact, they really had no clue about the disease's *etiology*. This fancy Latin term simply means "cause," or "causal history." In fact, there were two distinct sorts of causal ignorance about childbed fever. One had to do with the causal origins of the disease. The other was the causal progression of the disease within the victim's body. This helps us understand why the prevailing theories about the disease were so wildly misguided.

The two theories that focused on the second causal question both misunderstood—indeed, misidentified—the massive amounts of pus in the poor infected woman's body. One theory that went clear back to the Greeks misdiagnosed the putrid fluid as a corrupted form of *lachia*, the naturally occurring fluid that accompanies normal delivery. This led to much speculation about the effects of the latter stages of pregnancy. The other, which was favored by Semmelweis's teachers and supervisors, misidentified the pus as corrupted and misdirected milk. The reason for this physiological disaster was a complete mystery.

A very different causal account of childbed fever focused on its causal origins. Doctors were struck by the epidemic proportions of the disease and other epidemics they were familiar with, such as cholera and smallpox. They attributed all

this to a generic cause called miasma, or "atmospheric cosmic-telluric changes." But as to what all this really was, they were again completely ignorant. Nevertheless, at least three theories about puerperal fever were on the table for doctors to investigate.

> t_1. Lochial discharge theory
> t_2. Lactescent fluid theory
> t_3. Miasma

Ignác Fülöp Semmelweis

It is time to introduce the tragic hero to our story, Ignác Semmelweis. He was born of relatively humble origins in Hungary in the year 1818. At this time, Hungary was a relatively insignificant part of the Austro-Hungarian Empire, and its capital, Budapest, took a distinct backseat to the empire's capital of Vienna. Even within his Hungarian background, Semmelweis faced another source of prejudice—his family spoke a rather obscure regional dialect, and he carried a distinct accent for his entire life. All this is relevant to understanding Semmelweis's academic and professional life because like many victims of ethnic prejudice; he seems to have always seen himself as an outsider within the privileged class and suffered from something many of my students can identify with—a fear and loathing of formal academic writing.

Nevertheless, Ignác was a gifted student. He began college as a law student at the University of Vienna but was soon won over to the study of medicine. Splitting time between the University of Vienna and the Royal University of Pest, he completed his degree in 1844 and went looking for what we would now call an internship at the

Vienna General Hospital. He was unsuccessful in his applications to study under two gifted younger researchers in the pathology department and was forced to "settle" for an assistantship in the obstetrics department. At this time, obstetrics was a new and rather undistinguished specialty.

So at the age of twenty-eight, Ignác Semmelweis began as the second in charge of the Maternity Division of the Vienna General Hospital. Medical education was very different in those days, and this young, newly minted doctor assumed major responsibilities in clinical medicine, research, and hospital administration. We will pick up the sad conclusion to Semmelweis's biography directly, but we need to first turn our attention to the scientific problem he immediately encountered and his systematic discovery of the solution.

The Vienna General Hospital

For someone who is far from young, it pains me to admit how often the history of science reminds us that the truly significant scientific breakthroughs are made by younger researchers. There is nothing particularly surprising about this, of course, because younger thinkers are almost by definition less tied to the past, both in terms of prevailing knowledge and in terms of their own personal and professional standing.

The Vienna General Hospital was a classic mix of these generational divides. The Germanic system put great value on experience, loyalty, and political connection. The senior members of the faculty were described by one writer in 1876 in the following colorful language:

a generation that had been reared in an intellectual straight-jacket with dark spectacles before their eyes and cotton wool in their ears. The young people turned somersaults in the grass, and the old men, whose bodies had been hindered in their natural development by the lifelong burden of state supervision, felt their world about their ears, and believed that the end of things was at hand.[2]

On the other hand, the hospital possessed some of the finest young medical researchers in the entire world. Three of them deserve a brief introduction.

In 1844, Karl von Rokitansky, at the age of forty, became the director of pathological anatomy. He made huge contributions to medical knowledge and formalized the practice of conducting autopsies by trained experts of every fatality in the hospital. Semmelweis was a true disciple of Rokitansky's methodology and although not a member of the pathology department, was trained by him in the proper technique of conducting autopsies of the fatalities in the maternity division.

Joseph Skoda, who among other things invented the stethoscope, was also an advocate of pathological anatomy. His sole professional interest seems to have been in the diagnosis of disease, not its treatment. He felt that medicine, at least in his time, should concern itself with the prevention of disease, through an understanding of its causes, and not worry about the treatment, since it always seemed so ineffective anyway. From Skoda, Semmelweis learned the importance of careful pathological observation and a fixation on understanding both the causal origins of disease and its causal progression within the victim's body.

Ferdinand von Herba was really a contemporary of Semmelweis. He, just like his young friend and colleague, was very much a disciple of the new pathological and diagnostic techniques being taught by Rokitansky and Skoda. He took this background and used it to remarkable advantage by almost single-handedly beginning the specialty of dermatology. Herba's role in Semmelweis's story is twofold. He was friend and confidant to Ignác as he suffered through the childbed fever epidemic, and he was the first to finally share the discovery with the medical community, in both a professional presentation he gave and a short medical journal publication.

What Was Then Known

I want to share with you a rather lengthy excerpt from a marvelous book on Semmelweis, *The Doctors' Plague*, by the contemporary medical historian Sherwin B. Newland. You will notice that Dr. Newland summarizes Semmelweis's background knowledge of the magnitude and details of the childbed fever epidemic by introducing each short paragraph with the phrase "observation no." It is almost as though Newland is consciously schematizing the preliminary evidence in terms of our inference-to-the-best-explanation (IBE) recipe, and we can mentally substitute our convention of replacing the "observation no." with the appropriate e and subscript.

Observation no. 1: The same number of deliveries took place in the hospital's two obstetrical divisions, usually between 3,000 and 3,500. The only difference between them was that deliveries in the First Division

were carried out by doctors and medical students and those in the Second Division by midwives and students of midwifery. In the First Division, an average of 600 to 800 mothers died each year from puerperal fever; in the Second Division, the figure was usually about 60 deaths, one-tenth as many.

Observation no. 2: Although childbed fever raged violently in the First Division, there was no such epidemic outside the hospital walls, in the city of Vienna. The mortality of home delivery, whether by midwives or private doctors, was low. Even when they gave birth in alleyways and streets, the so-called Gassengeburten, *mothers who self-delivered rarely died.*

Observation no. 3: Despite a general impression to the contrary, the decades of carefully kept statistics at the Allgemeine Krandenhaus showed that neither the incidence nor the mortality of puerperal fever was related to the weather, as epidemics often were.

Observation no. 4: Greater trauma during delivery appeared to increase the likelihood that a mother would develop puerperal fever. This was true of no other epidemic disease.

Observation no. 5: Closing the ward for a period of time would always stop the mortality. When mothers were delivered elsewhere during that time, they did not get sick.

Observation no, 6: The infant delivered of a woman who subsequently died of puerperal fever would not infrequently die of a fever similar to its mother's. In such cases, the findings on autopsy were similar to those identified in the mother.[3]

Differences in the Divisions

Consider the confusion in the two kinds of disease etiology we have discussed. Semmelweis's superiors endorsed simultaneously the

milk and miasma accounts of childbed fever. Miasma, or "epidemic influences," has a tough time explaining observations two, three, and four (e_2, e_3, and e_4). It seemed obvious that the causal origin of the epidemic must lie in some way with differences between the two maternity divisions.

Most philosophers of my generation know of Semmelweis's story because of a very influential little textbook: *Philosophy of Natural Science* by Carl Hempel, one of the most sophisticated proponents of the "pretty picture of science." He interprets Semmelweis's careful procedure as one of conducting a series of miniexperiments to rule out possible causal differences between the two divisions. As long as we remember that experiments are simply a systematic way of gathering relevant new data and then reassessing the explanatory virtues of the competing hypotheses, this is a very useful way of interpreting Semmelweis's method.

One of the minor differences between the divisions was the position of the woman at birth: "A new idea was suggested to Semmelweis by the observation that in the First Division the women were delivered lying on their backs; in the Second Division, they delivered on their sides. Though he thought it unlikely, he decided, 'like a drowning man clutching at a straw,' to test whether this difference in procedure was significant. He introduced the use of the lateral position in the First Division, but again, the mortality remained unaffected."[4] We are offered a new rival explanation:

> t_4. Delivery in the supine position causes childbed fever.

The new data from Semmelweis's miniexperiment, however, drops this hypothesis way down on the rank ordering.

> e_7. Changing to the lateral position for delivery in the First Division made no difference in the mortality rates.

Another interesting difference had to do with the administering of the Catholic last rights, of all things.

Various psychological explanations were attempted. One of them noted that the First Division was so arranged that a priest bearing the last sacrament to a dying woman had to pass through five wards before reaching the sickroom beyond: the appearance of the priest, preceded by an attendant ringing a bell, was held to have a terrifying and debilitating effect upon the patients in the wards and thus to make them more likely victims of childbed fever. In the Second Division, this adverse factor was absent, since the priest had direct access to the sickroom. Semmelweis decided to test this conjecture. He persuaded the priest to come by a roundabout route and without ringing of the bell, in order to reach the sick chamber silently and unobserved. But the mortality in the First Division did not decrease.[5]

Again, we have a new rival explanation:

> t_5. The "terrifying and debilitating" effect of the deathbed priest's appearance was causing childbed fever.

But the experimental new data makes that a very poor explanation.

> e8. Changing the approach so that the priest could enter the sick room unobserved made no difference in the mortality rate.

"Fortuitous" New Data

Not all scientific data are the product of experimental procedures; sometimes, it's simply good luck. Semmelweis was out of the country at the time of a terrible tragedy at the Vienna General Hospital. Another of Rokitansky and Skoda's disciples, Jakob Kolletschka, had been accidentally cut by a medical student's scalpel as they were conducting an autopsy. He developed a massive infection and died a few days later. When Semmelweis returned soon after Kolletschka's death, he studied the pathology report and formed an exciting new hypothesis:

> Totally shattered, I brooded over the case with intense emotion until suddenly a thought crossed my mind; at once it became clear to me that childbed fever, the fatal sickness of the newborn and the disease of Professor Kolletschka were one and the same, because they all consist pathologically of the same anatomic changes. If, therefore, in the case of Professor Kolletschka a general sepsis [contamination of the blood] arose from the inoculation of cadaver particles, then puerperal fever must originate from the same source. Now it was only necessary to decide from where and by what means the putrid cadaver particles were introduced to the delivery cases. The fact of the matter is the transmitting source of those cadaver particles was to be found in the hands of the students and attending physicians.[6]

That one little "ah-ha" moment laid several new bits of data on the table. One was an overlooked difference between the two wards.

> e9. Medical students and their teachers in the First Division regularly conducted autopsies. The midwifery students and their teachers did not.

Another had to do with regular medical practice at the time.

> e10. Doctors and students would routinely transition from autopsies to gynecological examinations and procedures, including childbirth, with only the most cursory rinsing of their hands.

Added to this, of course, was the information garnered from Kolletschka's death.

> e11. Details regarding the accident, subsequent progression of the disease, and ultimate death of Kolletschka

All this led to a completely new and original theory about the cause of childbed fever.

> t0. Childbed fever is caused by the introduction to the blood of cadaver particles.

An Experiment and a Treatment

Semmelweis was, above all, a good and compassionate doctor. His first responsibility was to the patients entrusted to his care. It's not surprising, therefore, that his instincts upon forming his new hypothesis were all directed at putting this information immediately to work in the interests of his patients. The reasoning was straightforward. If childbed fever was being spread by the introduction of cadaver particles from the

hands of the doctors and students, something had to be done to stop this from happening in the future. Although nothing was known of the true nature of infectious disease, Semmelweis and his colleagues knew that

chloride solutions had long been used to rid objects of the noxious odor of putrid materials. Semmelweis reasoned that a chloride solution would be the ideal substance to destroy the foul-smelling cadaver particles. In the middle of May 1847, he ordered that a bowl of chlorine liquida*, a dilute concentration of the disinfectant, be placed at the entrance to the First Division, and he insisted that every entering medical attendant wash in it before touching a woman in labor. Small, stiff brushes were kept nearby, to be used for cleaning under fingernails.*[7]

Although medical research was not his primary goal at this juncture, it is quite natural to interpret Semmelweis's actions as an interesting experiment designed to test his new hypothesis. One can imagine a bizarre and evil experiment that could have been used to test the cadaver particles theory. He might have randomly chosen twenty pregnant women and separated them into two groups. To ten, he might have intentionally introduced cadaver particles into their bloodstreams; to the other ten, the "control," he would have scrupulously allowed no entry of cadaver particles. He would have then waited to see if the ten he predicted would contract childbed fever did, while the other ten did not. Thankfully, this was not his experimental procedure. He might, a little more sanely, have also conducted a similar experiment with laboratory animals, but again, his focus was on saving lives.

His order of chlorinated lime, though, produced some stunning new data:

e_{12}. Semmelweis ordered the chlorinated lime procedure in May of 1847.

e_{13}. By 1848, the death rate in the First Division from childbed fever had fallen to 1.2 percent, just a tick less than the Second Division, at 1.3 percent.

Semmelweis's Evidence

Let us pause for a moment and use inference to the best explanation to assess the quality of Semmelweis's evidence. There is a great deal of evidence to schematize.

e_1
:
e_{13}
———
t_0

There are also a number of rival explanations that had been discussed and partially tested.

t_1
:
t_5

When we now add t_0 to this list and rank order all them in terms of the best explanation, we would all agree, I trust, that t_0 is by far the best explanation and that Semmelweis's evidence was quite overwhelming.

I can imagine some of you seeing things differently. You are sophisticated about the true nature of infectious diseases such as childbed

fever and know that their cause is certain kinds of bacteria. You might argue, therefore, that a better explanation would be as follows:

> t_6. Childbed fever is caused by the introduction to the blood of a certain strain of bacteria.

Indeed, we would nowadays say that all the evidence, including a lot that was yet to come, strongly supports exactly such a theory. We would probably even say that we "know for certain" that childbed fever is caused by a bacterial infection. But all this is how the evidence stands at the beginning of the twenty-first century. Bacteria were completely unknown in Semmelweis's day, and what he called "cadaver particles" was a pretty accurate placeholder for their existence and causal role in childbed fever.

The Tragedy of Semmelweis

The story of Ignác Semmelweis should have ended in glory. He single-handedly solved a terrible medical mystery and saved countless lives. But glory was not to be his fate. He became so obsessed, first with solving the problem of childbed fever and then with insisting that colleagues immediately adopt his new methods, that he became a little hard to live with. He actually accused skeptical colleagues of murder for not disinfecting their hands. To make matters worse, his direct superior was part of the entrenched older generation and never accepted the theory or the empirical methodology that led to its discovery. In 1848, when his assistantship was up, he was denied reappointment to his position at the Vienna General

Hospital. He took all this very badly, and despite the support of Rokitansky, Skoda, and Herba, he abruptly departed Vienna and returned to Budapest.

He still might have garnered the fame and prestige he so richly deserved had he only published his results shortly after the discovery. As we discussed earlier, he was never comfortable with his speaking abilities and even less so with his writing. He simply did not alert the European medical community to what he had discovered. His friend, Herba, did make a couple of short reports that were eventually published, but all this was distinctly secondhand. When he finally did write a book about childbed fever, it was much later and consisted as much in character assassination of those colleagues who disagreed with his theory as it did of the clinical and experimental findings.

Semmelweis, like all of us, was a prisoner of his times, his personality, and his training and interests. He was pretty much ignorant of good experimental technique. Although he and a medical student did conduct one inconclusive set of experiments with rabbits, he did not pursue the systematic animal experimentation that would have strongly supported his theory. And although microscopes had been invented and were being used by medical researchers, it apparently never occurred to him to look and see if he could observe those cadaver particles firsthand. One can only imagine the course of medical history had he done so.

Semmelweis went to an early grave an embittered and disappointed man. He continued to practice in Hungary but never attained the recognition he craved. In early middle age, he began to behave erratically and was ultimately

institutionalized. He died shortly thereafter. There is a common ironic story about his end. Some have suggested that just like his friend Kolletschka, Semmelweis became infected with childbed fever and that the behavioral changes and death were a result of the infection. Professor Nuland, whose two books on Semmelweis I have used so freely, argues persuasively that Semmelweis, in fact, developed Alzheimer's disease and died from beatings in the mental hospital.

EXERCISES

1. Use all the steps in the IBE recipe to show how the new data concerning the deathbed priest gives us good evidence that the cause of childbed fever was not psychosomatic.
2. Why did I argue that Semmelweis's evidence was not undercut by the rival explanation that childbed fever is caused by bacterial infection? Do you agree with me?

QUIZ SEVEN

The turning point for Semmelweis and his quest to discover the cause of childbed fever was clearly the death of his colleague, Jakob Kolletschka. Show how this event constituted significant new data that led to a new hypothesis about the disease. Now show how his "order" to the hospital staff about thoroughly "disinfecting" their hands can be seen as a classic little experiment. Given the results of this experiment, use inference to the best explanation to assess the quality of evidence Semmelweis now had as to the (partial) cause of childbed fever.

Notes

1 Carl Hempel, *Philosophy of Natural Science* (Englewood Cliffs, NJ: Prentice-Hall, 1966), 3.
2 Theodor Billroth, *The Medical Sciences in German Universities* (1876), quoted in Sherwood B. Nuland, *The Doctor's Plague* (New York: Atlas Books, 2003), 77–78.
3 Nuland, 97–98.
4 Hempel, *Philosophy of Natural Science*, 5.
5 Hempel, 4–5.
6 Quoted in Nuland, *The Doctor's Plague*, 99–100.
7 Nuland, 101.

Darwin and Common Descent

When on board H.M.S "Beagle," as naturalist, I was much struck with certain facts in the distribution of the organic beings inhabiting South America, and in the geological relations of the present to past inhabitants of that continent. These facts, as will be seen in the latter chapters of this volume, seemed to throw some light on the origin of species—that mystery of mysteries, as it has been called by one of our greatest philosophers.
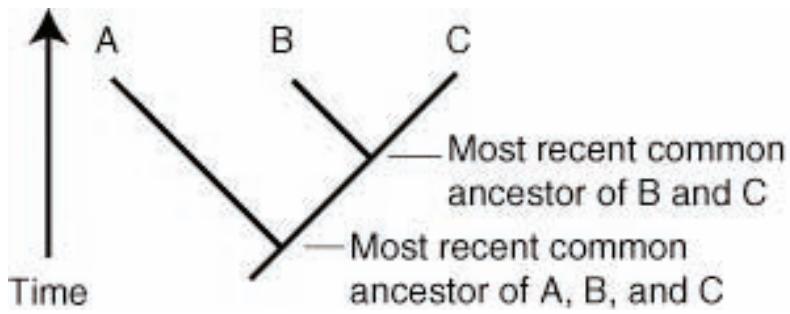
—CHARLES DARWIN[1]

Making Sense of What Is Already Known

The story of Semmelweis is one of a scientist confronting a mystery and systematically going out and gathering new data that helped him solve the mystery. The story of Darwin is very different. *On the Origin of Species*, Darwin's four-hundred-plus-page "abstract," is one of the best-argued works in the history of science. He makes a powerful case for, what we shall see, are two monumental theories. Although he was an excellent field biologist and geologist, and although his experiences on the Beagle were clearly formative, the evidence he presented in

On the Origin of Species was not original; nor did it contain cutting-edge discoveries. Darwin's genius was seeing, I would say, explaining, known facts in original and insightful ways.

The history of science is full of examples where the revolutionary breakthrough comes, not in the laboratory, but in the theorist's study. This is hardly surprising, since when you are trying to make sense of the myriad of facts and results that compose any of the natural sciences, the level of generality and abstraction required for the grand overarching theories will seldom, if ever, come from one nicely designed

experiment. Darwin was able to articulate general principles that have unified biology for more than a century and a half. And most remarkably, fit perfectly with biological discoveries that Darwin himself could never have imagined.

The Two Theories

The "theory of evolution," what Darwin called a "theory of descent with modification by natural selection," is really three distinct theories, two of which owe a great deal to Darwin. We can translate the term *evolution* as simply meaning "biological change." The biological world we see today, including the species now in existence, is different from the biological world at different historical periods. Many theorists before Darwin, including his own grandfather, Erasmus Darwin, had proposed theories of biological change. The problem was that, although (as we shall see directly) these theories nicely explained many known facts, no one before Darwin had any good ideas as to the causes of this change.

Descent with modification, or equivalently, *common descent*, is Darwin's theory about the patterns in, and the history of, this biological change. Darwin cannot really be given credit for originating the theory of descent with modification, but one of the great achievements of *On the Origin of Species* is that he laid out the evidence for this theory so powerfully that within less than a generation almost every biologist accepted the truth of this view of biological history.

The above very simple graphic gives us the heart of descent with modification. The vertical axis represents time, and the horizontal axis represents the present or past picture of biological diversity. So in this little snippet, we learn about the history of three related species, A, B, and C. That they are related is indicated by the common ancestor at the bottom (i.e., earlier in history). We also learn that species B and C are more recent evolutionary arrivals than species A, since the common ancestor that begins their history is higher (later). Descent with modification says that current species are related to one another through a series of ever-narrowing common ancestors (thus common descent). The logical extension of this line of reasoning is, as Darwin saw, that all life can be traced back to a single common ancestor.

I cannot doubt that the theory of descent with modification embraces all the members of the same great class or kingdom. I believe that animals are descended from at most only four or five progenitors, and plants from an equal or lesser number.

Analogy would lead me one step further, namely, in the belief that all animals and plants are descended from some one prototype.[2]

Darwin worried that "analogy may be a deceitful guide," but contemporary facts about the molecular structure of DNA make his speculation look even stronger.

If the history of life is as descent with modification outlines, the obvious question is what brings about all this change? If new species arise from ancestors, what is the *origin of species*? Darwin's stroke of genius was an original answer to this question. Breeders "select" in order to improve the stock. Nature, by analogy, also selects, but not consciously, nor with a purpose. *Natural selection* is the engine that drives biological history. More individuals in every generation are born than will survive, so there is a "struggle for existence." Some individuals are lucky enough to be born with slight advantages in this struggle, and these advantages improve their chances of surviving and passing along these advantages to their offspring. So over time, there is inevitable change within the species, and given enough time, these changes accumulate to result in the start of a new species.

Rival Explanations to Common Descent

In the rest of this chapter, we will spend most of our time focusing on the least scientifically controversial of Darwin's two theories but the one that is clearly the most controversial in the popular culture—descent with modification. I want to try to convince you that evidence Darwin presented for this view of biological history is quite overwhelming. More recent additional evidence has only further strengthened his original argument.

We should candidly address the sources of this cultural controversy. The primary source, of course, is that Darwin is widely believed to be antireligious. The theory of descent is seen by many as not only denying the literal truth of the Old Testament but flat-out denying the existence of God. This latter interpretation is surprising in light of the fact that many contemporary scientists see themselves as conventional religious believers yet accept the scientific truth of common descent and natural selection. My students are constantly surprised to hear that Darwin nowhere denies the existence of God, nor does *On the Origin of Species* say anything about either the creation of the universe or the origins of life. Many sincere theists have seen complete consistency between what traditional religion teaches us and what our best natural sciences, including biology, teach.

The second source of controversy regards the place of our own species in Darwin's picture. Although he tried to soft-pedal it in *Origin*, it was perfectly obvious to his contemporaries, both opponents and supporters, that humans were just as much a part of descent with modification and natural selection as every other part of the biological world. This is troubling to many, I realize. I personally think it explains a lot of what I know about myself, my friends, and the social world I live in.

Before *On the Origin of Species*, the most widely accepted rival account of biological history assumed that species were permanent, unchanging, and the individual products of divine creation. This view was not just a religious one but a scientific one as well. The theory

of *special creation* should be interpreted in our context as a rival explanation for the facts that Darwin offered in support of descent with modification. It will be helpful to distinguish two versions of special creation. One accepted the book of Genesis as literal history—all the earth's species, as well as everything else, were individually created by God over the course of six, twenty-four-hour days.

> t₁. Fundamentalist special creation

A second version of special creation that enjoyed more support among Darwin's contemporaries in the scientific community might be termed *relaxed* special creation. It conceded some of the data about biological change and allowed that divine creation of individual species took place at different times in the history of the earth and life.

> t₂. Relaxed special creation

The Expanded Age of the Earth

The first part of Darwin's case for descent with modification consisted of a review of, indeed a powerful subargument for, the relatively new estimates of the age of the earth.

> e₁. The earth is much older than had been previously believed—thousands of millions of years.

This was essential to his theory, for a great deal of time was required for the sort of biological change he was postulating. It's doubtful that any theory such as common descent could have come before the discovery of "geologic time."

We should pause here to notice something general about inference to the best explanation. You will remember that in chapter 4 we treated the premises in an argument as data and the theory being defended as an explanation of the data. That is actually a bit of an oversimplification. Oftentimes, important facts will be included in the premises that are not explained by the conclusion but are relevant to that conclusion being an adequate explanation of those data that are being accounted for. Charlie's being a poor writer was not explained by his being a cheater but was still relevant for this explaining the identical exams. Descent with modification does not explain a much more ancient earth than previous generations had believed, but it is required for descent with modification to work.

The Fossil Record

Darwin spends a great deal of time discussing fossils, and well he might. Whatever else it tells us, it virtually screams out change.

> *Let us now see whether the several facts and rules relating to the geological succession of organic beings, better accord with the common view of the immutability of species, or with that of their slow and gradual modification, through descent and natural selection.*[3]

We see species that once thrived and are now extinct. We see progressions such as the changes in the American horse. His emphasis on fossils shows us that he saw this as a particularly strong bit of evidence.

> e₂. The fossil record

The fossil record, particularly in Darwin's time, was a bit of a two-edged sword. Critics complained that if descent with modification was true, there should be a fossil record of these "transitional forms." Darwin wisely conceded the force of this objection but also offered a very sophisticated explanation of how difficult it is for fossils to form and why gaps in the record were inevitable.

The *Scala Naturae*, or the Natural System

A widely held view in the century before Darwin postulated a very different kind of order to the biological world. According to the *scala naturae* (scale of nature), life was static but hierarchical. There was an observable and classifiable *progression* from the simplest and most primitive forms of life to the most complex and advanced. This view had been pretty thoroughly rejected by the time Darwin began his work. But a remnant of it remained at the heart of biology. It was now understood that though the structure wasn't hierarchical, there was a structured order to life nonetheless.

> From the first dawn of life, all organic beings are found to resemble each other in descending degrees, so that they can be classed in groups under groups. This classification is not arbitrary like the grouping of stars in constellations.[4]

Any intelligent four-year-old can go to the zoo and recognize that the different feline species in the cages are all cats, just like Boots at home. Feline species around the world are "related" to each other, and they are more "closely related" to each other than they are to canine species living in the same environment with them. Nature

seems to sort itself out into one giant *natural system*.

The obvious question is why do we observe the following?

> e_3. The natural system

Darwin's answer was unequivocal:

> The real affinities of all organic beings are due to inheritance of community of descent. The natural system is a genealogical arrangement, in which we have to discover the lines of descent by the most permanent characters, however slight their vital importance may be.[5]

Patterns of Geographical Distribution

Darwin was fascinated by the connection between life and where that life was found on this earth. Before Darwin, the only viable explanation of this connection was that God chose to put it there. Darwin is the founder of modern, causal biogeography.[6] And biogeographical facts are, perhaps, the most widely used evidence in *On the Origin of Species*.

> e_4. Patterns of geographical distribution

Let's start with a macro question. If an omniscient and all-loving God deliberately created each species to fit perfectly with its environment, why do we see such diversity in virtually identical climates between the Old and New Worlds?

> If we travel over the vast American continent, from the central parts of the United States to its extreme southern point . . . There is hardly a climate or condition in the Old World which cannot be paralleled in

the New—at least as closely as same species generally require. . . . Not withstanding this general parallelism in conditions of the Old and New Worlds, how widely different are their living productions![7]

From continents separated by whole oceans to islands separated by just a few miles of ocean, the microquestions of biogeographical distribution are just as puzzling on the theory of special creation.

The same law which has determined the relationship between the inhabitants of islands and the nearest mainland, is sometimes displayed on a small scale, but in a most interesting manner, within the limits of the same archipelago. Thus each separate island of the Galapagos Archipelago is tenanted, and the fact is a marvelous one, by many distinct species; but these species are related to each other in a much closer manner than to inhabitants of the American continent, or any other quarter of the world.[8]

Descent with modification, of course, beautifully answers both questions. The flora and fauna in the Old and New Worlds are generally different because they spring from very different lines of descent. Species in the Galapagos (think of his famous finches) all descend from a common ancestor on the South American mainland but have different histories of descent on the individual islands.

Morphological Facts

Morphology is the science of shape and form, hence the computer notion of an image "morphing." Consider the following four tetrapods. Why the common four-"leg" structure? The frog hops, the lion runs, this particular dinosaur swam, and the bird flies. If you were engineering a hopping machine, a running machine, a swimming machine, and a flying machine, would you automatically use the same overall design?

Darwin saw morphology as fundamental to his defense of descent with modification.

We have seen that the members of the same class, independently of their habits of life, resemble each other in the general plan of their organization. This resemblance is often expressed by the term "unity of type" . . . The whole subject is included under the general name of Morphology. This is the most interesting department of natural history, and may be said to be its very soul.[9]

FIGURE 3. Frog, lion, dinosaur, and hawk

Retrieved from https://www.flickr.com/x/t/0094009/photos/aspidoscelis/31098104412/, https://www.flickr.com/x/t/0097009/photos/mathiasappel/26260010225/, https://www.flickr.com/x/t/0093009/photos/internetarchivebookimages/14777663574/, and https://www.flickr.com/x/t/0098009/photos/priyanthadealwis/29599225312/ (respectively).

Immediately following this quote, Darwin articulates as a question the data regarding the forelimbs in mammals that is perhaps, for my students at least, the most convincing bit of evidence for common descent.

> *What can be more curious than that the hand of a man, formed for grasping, that of a mole for digging, the leg of a horse, the paddle of the porpoise, and the wing of a bat, should all be constructed on the same pattern, and should include the same bones in the same relative positions?[10]*

Pretty darn curious, wouldn't you agree?

> e₅. Morphological commonalities

Embryological Facts

As Darwin remarks several times in his discussion of embryos, just as the remarkable similarity in the bones in the forelimbs of mammals require an explanation, curious features of embryos also must be accounted for.

> *How, then, can we explain these several facts in embryology,—namely the very general, but not universal difference in structure between the embryo and the adult;—of parts of the same individual embryo, which ultimately become very unlike and serve for diverse purposes, being at this early period of growth alike;—of embryos of different species within the same class, generally, but not universally, resembling each other;—of the structure of the embryo not being closely related to its conditions of existence, except when the embryo becomes at any period of life active and has to provide for itself;—of the embryo apparently having sometimes a higher organization than*

> *the mature animal, into which it is developed. I believe all these facts, as follows, on the view of descent with modification.[11]*

Give me a common ancestor, Darwin seems to say, and I can explain the circuitous route, with many detours, from egg to adult in animal development—why young baleen whales develop teeth, why land-living vertebrates (including ourselves) go through a gill-arch stage, and why higher vertebrates have a notochord.

> *There is no obvious reason why, for instance, the wing of a bat, or the fin of a porpoise, should not have been sketched out with all the parts in proper proportions, as soon as any structure became visible in the embryo.[12]*

> e₆. Embryological oddities

I must tell you here that were you to Google "Darwin, embryology," you would find that some of the sites are highly critical of Darwin and argue that his appeals to embryology have been discredited in modern biology. This isn't really true, but we can make sense of these, I believe sincere, criticisms. Part of the problem Darwin faced in his section on embryology was that centuries of thought had tied embryonic development to the static *scala naturae* that we discussed earlier. These scientists believed that each stage in embryonic development represented an earlier, nonchanging stage in the hierarchy of life. Darwin, of course, completely rejected this view, but it remained part of the common (mis)understanding within embryology.

Even more problematic, though, was that many scientists sympathetic to biological change

believed that there was a very strong correlation between the different stages of the history of life—its phylogenetic structure and the different stages of an individual's embryonic development. Thus one of Darwin's contemporaries, Ernst Haeckel, claimed

> *ontogeny is a concise and compressed recapitulation of phylogeny, conditioned by the laws of heredity and adaptation.*[13]

We now know that the recapitulation theory is mistaken and that embryonic development is much more complicated than either Darwin or Haeckel could have ever imagined. Darwin conceived of descent with modification as applying to individuals exemplifying a species—that species' *phenotype* (its appearance and behavior). Modern biology, though, also includes the descent with modification of its *genotype* (the genetic instructions for building the phenotype) and if that were not complicated enough, it also must include the descent with modification of the underlying biochemical processes that take the information in the genotype and physically develops the individual. We are really only just getting a handle on all this in the twenty-first century.[14]

Darwin's Evidence for Descent with Modification

The evidence can now be schematized.

e_1. The earth is much older than had been previously believed—thousands of millions of years.
e_2. The fossil record
e_3. The natural system

e_4. Patterns of geographical distribution
e_5. Morphological commonalities
e_6. Embryological oddities

t_0. Descent with modification

The central question in inference to the best explanation is always the same—is t_0 the *best* explanation? We've already discussed the two serious rival explanations in Darwin's time.

t_1. Fundamentalist special creation
t_2. Relaxed special creation

Within ten years or so of the publication of *On the Origin of Species*, say 1870, up to this first decade of the twenty-first century, there has been clear, overwhelming consensus in the broad scientific community that descent with modification—evolution—does such a manifestly better job of explaining all this uncontroversial data and that the evidence is so strong that we can talk of common descent as a scientific *fact*. You, of course, must rank order the explanations for yourself. Some of you will insist on a different ranking, and I maintain that is your moral and intellectual right. My job as a philosopher and a teacher is accomplished if you can simply see why Darwin, his contemporaries, and his scientific descendants all thought the evidence was so powerful. I do want to remind you, however, that many traditional theists have seen complete consistency between mainstream religious doctrine and evolution. Consider the words of Richard Swinburne, for many years the Nolloth Professor of the Philosophy of the Christian Religion at the University of Oxford, at the beginning of his book *The Evolution of the Soul*:

Men evolved from apes, and apes from more primitive animals, and the primitive animals evolved from the soup of inanimate atoms which consolidated to form the Earth some four thousand million years ago. Although there is much uncertainty about the exact stages and mechanisms involved, the fact of evolution is evident.[15]

Natural Selection

Why do we see such change in biological history? Why does this change so often seem exactly what is required for changing circumstances? What is the engine that drives descent with modification?

In considering the Origin of Species, it is quite conceivable that a naturalist, reflecting on the mutual affinities of organic beings, on their embryological relations, their geographical distribution, geological succession, and other such facts, might come to the conclusion that each species had not been independently created, but had descended, like varieties from other species. Nevertheless, such a conclusion, even if well founded, would be unsatisfactory, until it could be shown how the innumerable species inhabiting this world have been modified, so as to acquire that perfection of structure and coadaptation which most justly excites our admiration.[16]

One of my teachers called natural selection an algorithm, and Ernst Mayr, who I will be borrowing heavily from in this section, calls the theory "very logical."[17] All this could be taken to mean that natural selection is *automatic* or that the inference is deductive. The argument, though, is explanatory, just like the argument for common descent. I will follow Mayr, indeed I will use his wording, and treat Darwin's reasoning as "three inferences based on five facts."[18]

Three of these facts provide evidence for what he called the "struggle for existence."

A struggle for existence inevitable follows from the high rate at which all organic beings tend to increase. Every being which during its natural lifetime produces several eggs or seeds, must suffer destruction during some period of its life, and during some season or occasional year, otherwise, on the principle of geometrical increase, its numbers would quickly become so inordinately great that no country could support the product. Hence, as more individuals are produced than can possibly survive, there must be in every case a struggle for existence, either one individual with another of the same species, or with distinct species, or with the physical conditions of life.[19]

e_7. All species have such great potential fertility that their population size would increase exponentially . . . if all that are born would again reproduce successfully.[20]

e_8. Except for minor annual fluctuations and occasional major fluctuations, populations normally display stability.[21]

e_9. Natural resources are limited. In a stable environment, they remain relatively constant.[22]

t^1_0. There is a fierce struggle for existence among individuals of a population, resulting in the survival of only a part, often a very small part, of the progeny of each generation.[23]

The game of life is unfair—not all compete in this struggle for existence equally. Darwin, who was a pigeon breeder and recognized its relevance to his argument, saw that some individuals

in any species would have slight advantages (and others would have slight disadvantages) in surviving long enough to reproduce. Nature, itself, would be selecting.

> *Owing to this struggle for life, any variation, however slight and from whatever cause proceeding, if it be in any degree profitable to an individual of any species, in its infinitely complex relations to other organic beings and to external nature, will tend to the preservation of that individual, and will generally be inherited by its offspring. The offspring, also, will thus have a better chance of surviving, for, of the many individuals of any species which are periodically born, but a small number can survive. I have called this principle, by which each slight variation, if useful, is preserved, by the term of Natural Selection, in order to mark its relation to man's power of selection.*[24]

e_{10}. No two individuals are exactly the same; rather, every population displays enormous variability.[25]
e_{11}. Much of this variation is heritable.[26]

t^2_0. Survival in the struggle for existence is not random but depends in part on the heredity of the surviving individuals. This unequal survival constitutes a process of natural selection.[27]

From t^2_0, Darwin makes one more inference that gives him the title for his book and the explanation of descent with modification.

t^3_0. Over generations, this process of natural selection will lead to a continuing gradual change of populations—that is, to evolution and to the production of new species.[28]

One Long Argument

Darwin called *On the Origin of Species* "one long argument." I have stressed that he actually defended two, quite distinct theories, but at the same time, it's easy to see the truth in the one long argument characterization. Having clearly presented the evidence for descent with modification, he then (actually, this is not the progression in the book) lays out the case for natural selection.

e_1. The earth is much older than had been previously believed—thousands of millions of years.
e_2. The fossil record
e_3. The natural system
e_4. Patterns of geographical distribution
e_5. Morphological commonalities
e_6. Embryological oddities

t_0. Descent with modification
e_7. All species have great potential fertility.
e_8. Populations normally display stability.
e_9. Natural resources are limited.

t^1_0. Fierce struggle for existence—more are born than will reproduce

e_{10}. No two individuals are exactly the same.
e_{11}. Much of this variation is heritable.

t^2_0. Survival in the struggle for existence is not completely random; it is the product of natural selection.

t^3_0. Over generations, this process of natural selection will lead to evolution and to the production of new species.

As always, rival explanations are possible. Almost every biologist now accepts t_0, t^1_0, and

t^2_0 as the best explanations. Some controversy remains, however, regarding t^3_0. Most grant that natural selection does result in species change, but some question whether it is the primary cause. This kind of controversy, rather than calling evolution into question, is precisely what healthy science is all about. There do remain questions, not about the overall theory, but about the details. Darwin wrote *On the Origin of Species* in ignorance of genetics, population biology, and molecular biology. It is quite remarkable that these revolutions, rather than undercutting his theories, actually over time came to add further support.

EXERCISES

1. Darwin marshaled a lot of evidence in support of descent with modification—e_2 through e_6. If you had to make his case *using just one* of these categories of data, which would you choose? Why?
2. Can you think of any rival explanations to t^1_o, t^2_o, or t^3_o?

QUIZ EIGHT

The quiz for this chapter is to write a short (no more than three pages) paper on Darwin's two theories. Your paper should do three things. It should carefully explain Darwin's theory of common descent (or descent with modification). It should then explain what natural selection is. Finally, it should use the tools of inference to the best explanation (the IBE recipe) to critically assess the quality of Darwin's evidence for the first part of his "one long argument," the theory of *descent with modification.*

Notes

1 Charles Darwin, *On the Origin of Species* (Cambridge, MA: Harvard University Press, 1964), 1.
2 Darwin, 484.
3 Darwin, 312.
4 Darwin, 411.
5 Darwin, 479.
6 Ernst Mayr, *The Growth of Biological Thought* (Cambridge, MA: Harvard University Press, 1982), 446.
7 Darwin, *Origin of Species*, 306–7.
8 Darwin, 338.
9 Darwin, 434.
10 Darwin, 434.
11 Darwin, 442–43.
12 Darwin, 442.
13 Quoted in Mayr, *Growth of Biological Thought*, 474.
14 See John Maynard Smith, *Shaping Life: Genes, Embryos, and Evolution* (New Haven, CT: Yale University Press, 1998).
15 Richard Swinburne, *The Evolution of the Soul* (Oxford: Oxford University Press, 1997), 1.
16 Darwin, *Origin of Species*, 3.
17 See Daniel C. Dennett, *Darwin's Dangerous Idea* (New York: Simon & Schuster, 1995); and Mayr, *Growth of Biological Thought*.
18 Mayr, *Growth of Biological Thought*, 479.
19 Darwin, *Origin of Species*, 63.
20 Mayr, *Growth of Biological Thought*, 479.
21 Mayr, 480.
22 Mayr, 480.
23 Mayr, 480.
24 Darwin, *Origin of Species*, 61.
25 Mayr, *Growth of Biological Thought*, 480.
26 Mayr, 480.
27 Mayr, 480.
28 Mayr, 480.

Testimony

In the testimony case a person comes to know something when he is told about it by an eyewitness or when he reads it in the newspaper. . . . No obvious deductive inference leads to a probabilistic conclusion in this case; the acceptance of testimony can be based on two consecutive inferences to the best explanation. . . . First, we would infer that the speaker so testifies because he believes what he says (and not because he has something to gain by so testifying, or because he has gotten confused and has said the opposite of what he means, etc.). Second we would infer that he believes as he does because in fact he witnessed what he described (and not because he has suffered an hallucination, or because his memory deceived him, etc.).

—GILBERT HARMAN[1]

A Letter of Recommendation

I have a good friend in the psychology program. He has asked me to write a letter of recommendation in his search for a new job. I know him pretty well—we have collaborated on a short article and have team-taught on two occasions. I tell his prospective employers that he is a fine teacher and a great colleague and that he will go on to be a major figure in academic psychology someday. Suppose you read my letter and wonder what kind of evidence it provides about the job candidate.

Gilbert Harman, in the previous quote, provides a succinct characterization of how inference to the best explanation can be used to unpack the reasoning involved in accepting the word of others. In most cases where we assess testimony, we have more data to explain than simply what has been said. Minimally, we will know something about the speaker and something about the context in which the statement was made. The abstract model looks something like the following. First of all, we have the information contained in the language:

> e_1. Linguistic statement—"He is a fine teacher . . . major figure."

Almost as important in this case is the context in which the statement is offered:

> e_2. Context—letter of recommendation.

Finally, we know something about the letter writer himself:

> e_3. Relevant biography—philosophy professor at a small state university.

The explanatory or interpretive question is, Why did this speaker (biography) in this circumstance (context) say this (statement)? In ordinary communicative contexts, we generally give people the benefit of the doubt. Until given reason not to, we are presupposed to believe that our interlocutors are being straight with us. The conventions of normal linguistic communication ask you to first consider a theory that explains all these data in terms of sincerity:

> t_0. The letter writer said it because he believed it to be true—he believed that his friend was a good teacher and a great colleague and had the potential to make significant contributions to his field.

Unfortunately, years of reading these sorts of letters have made some of us a little cynical. We can immediately conceive of two alternative explanations of the letter writer's linguistic behavior.

> t_1. The letter writer said it because he wants to get his friend a job.
> t_2. The speaker said it to get rid of an undesirable colleague.

Inference to the best explanation asks us at some point to commit ourselves to a judgment of explanatory plausibility. What is the best explanation of what the letter writer said? Basically, our answers fall into two categories. We will either judge that the best explanation of the statement is the original one that normal communication recommends—he said it because he believes it; he is sincere. Or we will prefer one of the rival explanatory accounts that offer some other reason for his having made the statement. In this latter case, his testimony is of no use to us, indeed we should discount it. Even if it turns out that his friend is a great candidate for the job, if we judge that the letter writer is insincere or dishonest, his testimony is unreliable evidence about this.

If we do give him the benefit of the doubt on the question of sincerity, we must go through a whole other level of assessment before we can put complete confidence in the truth of his statement. The first level of evidence evaluation yields some new data that must also be explained.

> e_4. The letter writer is saying these great things about his colleague because he sincerely believes them to be true.

Why does this person (biography) believe these things (the content of the statement)? Once again, the presuppositions of normal communication

ask us to endorse a standard explanation for most sincere communicative attempts.

> t*₀. The speaker believes this because he knows what he is talking about—he believes it because it is, in fact, true.

Thus when we accept information through the testimony or authority of others, we tacitly engage in a dual explanatory inference. We explain the linguistic act as a sincere attempt to communicate the speaker's belief and then explain the speaker's having the belief in terms of the speaker knowing what they're talking about.

Larry Wright has helpfully distinguished two quite different things that can go wrong when someone communicates a sincerely held belief. Sometimes people have unreliable access to the information they are trying to communicate. Thus a rival explanation of my belief that my friend is a good teacher might be that I have only observed him in specialized upper-division courses that would be of interest to philosophy and psychology majors—I have never observed him, for example, in large introductory courses.

> t*₁. The letter writer believes that his friend is a good teacher because he has never observed his lousy teaching in large introductory courses.

Even when authorities possess excellent access to information, we still worry sometimes about their ability to reliably interpret this information. In this context, the cautious letter reader might have at least two potential worries about my testimony. The first has to do with specialized training. Obviously, my claims presuppose some fairly technical knowledge about pedagogy, academia, and research standards in contemporary psychology. One would like to think that expectations for teaching and collegiality would not vary across the humanities and natural and behavioral sciences. I, hopefully, have the necessary background to provide relevant information about these aspects of my friend's career. But what about the prediction for professional distinction with respect to his research? I am trained as a philosopher, not a psychologist. Perhaps his psychological "insights" I observed in the course of our collaborative teaching and writing are common knowledge in the field. Or worse, maybe they are discredited or eccentric. Am I really qualified to say? A rival explanation once again suggests itself.

> t*₂. The letter writer believes his colleague will make a name for himself because of his lack of knowledge about contemporary academic psychology.

A very different worry about the reliability of my belief focuses on my ability to "objectively" process the information to which I do have reliable access. Basically, the worry here is one of perceptual or interpretive bias. Perhaps I so admire his pedagogic technique because it is so similar to my own ineffective classroom style. Or maybe I am so impressed with his psychological hypotheses because they nicely coincide with my own half-baked notions. He is, after all, my good friend—might I not be guilty of "seeing more with my heart than with my eyes?" So we have yet another category of rival explanation:

t*₃. The letter writer believes these grossly inflated things about his friend because of some sort of perceptual bias.

None of the above should be taken to suggest that testimony is inherently unreliable. What could be more obvious than the fact that almost everything we claim to know comes to us second-hand through the word of others? What I am suggesting is that our assessment of testimony can be structured and critically evaluated as a kind of evidence—evidence that perfectly fits the inference-to-the-best-explanation recipe.

Testimony regarding Miracles

In David Hume's monumental book, *An Enquiry Concerning Human Understanding*, there is a very short little argument with astounding religious implications. Hume argues that we are never justified in accepting the testimony of others that a truly miraculous event has transpired. But since the three great theistic religions—Judaism, Christianity, and Islam—all depend, at some foundational level, on reports of miracles, Hume's argument seems to threaten their intellectual legitimacy. A full analysis of Hume's argument, let alone a full philosophical investigation of miracles, would be the subject of a whole book, maybe a whole career. Nevertheless, we now possess the tools to at least lay out the structure of Hume's argument and perhaps to begin the process of evaluating his evidence. So what exactly is the argument?

A miracle is a violation of the laws of nature; and as a firm and unalterable experience has established these laws, the proof against a miracle, from the very nature

of the fact, is as entire as any argument from experience can possibly be imagined. Why is it more than probable, that all men must die; that lead cannot, of itself, remain suspended in the air; that fire consumes wood, and is extinguished by water; unless it be, that these events are found agreeable to the laws of nature, and there is required a violation of these laws, or in other words, a miracle to prevent them? Nothing is esteemed a miracle, if it ever happened in the common course of nature. It is no miracle that a man, seemingly in good health, should die on a sudden: because such a kind of death, though more unusual than any other, has yet been frequently observed to happen. But it is a miracle, that a dead man should come to life; because that has never been observed in any age or country. There must, therefore, be a uniform experience against every miraculous event, otherwise the event would not merit that appellation. . . .

The plain consequence is (and it is a general maxim worthy of our attention), "That no testimony is sufficient to establish a miracle, unless the testimony be of such a kind, that its falsehood would be more miraculous, than the fact, which it endeavours to establish. . . ." When anyone tells me, that he saw a dead man restored to life, I immediately consider with myself, whether it be more probable, that this person should either deceive or be deceived, or that the fact, which he relates, should really have happened. I weigh the one miracle against the other; and according to the superiority, which I discover, I pronounce my decision, and always reject the greater miracle. If the falsehood of his testimony would be more miraculous, than the event which he relates; then, and not till then, can he pretend to command my belief or opinion.

In the foregoing reasoning we have supposed, that the testimony, upon which a miracle is founded, may possibly amount to an entire proof, and that the falsehood of that testimony would be a real prodigy: But

it is easy to shew, that we have been a great deal too liberal in our concession, and that there never was a miraculous event established on so full an evidence.[2]

Let's begin with the middle paragraph. Someone reports seeing a dead man restored to life. If we treat this report as potential evidence a genuine miracle has occurred, we would schematize this testimony as follows.

> e_1. Linguistic statement—"I saw a dead man restored to life."
>
> e_2. Context—where, when, and how we were told
>
> e_3. Relevant biography—whatever we know about the person who tells us this
>
> ―――――――――
>
> t_0. He genuinely believes that he saw a dead man restored to life.
>
> ―――――――――
>
> t^*_0 A dead man was restored to life.

Hume now considers two rival explanations, one for each of the inferences: "This person . . . deceive[s]."

> t_1. He does not really believe that he saw a dead man restored to life.

Or "this person . . . [was] deceived."

> t^*_1. He was mistaken in thinking he saw a dead man restored to life.

Hume proceeds to combine t_1 and t^*_1 into what logicians call a disjunction—"t_1 or t^*_1"—"he deceives, or he was deceived." Although he was not explicitly using inference to the best explanation, we can take Hume as proposing a rival explanation.

> t^*_2. He does not really believe that he saw a dead man restored to life, or he was mistaken in thinking he saw a dead man restored to life.

Hume then implicitly moves to step 3 in the recipe and offers a rank ordering of the original explanation of the testimony regarding a miracle and the disjunctive rival explanation. Theory t^*_2 is a better explanation of what was said than t^*_0.

Why is he so confident of this ranking? The answer is what Hume, and almost every philosopher and theologian since, means by something being a *miracle*. Miracles are violations of laws of nature. Given the laws of physics, biochemistry, and biology, the natural world dictates that death is permanent. The very evidence that establishes these laws of nature automatically counts against the reported miracle. For Hume, it's obvious that the various law of nature hypotheses are so much better explanations than rivals that allow for exceptions to these laws that miracles are doomed to be exceedingly implausible.

I agree with Hume about this so far. If a casual stranger tells me that she has witnessed a miracle, I would almost certainly judge that she is either lying or honestly mistaken and *not* that there has been an interruption in the operations of the natural world. But my judgment is based on a subjective assessment of the plausibility of differing explanatory accounts—classic application of the inference-to-the-best-explanation recipe—and not the meaning of the term *miracle*. Theists are not claiming, in my judgment,

that laws of nature don't hold or that the evidence for them is in anyway flawed. They believe, rather, that an omnipotent God created the entire physical world, including those laws of nature, and can, if He chooses, supersede those laws by the exercise of His omnipotence. Miracles, therefore, presuppose the existence of God. Testimony about the occurrence a miracle might count as good evidence for the existence of God, but as Hume saw, it will always face serious difficulty. For me to take seriously this kind of testimony, it would need to come from very special sources, so e_3 would be very important. Further, I suspect that regardless of the qualities of the source, I would need the corroboration of lots of equally good sources. Finally, I think I would need some independent evidence that God might exist. To see whether such independent evidence available is one of the oldest questions in Western philosophy. If you are curious about using evidence, indeed using inference to the best explanation (IBE), to present arguments for and against the existence of God, I invite you to read my next book, *Religious Evidence*, or perhaps some of my articles that attempt to apply inference to the best explanation as a means of assessing the quality of evidence we have for the existence of God.[3]

EXERCISES

1. Why do the conventions of normal communication recommend that we assume honesty when someone tells us something?
2. Assuming that I was being totally honest in my letter of recommendation, what were the two of worries that one might have that I knew what I was talking about?
3. You read the following on a Facebook post: "I just observed a miracle—I saw a dead man restored to life!" Use the tools we have developed in this chapter to assess the quality of evidence you have for the claim that a dead man has been restored to life.

QUIZ NINE

On November 6, 2012, Donald Trump tweeted the following: "The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive" (https://twitter.com/realdonaldtrump/status/265895292191248385?lang=en).[4]

Use the tools we have developed in this chapter to assess the quality of evidence you have for the claim that global warming is a hoax perpetrated by the Chinese to damage US manufacturing.

Notes

1 Gilbert Harman, "Knowledge, Inference, and Explanation," *American Philosophical Quarterly* 5 (1968): 167.
2 David Hume, *An Inquiry Concerning Human Understanding*, ed. L. A. Selby Bigge (Oxford: Calendon, 1902), 114–16.

3 See Jeff Johnson, "Inference to the Best Explanation and the Problem of Evil," *Journal of Religion* 64, no. 1 (1984): 54–72; Jeffery L. Johnson, "Inference to the Best Explanation and the New Teleological Argument," *Southern Journal of Philosophy* 31 (1993): 193–203; Jeffery L. Johnson, "Explanation, Evidence, and Mystical Experience," *Minerva—an Internet Journal of Philosophy*

5 (2001): 69–93; Jeffery L. Johnson, "From Friendly Atheism to Friendly Natural Theology," *Minerva—an Internet Journal of Philosophy* 7 (2003): 125–42; and Jeffery L. Johnson and Joyclynn Potter, "The Argument from Language and the Existence of God," *Journal of Religion* 85, no. 1 (January 2005): 83–93.

4 Donald J. Trump (@realDonaldTrump), "The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing noncompetitive," Twitter, November 6, 2012, 11:15 a.m., https://twitter.com/realdonaldtrump/status/265895292191248385?lang=en.

Textual Interpretation

It is the task of the historian of culture to explain why there has been in the last four decades a heavy and largely victorious assault on the sensible belief that a text means what its author meant.

—E. D. HIRSH[1]

Sounds, Shapes, Gestures, and Dashes and Dots

My generation grew up with two things that have largely been spared to most of you. Radios, newspapers, television, novels, and movies all told us that the world would end in nuclear war. And probably as a result of movies depicting World War II, we all had an idea of the telegraph and Morse code. All this played into a wonderful, if creepy, movie classic, *On the Beach*. An accidental nuclear war has wiped out most of the world, and only Australia has survivors, but they have less than a year to live. A US Navy ship decides to return to the West Coast, partly because they want to die at home and partly because the Australian base has been receiving gibberish in Morse code from a location in San Diego. What should we make of those seemingly random dashes and dots?

> e_1. The base has been receiving gibberish on its telegraph from a source in San Diego.

How should we explain this? Is it a cry for help? A survivor simply desiring long-distance companionship? Or is there some other explanation?

You're driving on the interstate; you come up quickly on a car ahead, change lanes, and pass. As you pass, the driver's left hand comes

up along the side of his head. Did he just give you an obscene hand gesture? Or was he simply scratching his ear? I text you "Meet you at 11" and get "?" as a response. Are you confused about 11 a.m. or 11 p.m.? Did you mean to text "k," or did I mistakenly text my mother-in-law, and she has no idea what in the world I'm saying? Just as we must explain identical exams, the car outside Joe's bar, and morphological similarities in mammalian forelimbs, we often find ourselves in communicative contexts where we must explain gibberish Morse code, potential hand gestures, and "?" in a reply text. It should surprise none of you that I believe inference to the best explanation will be helpful to you in these latter situations.

Inference to the Best Explanation and Textual Interpretation

Historians are concerned with texts, so are legal scholars, and indeed all of us rely on the spoken and printed word as evidence for all sorts of hypotheses. We might well turn to other interpretive disciplines such as biblical hermeneutics and literary criticism for methodological insights. Rather than begin with a tricky legal statute or a puzzling short story, however, it will be clearer, and more amusing, to illustrate the explanatory nature of textual interpretation with an example that does not require the background of an academic specialization. Stanley Fish provides a good one:

I have in mind a sign that is affixed in this unpunctuated form to the door of the Johns Hopkins University Club: PRIVATE MEMBERS ONLY

I have had occasion to ask several classes what that sign means, and I have received a variety of answers, the least interesting of which is, "Only those who are secretly and not publicly members of this club may enter it." Other answers fall within a predictable narrow range: "Only the genitalia of members may enter" (this seems redundant), or "You may bring in your own genitalia," or (and this is the most popular reading perhaps because of its Disney-like anthropomorphism) "Only genitalia may enter." In every class, however, some Dr. Johnson-like positivist rises to say, "But you're just playing games; everybody knows that the sign really means, 'Only those persons who belong to this club may enter it.'" He is of course right.[2]

Interpreting the sign involves making an inference about what it means. We have a collection of data that is in need of explanation:

e_1. The "text" is on a sign.

e_2. The sign is on a door.

e_3. The door is to the Johns Hopkins University Club.

e_4. The "text" reads, "PRIVATE MEMBERS ONLY."

Such a characterization of the data implies that we have already done a certain amount of interpretation. We have explained the shapes "PRIVATE MEMBERS ONLY" as an attempt at linguistic communication; they did not accidentally appear when the building was being painted nor are they modern art. Our explanatory question focuses on what these words are intended to communicate. We have a number of explanatory hypotheses:

t_0. Only those persons who belong to this club may enter it.

t_1. Only those who are secretly and not publicly members of this club may enter it.

t_2. Only the genitalia of members may enter.

t_3. You may bring in your own genitalia.

t_4. Only genitalia may enter.

t_5. The sign was intentionally designed with the double meaning by witty intellectuals.

As Fish's no-nonsense student insists, it is perfectly obvious what the best explanation of the words on the door is. Clearly, t_0 is the simplest, most complete, least ad hoc, and most plausible account. Linguistic communication and interpretation is an inherently explanatory process. From casual conversations and fun signs on doors to the interpretation of literary, constitutional, and biblical texts, the role of the reader (or listener) is always the same. There are shapes, gestures, and noises that need to be explained. Given the first order explanation that they are attempts at linguistic communication, the question now becomes what hypothesis best accounts for the meaning in the present context?

Authorial Intention

Virtually every one of the explanations we have alluded to so far share a common feature. The gibberish was perhaps a cry for help (or sad attempt to find companionship). The gesture might well have expressed his displeasure at your driving. The "?" text probably was a request for more information. The sign was saying who (or what) could or could not come in through the door. The following picture is so natural that we hardly think about it, and that, indeed, is the magic of linguistic (or symbolic) communication. Authors desire to communicate. They use a medium—spoken or written words, Morse code, hand gestures, motion pictures, or smartphone texting—as their means for communicating. In the ideal case, when we are unsure of what they were communicating, we simply ask them, What did you mean? If that proves impossible, as in all the previous cases, we must infer what they meant. As Hirsh put it in this chapter's epigraph, "A text means what its author meant."

e_1. There is a text.

e_2. The text has an author.

t_0. The text means what its author intended it to mean.

A Notorious Interpretation of *Hamlet*

It was a bad year, indeed, for Hamlet. He left school and returned to Denmark to attend the old king's—his father's—funeral. When he arrives, he discovers that his mother has hastily remarried his father's brother, Claudius, who has installed himself as the new king despite the fact that Hamlet was heir to the throne. If this were not bad enough, his father's ghost visits him and relates that Claudius, in fact, murdered the old king. Just as you can go to a romcom or a superhero flick and pretty much know what to expect, playgoers in Shakespeare's time knew they were to be treated to a revenge

tragedy. Hamlet would surely spend the rest of the play avenging his father's murder. Hamlet does eventually kill Claudius but more by accident than an avenging action. In the meantime, for a good four hours of the play, Hamlet mainly dithers, second-guesses himself, and seriously messes up his love life with Ophelia. Why, critics have asked for three hundred years, doesn't Hamlet get on with it and kill his uncle, as the genre dictates?

Earnest Jones begins his analysis of the play with a very general summary of critical responses:

> The most important hypotheses that have been put forward are sub-varieties of three main points of view. The first of these sees the difficulty in the performance of the task in Hamlet's temperament, which is not suited to effective action of any kind; the second sees it in the nature of the task, which is such as to be almost impossible of performance by any one; and the third in some special feature in the nature of the task which renders it peculiarly difficult or repugnant to Hamlet.[3]

Besides its fame or perhaps infamy, Jones's essay offering the Oedipus complex as an interpretation of "the cause of Hamlet's hesitancy in seeking to obtain revenge for the murder of his father"[4] would merit some discussion simply because of its title—"The Oedipus-Complex as an Explanation of Hamlet's Mystery: A Study in Motive."[5] Jones's interpretation explicitly appeals to the notion of explanation at two distinct levels. One, of course, is Hamlet's inaction. Why all the dithering? Jones argues that Hamlet is suffering from an Oedipus complex and offers as evidence in support of this hypothesis several

bits of textual data. Inference to the best explanation (IBE) would structure this argument in the following way:

e_1. What we know from the text about Hamlet's behavior—his inaction, his peculiar relationship with Gertrude, his misogynistic treatment of Ophelia, and so on

t_0. Hamlet was suffering from an Oedipus complex.

The psychoanalytic diagnosis explains all this puzzling behavior. The obvious critical problem for this interpretation is the embarrassing fact that Shakespeare wrote *Hamlet* almost three hundred years before Freud identified the Oedipus complex. Jones wisely anticipates the problem and offers an explanation of Shakespeare's mental state in writing the play.

> We have finally to return to the subject with which we started, namely poetic creation, and in this connection to enquire into the relation of Hamlet's conflict to the inner workings of Shakespeare's [sic] mind. It is here maintained that this conflict is an echo of a similar one in Shakespeare himself, as to a greater or less extent it is in all men. It is, therefore, as much beside the point to enquire into Shakespeare's conscious intention, moral or otherwise, in the play as it is in the case of most works of genius. The play is the form in which his feeling finds its spontaneous expression, without any inquiry being possible on his part as to the essential nature or source of that feeling.[6]

So now we are presented with an explanation not just of the events in the play but of its author

as well. Again, Jones offers evidence. He points out that the *Hamlet* story was widely known in Shakespeare's time, that the famous Thomas Kyd version was on the contemporary scene, and that "Shakespeare in 1585 christened his own son Hamnet, a frequent variation of the name."[7] The key, however, for Jones is Shakespeare's own father.

> *Highly suggestive, therefore, of the subjective origin of the psychical conflict in the play is the fact that it was in September, 1601, that Shakespeare's father died, an event which might well have had the same awakening effect on old "repressed" memories that the death of Hamlet's father had with Hamlet; his mother lived till some seven years later. There are many indications that the disposition of Shakespeare's father was of that masterful and authoritative kind so apt to provoke rebellion, particularly in a first-born son.[8]*

Thus we get a linked argument reminiscent of the reasoning from the chalk on Watson's hand to the decision not to invest or the two-step inferences in cases of testimony.

> e_1. What we know from the text about Hamlet's behavior—his inaction, his peculiar relationship with Gertrude, his misogynistic treatment of Ophelia, and so on
>
> ---
>
> t'_0. Hamlet was suffering from an Oedipus complex.
> e_2. Shakespeare's familiarity with the Hamlet legend and Kyd's version of the play
> e_3. Shakespeare's son's name
> e_4. Shakespeare's father's temperament
> e_5. The death of Shakespeare's father 1601

> t''_0. Shakespeare himself suffered from Oedipus complex and unconsciously transferred character traits from himself to Hamlet.

The million-dollar questions are, of course, whether t'_0 and t''_0 are the *best* explanations of the textual and authorial data. I think we would be hard pressed to find many defenders of the Jones hypotheses. The problem is not so much the quality of Jones's reasoning but the Freudian paradigm that he so candidly and enthusiastically buys into. If one is skeptical that such a thing as an Oedipus complex exists, one is going to find it very difficult to explain the actions and creations of literary characters and authors in terms of it.

A Contemporary Psychological Interpretation of *Hamlet*

It is interesting in this connection to consider a more contemporary psychological account of *Hamlet*. A. B. Shaw has recently argued that Hamlet suffered from depressive illness and that this diagnosis explains his failure to exact revenge.

> *Hamlet is a creature of Shakespeare's imagination . . . He is not an actual patient. Therefore clinical diagnosis must be tentative, but there is good evidence in the play for depressive illness. Depressive illness is characterized by low mood, anhedonia, negative beliefs, and reduced energy. Hamlet actually calls himself melancholic and the very first speech he makes in the play is devoted to a public statement of his melancholy.[9]*

Shaw now proceeds to show how the text clearly shows Hamlet manifesting these clinical indicators:

e_1. Hamlet exhibits anhedonia—for example, "He speaks at length to Rosencrantz and Guildenstern, saying he has lost all mirth and that man does not delight him."[10]

e_2. Hamlet expresses negative beliefs—for example, "He calls Denmark a prison. His comments to Ophelia on women are bitter."[11]

e_3. Hamlet "alludes to sleep disturbance 'were it not that I had bad dreams.'"[12]

e_4. Hamlet "has experienced events likely to precipitate depression: his father's sudden death, his mother's hasty marriage, and his disappointment in the succession."[13]

---

t_0. Hamlet suffered from depressive illness.

Shaw argues further that it is no embarrassment whatsoever that depressive illness only entered the clinical paradigm centuries after the play was written. We certainly grant that people suffered from this devastating condition long before psychology and medicine cataloged and began to treat it. Shakespeare was an excellent student of the human condition. Just as a perceptive author can recognize overly ambitious characters, jealous lovers, and power-mad leaders, Shakespeare can recognize a person exhibiting the behavior brought on by depressive illness—what his contemporaries would have called melancholy. Further, he can locate his depressive lead character in a play with perhaps larger and different artistic motives.

We can only assess the quality of Shaw's depressive illness interpretation, of course, by comparing his explanation of key parts of the play to the many rival interpretations that have been offered in the past three hundred years. I make no claim that Shaw's explanation is the *best* explanation for two reasons. One is that I am not a qualified critical scholar, and this is a book about evidence evaluation, not Shakespearian critical analysis. The second is a kind of intellectual confession. I find the play both aesthetically and intellectually fascinating. Every time I read a thoughtful interpretation of *Hamlet*, I find myself being won over to that critic's point of view. I recognize, of course, that all these critics can't be right, since many consciously write to refute one another.

I suspect that my problem lies with the whole notion of truth—truth in science, truth in literary analysis, and truth in constitutional interpretation, a topic we will return to in later chapters.

EXERCISES AND QUIZ TEN

Retrieved from https://www .flickr.com/x/t/0090009/photos/ mastababa/2354567815/.

Retrieved from https://www .flickr.com/x/t/0099009/photos/ mstabbycat/3127520409/.

Here are three images of signs I found on the web. A fourth image, which was protected by copyright, showed pedestrians walking a street with a sign in the foreground that read, "GO SLOW: ACCIDENT PORN AREA."

You may choose any one you want for this chapter's quiz. The others may be used as practice exercises.

The directions for the quiz and the practice exercises are all the same. What is the sign saying—what does it mean? Defend your interpretation of the sign using the tools we have developed in this chapter. The fun, I believe, will be in coming up with your rival explanations.

Notes

1 E. D. Hirsch, "In Defense of the Author," *Validity in Interpretation* (New Haven, CT: Yale University Press, 1967), 1.

2 Stanley Fish, *Is There a Text in This Class?* (Cambridge, MA: Harvard University Press, 1982), 274–75.

3 E. Jones, "The Oedipus-Complex as an Explanation of Hamlet's Mystery: A Study in Motive," *American Journal of Psychology* 21, no. 1 (1910): 75.

4 Jones, 74.

5 Jones, 74.

6 Jones, 102–3.

7 Jones, 103.

8 Jones, 103.

9 A. B. Shaw, "Depressive Illness Delayed Hamlet's Revenge," *Medical Humanities* 28, no. 2 (2002): 92–96.

10 Shaw, 92.

11 Shaw, 92.

12 Shaw, 92.

13 Shaw, 93.

Statistics
Making Sense of the Numbers

Data do not give up their secrets easily. They must be tortured to confess.

—JEFF HOPPER[1]

What Numbers Can Tell Us

Here is a chart that seems to say quite a lot. After the disastrous recession of 2008, the story about jobs in the United States seems rosy indeed. The trend from July 2010 until July 2018 shows a dramatic decline in the national unemployment rate. As I write these words in the summer of 2018, "job openings hit record highs and the unemployment rate dipped to the lowest level in decades."[2] Ordinarily all this would have resulted in higher wages for working men and women and an increase in their standard of living. This is not, however, how it feels to many working Americans. Perhaps the following chart gives a more accurate account of what is really going on.
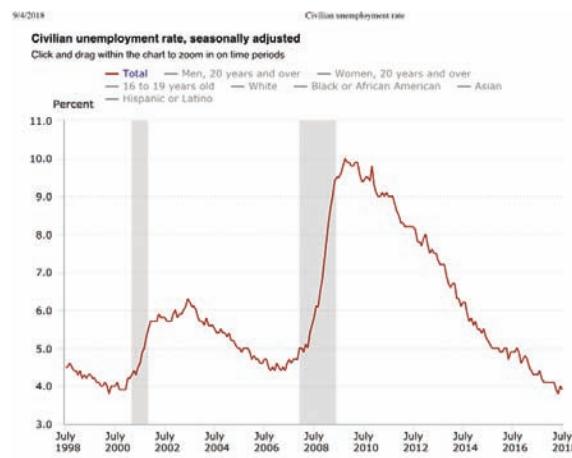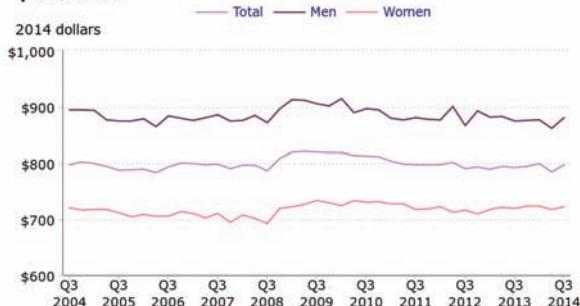
FIGURE 4. Civilian unemployment rate
Retrieved from https://www.bls.gov/charts/employment-situation/civilian-unemployment-rate.htm

Inflation-adjusted median usual weekly earnings of full-time wage and salary workers, by gender, seasonally adjusted, third quarter 2004 to th[] quarter 2014

Click legend items to change data display. Hover over chart to view data.
Source: U.S. Bureau of Labor Statistics.

FIGURE 5. Median weekly earnings, 2004–2014

Retrieved from Bureau of Labor Statistics, The Economics Daily, https://www.bls.gov/opub/ted/2014/ted_20141028.htm.

All this stuff—"the seasonally adjusted civilian unemployment rate," "inflation adjusted median weekly earnings," and the like—really matters for a number of reasons. The biggest concern, of course, is that most of my readers have bills to pay, families to support, and financial plans to make for their futures; what their paycheck is, and what it buys them, are of paramount importance. In addition, politicians of all stripes demand their votes because the economy is doing so well or because it is doing so poorly. Finally, as good explanation seekers, we would all like to know what's going on.
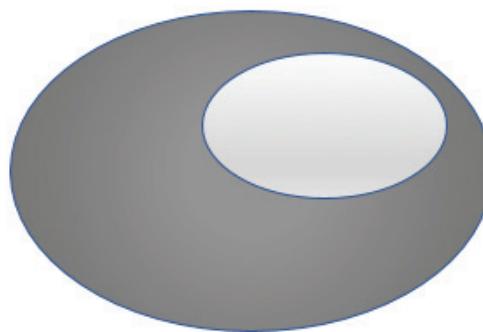
Were it my paycheck, my vote, or simply my intellectual curiosity, I'd probably take an economics course or two, read a bit more about where the parties and their candidates stand on all this, and as you may have guessed, apply the methods of inference to the best explanation to all this statistical data.

Samples and Populations

We will use the term *population* as jargon for any sort of a group—a group of people; a group of things, such as vehicles that get better than thirty miles per gallon; or groups of very abstract things, such as depictions of Santa Claus in primetime television. We can use the mathematician's notion of a set to characterize a population. Similarly, we will use the term *sample* as jargon for any part of the group constituting the population. Thus samples are subsets of the set making up the population. In a familiar Venn diagram, the lighter, smaller oval constitutes the sample and the darker, larger oval the population.

Very often we are interested in samples because we assume that they can tell us something interesting about the population. You might well ask, If we are really interested in the population, why we wouldn't just look at it directly? And the

simple answer is one of practicality. It would be too time consuming, too expensive, or otherwise too impractical to survey the entire population. Thus we use the sample, which can be examined and described, as a clue about the whole population, which cannot.

Inferences from samples to populations are classic examples of inferences to the best explanation. Our data are the discovery that some sample has an interesting feature or property, and we use this as evidence that the population also has this property. We ask the explanatory question—Why does the sample have P? And our hypothesis answers that it has P because the population as a whole has P.

> e_1. Sample has property P.
> ___
> t_0. Population has property P.

Couldn't It Just Be a Fluke?

I hope by now you are almost programmed when you see an argument such as the previous one to begin to think of rival explanations. Sure, if the population has P, that would be a good explanation of why the sample has P. But what else might explain the sample having P?

I get home at 6:00 on a Tuesday evening and before I can finish looking at the mail and fixing a martini, the phone has rung three times, all from charitable organizations seeking contributions. I conclude that this Tuesday is a big push for getting money. My sample, those three phone calls, is pretty skimpy. After all, I'm offering a hypothesis about the whole country (or perhaps state or county). Isn't the following rival explanation just as plausible, perhaps

more plausible, than my charity full court press theory?

> t_1. It's just a coincidence that those three calls were all from charitable organizations.

Or more generally,

> t_1. It's just a coincidence that the sample has property P.

Modern probability theory has devoted a good deal of time and attention to developing some very sophisticated mathematical tests of how likely it is that a sample will have a given property simply as a matter of random chance. Some of you may be familiar with some of these tests for what is called statistical significance from other courses or computer software. Even those of you who hate numbers or math would be well advised, in my humble opinion, to learn a bit about all this by taking an introductory statistics course. But that is not my goal in the present context.

Even those of you with the least experience and confidence with mathematics know that the size of the sample matters in important ways. A sample of three calls tells us almost nothing, while a sample of three thousand can tell us quite a lot. We will confine our discussion to an informal treatment of what statisticians call statistical significance. How accurate are our measurements within samples of a given size? A contemporary philosopher of science Ronald Giere offers what he calls a rule of thumb for answering this question.[3] He offers the following scale for correlating the size of the sample with the accuracy of what is being measured:

SAMPLE SIZE (PEOPLE)	ACCURACY
100	±10 percent
500	±5 percent
2,000	±2 percent
10,000	±1 percent

You might note a couple of things about this little chart. One is how nicely the first digit in the sample size correlates with the accuracy measurement, thus making it pretty darn easy to remember. The other is what economists call "the law of diminishing returns." Increasing the sample from one hundred to five hundred buys you a lot of increased accuracy; increasing it from two thousand to ten thousand buys you hardly any increased accuracy. You will find, I predict, that almost all the polls you read about in the newspapers will have sample sizes around five hundred. This is because an accuracy of about ±5 percent is all that is needed for most purposes, and it would be very expensive and time consuming to improve that accuracy significantly.

Couldn't the Sample Be Biased?

The notion of bias in colloquial speech often conveys a lack of openness or even prejudice, which counts as a kind of character defect—for example, "he's really biased in his grading against student athletes." I'm biased toward folk and rock music because it's what I grew up with. Some of you, God forbid, are biased toward hip-hop for the same reason. All the notion really means is that people are not equally open—to giving good grades, appreciating a song as a good one, or noticing that the dishes need to be washed. We need to make sure that our samples are not biased but equally open to everyone or everything in the population.

Statisticians desire randomly selected samples. This is technical jargon that means every single individual in the population has an equal probability of being selected as a member of the sample. My computer can approximate random selection, so it would be relatively easy for me to feed in all my class rosters for the past five years, randomly select three students from each course, and then query this sample to discover things about my teaching, grading, and so on. Not a bad idea, actually.

In the real world, however, technical randomness is often impossible. We only have a couple of days to find out voter sentiment in the upcoming election, and so we phone a sample of six hundred likely voters. Obviously, this is not a true random sample, since every likely voter did not have an equal chance of being selected—some didn't have phones, some were away on vacation, and some screen their calls. But for practical purposes, if the phone numbers are randomly selected from a master list of likely voters who answer their phones, the information we gather approximates what could be gathered from a technically random sample, and our sample might be characterized as *practically random*. Technically random samples are the exception, while what we hope are practically random samples are the rule.

Consider a very famous poll that went spectacularly wrong. The *Literary Digest* had been conducting polls on presidential elections since 1920 and had gotten the winner right in four straight elections; indeed, in the 1932 election, they got the popular vote right within 1 percent.

As the 1936 election approached, they once again conducted a massive poll. Take a look at the relevant data.

> e_1. The *Literary Digest* mailed out more than ten million straw vote ballots.
> e_2. Their sample was drawn primarily from automobile registration lists and phone books.[4]
> e_3. "Over 2.3 million ballots were returned."[5]
> e_4. 55 percent planned to vote for Alf Landon, 41 percent for Roosevelt, and 4 percent for Lemke.

This led to their conclusion that voters overwhelmingly favored Landon and their cover story prediction that he would win the election. They made a classic inference from a sample to a population.

> e_1. *Literary Digest* sample strongly favors Landon.
> ___
> t_0. Voters, nationally, strongly favor Landon.

Bad luck for the *Literary Digest*! You, of course, know that Alf Landon never became president. I'll bet a good number of you have never even heard of him before. Roosevelt crushed Landon in the general election 61 percent to 37 percent. What went wrong?

The *Digest*'s sample was horribly biased. Not because they were prejudiced or had some ax to grind but because the way they selected the names and addresses was far from random—not the technical randomness that we almost never find, but the practical randomness that good polling requires. The clue is in e_2. This was, after all, the height of the Great Depression. Poor people were much less likely to own a car. And even phones were then considered not necessities but, in a sense, luxuries. Again, poor people were much less likely to have phones. What the *Literary Digest* had unintentionally done is measure the sentiments of relatively wealthy voters, not voters in general. This suggests the following rival explanation:

> t_1. Wealthy voters strongly favor[ed] Landon.

It is well known in political science that wealthier voters tend to vote for Republicans and less wealthy voters for Democrats. It's hardly surprising, therefore, that a sample of voters biased toward the Republican Party tended to favor the Republican candidate.

There was a second source of bias in the sample that is less well discussed in academic circles. The whole poll depended on what statisticians call the "response rate." The *Literary Digest* sent out a truly amazing number of straw ballots—more than ten million. They got a pretty good response too—almost a quarter. But we should ask ourselves if there was anything special about those 2.3 million who took the trouble to mail their ballots back. It seems reasonable to suppose that they were more educated and politically concerned. So we have a second rival explanation:

> t_2. Better educated and politically concerned voters favored Landon.

And, indeed, t_1 and t_2 nicely complement one another and suggest a more comprehensive rival:

t₃. Wealthy voters, as well as better educated and politically concerned voters, favored Landon.

Lest any of you think that all this concern with polling for presidential elections is a thing of the past, you might well reflect on the recent elections. Here's what professional pollsters were worried about as the 2008 election approached:

"We were all scared to death in 2004, because we had a close race and the cell phone-only problem was already with us then," says Scott Keeter, the head of surveys at the Pew Research Center . . .

"Pollsters have learned quite a bit about the cell phone-only users they do call. They are most likely to be under 30, unmarried, renters, making less than $30,000 a year, and are slightly more likely to be black or Hispanic," says Keeter. . . .

He adds, "It suggests that if there are enough of them, and you are missing them in your landline surveys, then your polls will have a bias because of that."[6]

Naomi Oreskes's Study

There is an interesting segment in Al Gore's movie, *An Inconvenient Truth*, where he cites a scholarly study of peer-reviewed articles on climate change.

A University of California at San Diego scientist, Dr. Naomi Oreskes, published in Science *magazine a massive study of every peer-reviewed science journal article on global warming from the previous 10 years. She and her team selected a large random sample of 928 articles representing almost 10% of that total, and carefully analyzed how many of the articles agreed or disagreed with the prevailing consensus view. About a*

quarter of the articles in the sample dealt with aspects of global warming that did not involve any discussion of the central elements of the consensus. Of the three-quarters that did address these main points, the percentage that disagreed with the consensus? Zero.[7]

Here we have, a little bit secondhand, an incredibly interesting, and potentially quite important, sample. The argument leaves the conclusion unstated but still quite obvious—almost all natural scientists publishing on climate change endorse the consensus view about climate change.

e₁. In a sample of 928 peer-reviewed articles dealing with climate change, 0 percent disagreed with the consensus view.

t₀. Virtually all peer-reviewed research on climate change endorses the consensus view.

Mr. Gore is quite right that Dr. Oreskes published a short, but very influential, article, "Beyond the Ivory Tower: The Scientific Consensus on Climate Change," in a prestigious journal, *Science*, in December of 2004.[8] She begins by reminding her readers that policy makers and the mass media often suggest that great scientific uncertainty about "anthropogenic" climate change but states flatly, "This is not the case."[9]

In defense of her thesis, she offers a fairly elaborate study she has conducted. She offers a working definition of what she will call "the consensus view," from reports by the Intergovernmental Panel on Climate Change:

Human activities . . . are modifying the concentration of atmospheric constituents . . . that absorb or scatter radiant energy. . . . Most of the observed warming

over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations.[10]

Notice the challenge she faces. She is making a claim about a very large, and not that well-defined, population—science ("great scientific uncertainty"). To make matters worse, policy makers and the media dispute her claim.

Her first move is to more carefully define the population she is interested in. She utilizes a standard reference tool in the natural sciences, the Institute for Scientific Information (ISI) data-base. In this database, authors are asked to identify certain "key words," really topics, that their articles address. Professor Oreskes searched for the key word "climate change." Her team then randomly selected more than 928 articles.

Obviously not every article is going to explicitly endorse or disagree with the consensus view, so Oreskes and her team had to read and "code" the articles. They broke them down into six categories.

The 928 papers were divided into six categories: explicit endorsement of the consensus position, evaluation of impacts, mitigation proposals, methods, paleoclimate analysis, and rejection of the consensus position. Of all the papers, 75% fell into the first three categories, either explicitly or implicitly accepting the consensus view; 25% dealt with methods or paleoclimate, taking no position on current anthropogenic climate change. Remarkably, none of the papers disagreed with the consensus position.[11]

She is also quite candid that a certain amount of judgment and editing of the sample was required.

Some abstracts were deleted from our analysis because, although the authors had put "climate change" in their key words, the paper was not about climate change.[12]

So what do we (none of us trained climate scientists) think of Professor Oreskes's evidence? We possess the tools to make some sort of evaluation.

We have a fair amount of data that is being offered as evidence:

e_1. Definition of the "consensus view"

e_2. ISI database

e_3. Key word: climate change

e_4. 928 articles

e_5. Some articles did not really address climate change and were removed.

e_6. Six potential categories

e_7. 75 percent "implicitly or explicitly" endorsed the consensus view.

e_8. 25 percent took no stand.

e_9. Not one article disagreed with the consensus view.

t_o. Almost all scientists working and publishing on climate change endorse the consensus view.

Rival Explanations of the Sample

We will begin with two different rival explanations that attribute the fact that no one challenged the consensus view to pure chance. Perhaps it was just a fluke that all 928 articles either endorsed the consensus view or took no position on it. Perhaps the study tells us something about the articles in the ISI database, but it's simply a fluke that the articles that the database includes are not skeptical but that other peer-reviewed articles not included are skeptical. Either of the following sorts of mathematical coincidence is possible:

t₁. It was a fluke that the 928 articles showed no skepticism about the consensus view; the ISI database contained many articles that were skeptical.

t₂. Although the sample told us something significant about the ISI database, it was a coincidence that the articles they included showed no skepticism when in fact many peer-reviewed articles not included show plenty of skepticism.

I have already conceded that both of these rivals are logically possible. I want to insist, however, that they are very improbable. Remember Giere's "rule of thumb"? He tells us that for random samples, the margin of error is a direct function of the size of the sample. Samples of five hundred are accurate to about ±5 percent, and samples of two thousand are accurate to about ±2 percent. That means that Professor Oreskes's sample has an accuracy of, conservatively, ±4 percent. For a statistician adopting a 95 percent confidence level, there is only a 5 percent chance that the population falls outside of the ±4 percent margin of error. Could it happen? Yes. Is it likely at all? No.

Much more interesting rivals will have to do with the problem of bias, either intentional or, more likely, unintentional. I suspect that some of you have already wondered if there might be a bias in the ISI database. Maybe they only list "green" articles. Again, the following rival explanation is possible:

t₃. The ISI database is biased in favor of the consensus view.

A very different sort of bias is possible because of Oreskes's methodology. It is highly unlikely that most of the articles in the sample came right out and said where they stood on the consensus view. Indeed, she tells us that some of the endorsement was implicit. That must mean that her team had to "code," or otherwise interpret, that article's intention and subsequent endorsement or nonendorsement. Perhaps her team was so unconsciously wedded to the consensus view that they misinterpreted many of the articles as endorsing or taking no stand when in fact the authors of those articles intended a rejection of the consensus view. Thus another possible rival explanation focuses on the coding of the articles:

t₄. Oreskes, because of her biases, misinterpreted many of the articles as favorable or neutral when in fact the authors were arguing against the consensus view.

A final rival explanation centers on the possible bias of the entire scientific community. One might argue, as some have in defense of "creation science," that there is a kind of professional conspiracy that effectively censors articles that challenge the consensus view (not just of climate change but of any accepted scientific theory) from being published in peer-reviewed journals in the first place. Here, the rival does not really challenge the population of peer-reviewed publications, but rather the implied attitude of endorsement by working scientists.

t₅. Respectable scientists arguing against the consensus view cannot get their articles published in peer-reviewed journals.

The Best Explanation?

In the case of the rivals focusing on a statistical fluke, I could argue against their plausibility by focusing on their mathematical improbability. No such technique exists for dealing with the rivals t_3, t_4, and t_5. Nevertheless, I want to argue that they are all implausible, at least when compared to the original explanation that there exists practically universal endorsement of the consensus view regarding climate change among trained climate scientists.

Consider first the journal that Oreskes's article appeared in, *Science*. The journal is one of the most highly respected academic journals in the world. They have a huge interest in policing themselves, since their name is on the cover of every article they publish.

Next, we must face the charge that the Institute for Scientific Information is somehow biased. Again, we are dealing with a very prestigious and widely used reference tool, which is now operated by a for-profit corporation. The ISI has a huge stake, both its reputation and its financial outlook, in being regarded as absolutely trustworthy. Thus they too can be expected to police themselves.

The same may be argued for Professor Oreskes herself. She is a highly respected scholar, educator, and university administrator. Her own professional reputation is on the line. She would be insane not to carefully ensure the accuracy of an article in a major journal that was guaranteed to be read and debated by a wide audience of scientists and indeed, those outside of the sciences.

Finally, we come to perhaps the most serious of the charges in our rivals. Perhaps all climate science is biased against critics of the consensus view. As I said in an earlier chapter, these sorts of conscious or unconscious conspiracy theories are offered by critics of natural selection. I want to concede that something like that can happen, and the history of science tells us that it has happened on occasion. In a way, the criticism of Semmelweis's theory by skeptics of the entrenched generation had shades of this mechanism. But with all this conceded, I have to tell you that this sort of thing is very, very rare. Most natural scientists respect the need for skepticism from their peers. Studies challenging the consensus view, in one sense, have a better chance of being published, if for no other reason than that they are saying something new. Furthermore, we live in the age of information. Much more is being published, and many more venues for peer-reviewed academic publishing exist now. Thus the fact that the ISI database did not include even one skeptical defense leads me to believe that there just aren't many skeptics out there, at least not within mainstream climate science.

EXERCISES

1. For the fall quarter of 2008, Eastern had 3,666 students. When you break down that number on the basis of sex, you discover something a little surprising. 2,344 of those students were female, while only 1,322 were male. Why would it have been a bad idea to take the 2008 institutional data from Eastern as telling us anything significant about gender and college attendance nationally?

2. Why do we almost never see samples that are truly (technically) random?

3. Teaching evaluations for online courses have notoriously low response rates. Less than 10 percent of my online students return their course evaluations. What kinds of bias might infect the accuracy of these student evaluations? Is this sample close enough to practical randomness to tell us anything interesting about the quality of my online teaching?

QUIZ ELEVEN

A recent Gallup News story claims that "public concern about global warming is evident across all age groups in the U.S., with majorities of younger and older Americans saying they worry about the problem a great deal or fair amount. However, the extent to which Americans take global warming seriously and worry about it differs markedly by age, with adults under age 35 typically much more engaged with the problem than those 55 and older."[13]

The following results were "based on aggregated telephone interviews from four separate Gallup polls conducted from 2015 through 2018 with a random sample of 4,103 adults, aged 18 and older, living in all 50 U.S. states and the District of Columbia. For results based on the total sample of national adults, the margin of sampling error is ±2 percentage points at the 95% confidence level. All reported margins of sampling error include computed design effects for weighting."[14]

Here is a summary of their findings: 75 percent of respondents aged eighteen to thirty-four believed that "global warming is caused by human activities," while only 55 percent of respondents aged fifty-five and over believed this. Apropos our earlier discussion, 73 percent of the younger cohort thought "most scientists believe global warming is occurring," but only 58 percent in the older group thought this was true.[15]

Based on the information in the Gallup polls, use the techniques developed in this chapter to evaluate the quality of evidence we have for the author's claim that "the extent to which Americans take global warming seriously and worry about it differs markedly by age."

Here is the complete article from Gallup: https://news.gallup.com/poll/234314/global-warming-age-gap-younger-americans-worried.aspx.

Notes

1 Quoted in Sourav S. Bhownick and Boon-Siew Seah, *Summarizing Biological Networks* (New York: Springer, 2017), vii.

2 Heather Long, "In U.S., Wage Growth Is Being Wiped Out Entirely by Inflation," *Washington Post*, August 10, 2018, https://www.washingtonpost.com/business/2018/08/10/america-wage-growth-is-getting-wiped-out-entirely-by-inflation/?noredirect=on&utm_term=.65fd9f744116.

3 Ronald Giere, *Explaining Science* (Belmont, CA: Wadsworth, 2005), 142–44.

4 Peverill Squire, "Why the 1936 *Literary Digest* Poll Failed," *Public Opinion Quarterly* 52, no. 1 (Spring 1988): 128.

5 Squire, 128.

6 Audie Cornish, "Do Polls Miss Views of the Young & Mobile?," NPR, October 1, 2007, http://www.npr.org/templates/story/story.php?storyId=14863373.

7 Al Gore, *An Inconvenient Truth* (Emmaus: Rodale, 2006), 262.

8 Naomi Oreskes, "The Scientific Consensus on Climate Change," *Science* 305, no. 5702 (2004): 1686, http://www.sciencemag.org/cgi/content/full/306/5702/1686.

9 Oreskes, 1686.

10 Oreskes, 1686.

11 Oreskes, 1686.

12 Oreskes, 1686.

13 R. J. Reinhart, "Global Warming Age Gap: Younger Americans Most Worried," Gallup, May 11, 2018, https://news.gallup.com/poll/234314/global-warming-age-gap-younger-americans-worried.aspx?version=print.

14 Reinhart.

15 Reinhart.

Correlations and Causes

Most of you will have heard the maxim "correlation does not imply causation." Just because two variables have a statistical relationship with each other does not mean that one is responsible for the other. For instance, ice cream sales and forest fires are correlated because both occur more often in the summer heat. But there is no causation; you don't light a patch of the Montana brush on fire when you buy a pint of Haagan-Dazs.

—NATE SILVER[1]

Correlations

The Concise Oxford Dictionary offers two definitions of the term *correlation*:

1. *Mutual relationship between two or more things.*
2. *Interdependence of variable quantities, quantity measuring extent of this.*[2]

The latter definition gets most of the attention in statistics courses. But the more generic definition is at the heart of reasoning from a cause to an effect. What is the relationship between two things—a car accident on Tuesday and a backache on Wednesday morning? "Obviously" the crash caused the back injury. Well, maybe, but maybe not. Perhaps the back injury (caused from too much of a workout at the gym on Monday) resulted in the crash because of a muscle spasm as the driver was trying to hit the brakes. Or suppose some third thing—say, a small seizure—simultaneously caused the crash by distracting the driver and caused the back injury as the driver wrenched in surprise. And maybe the relationship is one of simple coincidence. The injury occurred at the gym and the crash from foolishly texting while driving—there was

simply no causal relationship between the two occurrences. This all suggests four possible causal relationships between any two events, A and B.

> 1. A caused B.
> 2. B caused A.
> 3. Some third "common cause," C, independently caused both A and B.
> 4. There is no causal relationship between A and B.

We shall see, directly, that there is a fifth possible causal relationship between A and B, but I'm saving that as a surprise. Just what we have so far, though, allows us to explain the correlation between ice cream sales and forest fires. Nate Silver says "there is no causation," but this is a little careless. He's right, of course, that A is not the cause of B nor B the cause of A. But there is a causal relationship that best explains the correlation. C (the summer heat) is the common cause of the increased ice cream sales and greater number of forest fires.

Explaining the Numbers

Much of statistical reasoning in the social and natural sciences can easily be reconstructed as a related pair of inferences to the best explanation. In the first inference, the explanatory question focuses on a quantitative relationship. We typically have some study or sample that is asserted to tell us something about a larger group or population. Consider the extensive medical data that was uncovered over several decades in the famous Framingham study. Medical researchers were surprised to discover that 29 percent of the men in the forty- to forty-nine-year range suffered from coronary heart disease, while only 14 percent of

the women in the same age range suffered from the disease. This tells us something potentially very important about gender and heart disease.

> e_1. Of the 771 men in the forty- to forty-nine-year age group, 29 percent showed some signs of coronary heart disease.
> e_2. Of the 954 women in the forty- to forty-nine-year age group, only 14 percent showed signs of coronary heart disease.
>
> ---
>
> t_0. Coronary heart disease appears much more often in men than in women.

One rival explanation that I believe current medical advances force us to take seriously is that coronary heart disease is much more prevalent in woman than was recognized by medical experts at the time of the Framingham study—then current diagnostic indicators failed to correctly identify all the signs of coronary heart disease in women. So the following may better explain *some* of the gender disparity:

> t_1. All the clinical indicators of coronary heart disease in women were not recognized at the time of the study.

But let's grant that the Framingham data truly indicated some real gender disparity and that the samples do suggest that coronary heart disease was more prevalent in men.

Explaining the Correlations

Noticing this striking correlation between gender and heart disease is only the first step in figuring out what is going on here. We might think that there's something deeply biological going on.

e$_1$. Of the 771 men in the forty- to forty-nine-year age group, 29 percent showed some signs of coronary heart disease.

e$_2$. Of the 954 women in the forty- to forty-nine-year age group, only 14 percent showed signs of coronary heart disease.

t$_0$. Coronary heart disease appears much more often in men than in women.

t*$_0$. The biological makeup of males, their hormones, physiology, and DNA, causes an increased danger of coronary heart disease.

But certainly, the possibility of a cultural explanation must be taken seriously, particularly since the data was collected at a time in our history when gender roles were much more pronounced. Perhaps something regarding the differences in workforce stress between men and women accounts for the disparity in coronary heart disease. Or, perhaps, it's a simple as diet and alcohol consumption. We are once again confronted with a serious rival explanation:

t*$_1$. The culturally defined differences in work and lifestyles between men and women cause the differences in coronary heart disease.

Or this may well be one of those times when the best explanation combines the features identified in alternative explanations:

t*$_2$. The biological makeup of males as well as the culturally defined differences in lifestyles between men and women jointly cause an increased danger of coronary heart disease.

I hope that it is obvious by now that I am not suggesting that statistical studies such as the Framingham study are too ambiguous to tell us anything important. The message I take from this is that explaining statistical data can be a difficult task indeed and that carefully considering alternative accounts of statistical correlations may suggest further studies that may need to be conducted before we can fully understand the causal connections between gender and coronary heart disease.

CO$_2$ and Global Temperatures

Consider the following data that played such a prominent role in Al Gore's *An Inconvenient Truth*. Mr. Gore used these data as evidence that CO$_2$ concentrations cause global temperature variations.

e$_1$. There is a strong correlation between CO$_2$ levels and the Earth's average temperature.
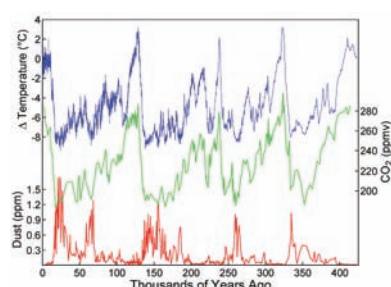

FIGURE 6. Temperature variation from present-day values (blue), atmospheric carbon dioxide concentration (green), and dust (red) based on data from ice cores retrieved at the Vostok drilling site in Antarctica.

Retrieved from Randy M. Russell, https://eo.ucar.edu/staff/rrussell/climate/paleoclimate/ice_core_proxy_records.html.

> t_0. High CO_2 concentrations cause global temperature variations.

Given that the correlation is real and not simply a fluke or coincidence—for the modern social scientist, it is statistically significant—we must now determine whether t_0 is the best explanation of the correlation. We must compare it to some rival explanations. Perhaps, as some skeptics have claimed, the direction of causation is reversed:

> t_1. Global temperature variations cause varying CO_2 concentrations.

This rival is probably a better account of the historical data because many believe that we see the changes in temperatures before we see changes in CO_2 level in the historical record. In addition, before the advent of the Industrial Revolution, it was hard to see what else could initiate such large-scale changes in the CO_2 concentrations.

> *It is likely that the temperature variations . . . drove the CO_2 variations, not the reverse. That might have occurred, for example, when warmer temperatures increased the rate of bacterial breakdown of plant material, releasing CO_2 to the atmosphere as it warmed. This historical relationship does not, however, refute the modern relationship of human additions of CO_2 to the atmosphere driving increases in temperature.*[3]

Why, you may ask, doesn't the "reverse cause" rival, t_1, refute the anthropogenic hypothesis? Here comes the surprise possible causal relationship between two things, *A* and *B*, that I promised earlier.

> *[One] potential explanation for the observed warming of the Earth is human activity. There are several reasons to think that this can account for some portion of the observed warming. We know that human activities have been increasing the concentration of CO_2 and other greenhouse gases in the atmosphere for at least the past century or two. Measurements show the concentration of CO_2 has increased about 30 percent over that time . . . while other greenhouse gases have increased by similar or larger amounts. Basic physics provides strong theoretical reasons to believe that such an increase in greenhouse gases should warm the Earth.*[4]

It now seems likely that the best explanation of the correlation is that the causal relationship between CO_2 and global warming actually points in both directions; increased CO_2 concentrations cause increased temperatures, and simultaneously, increased temperatures cause increases in CO_2 concentrations. We probably have a kind of *feedback loop*.

> t_2. Increased CO_2 concentrations cause increased temperatures, while increased temperatures cause increases in CO_2 concentrations.

In a way, of course, t_2 does not really contradict Gore's original causal hypothesis in t_0; it merely offers more detail about the complicated causal relationship between CO_2 and global temperatures. So in the sense that we are using the term in the inference-to-the-best-explanation (IBE) recipe, t_2 does not even count as a rival

explanation. Gore himself is very careful in how he articulates t_0.

> *It's a complicated relationship, but the most important part of it is this: When there is more CO_2 in the atmosphere, the temperature increases because more heat from the Sun is trapped inside.*[5]

Causation and Explanation

It's hard to write a chapter on causal inferences without noting that many philosophers of science believe that the notion of causation is the fundamental building block of *any* sort of explanation.

> *According to the causal model of explanation, to explain a phenomenon is simply to give information about its causal history or, where the phenomenon itself is a causal regularity, to explain it is to give information about the mechanism linking cause to effect.*[6]

We should expect to see causal reasoning deeply involved in all inferences to the best explanation.

Recall poor Connie. She noticed a correlation between two events—her boyfriend's extended absence and the lipstick stain on his collar when he returned. Almost immediately thereafter she observed a second correlation—the all-too-obvious lipstick stain and Mary Jane's lipstick being a mess. The heart and soul of Connie's inference regarding what happened is a causal account of the lipstick stain as well as the causes of the absence and Mary Jane's cosmetic disaster. The simple *A*-caused-*B* or *B*-caused-*A* accounts of the correlations all seem artificial or convoluted.

> t_1. The extended absence caused the lipstick stain.
> t_2. The lipstick stain caused the extended absence.
> t_3. The lipstick stain caused the Mary Jane's lipstick to be all a mess.
> t_4. Mary Jane's lipstick being all a mess caused the lipstick stain.

But of course, Connie knew exactly what had happened, there was a common cause of the lipstick stain, the extended absence, and Mary Jane's messed up lipstick.

> t_0. Connie's boyfriend had been smooching Mary Jane. The smooching caused the lipstick stain on his collar, as well as causing him to be gone for half an hour or more at the record hop and causing Mary Jane's lipstick to get all messed up.

Or consider Semmelweis's predicament. He recognized a correlation between his colleague's being cut while conducting an autopsy and his colleague dying with symptoms very similar to childbed fever. He was led to a straightforward causal explanation:

> t'_0. The laceration introduced cadaveric particles into his colleague's bloodstream, which then caused his colleague's death.

Almost simultaneously with this inference, he noticed the key correlation between the high death rate from childbed fever in the First Maternity Division and the fact that autopsies were routinely conducted by the physicians and medical students in the First Maternity Division.

And once again, the causal diagnosis was immediately obvious to Semmelweis:

> t″₀. Cadaveric particles from the hands of the physicians and medical students were being introduced into the bodies of pregnant women in the First Maternity Division during childbirth and gynecological examinations, and these particles were then causing the childbed fever.

A Sad Story

It's late in the afternoon. Two young men in different cars are headed home. One is a thirty-year-old professional who works for the state; we'll call him Tony. The other has just graduated from high school and is planning to attend college the coming fall; we'll call him Corey. Corey is driving well within the speed limit and approaches a stop sign. He comes to a full stop. Although he sees Tony's car coming, Corey incorrectly believes the intersection is a four-way stop, so he feels safe proceeding through the intersection. Tony is also driving well within the speed limit and having no stop sign proceeds through the intersection. The two cars collide at almost a perfect ninety-degree angle on their front ends. Corey is not hurt at all and leaves his car to check on Tony, who initially reports that he is fine too. Corey and Tony exchange contact and insurance information, and Corey heads home. Tony tries to drive home as well but discovers that the crumpled wheel well makes this impossible. After a long evening waiting for a tow truck, Tony is finally taken home by his fiancée.

Our story now focuses on Tony. A day or two after the accident, he is stiff and sore and goes to see a chiropractor he has seen before. After hearing about the crash, the chiropractor diagnoses Tony's complaints as a back injury and begins a treatment protocol based on this. His symptoms start to improve, but over the next few months, pain in his hip and leg gradually increase, and he consults his regular doctor. She suspects that Tony is suffering from some sort of hip injury and even goes on to guess it might be a labral tear. After an MRI and consulting an orthopedic surgeon, the labral tear diagnosis is confirmed. After months of more treatment with mixed success, Tony decides to have surgery to repair the torn labrum. Tony almost dies during surgery because of complications with the anesthetic, but from an orthopedic perspective, the surgery seems to be a success. His symptoms disappear, and he is virtually pain-free. After just a few months, however, Tony's symptoms begin to reappear and new surgery is planned.

Tony decides to sue Corey for his expenses—almost $100,000—and for his pain and suffering, he asked for an additional $400,000. I was chosen to serve on the jury for this civil suit. Although the story is indeed sad, sitting on this jury was something of a treat for me because I am a hopeless wannabe lawyer and because it gave me a chance to actually apply inference to the best explanation to a real-world case of legal evidence.

Our jury was not asked to assign blame, Corey had already admitted he was at fault for the accident. The plaintiff, Tony, therefore, had already established Corey was, what lawyers call, negligent, and Tony was almost certainly going to get some damages. The question was what the amount of those damages should be.

The defendant's attorney conceded that his client was liable for some of Tony's initial pain and suffering, that original trip to his chiropractor, and certainly the tow truck and body shop expenses. He argued vehemently, however, that Corey bore no responsibility, legally or morally, for extensive orthopedic surgery or the years of suffering that Tony had manifestly endured or his diminished lifestyle as a result of the labral tear because the car accident was in no way causally responsible for the injury. Tony's whole case, of course, depended on the contrary assertion that the crash had caused the labral tear and that the ensuing three years of pain and psychological suffering were the direct result of Corey's negligent driving.

The basic evidence that got this civil suit going in the first place was a classic inference from a correlation—in the first sense defined above—to a cause.

> e_1. Corey and Tony's car were involved in a collision, and shortly after (within three months), Tony was diagnosed with a labral tear.
>
> ---
>
> t_0. The collision caused the labral tear.

We can imagine reverse cause, and common cause, rival explanations:

> t_1. The labral tear occurred three weeks earlier while skiing. Tony could easily have avoided the accident by timely braking, but the loss of mobility from the hip injury prevented him getting to the brake pedal on time. Thus the tear caused the collision.
> t_2. A loud crashing sound from a construction site nearby distracted Corey and led to

> his misreading of the stop signs. It also startled Tony, and as he wrenched to see where the crash came from, he tore his labrum, and because he was distracted, he was slow to apply the brakes. Thus the loud crashing sound caused both the labral tear and the collision.

Corey's attorney wisely refrained from suggesting accounts such as these and rested his case on the null hypothesis rival explanation that something completely independent of the car accident caused the hip injury.

> t_3. The collision did not cause the labral tear; something else was its cause.

You may think that t_3 is a pretty vague rival theory, and indeed, it is. But it was probably a good trial strategy for two reasons. One is the rules for negligence suits. The plaintiff must "prove," by a "preponderance of evidence," that the defendant's negligent action (remember, Corey had already admitted that he was at fault for the accident and thus legally negligent) caused the financial and psychological loss that needs to be compensated. The defense need not, therefore, explain what did cause the injury but simply show that the generic rival is better (or even just as good) as the plaintiff's account. The second reason for keeping things vague is that Corey's lawyer could toss out hints as to what the outside cause of the tear might have been without being committed to any of these theories being a better explanation. The defense, for example, made a big deal out of Tony's own admission that he had been a very avid skier for most of his life and that the hospital records from

Tony's first surgery showed that surgeon noted a slight physiological abnormality in Tony's hip. Who knows if a lifetime of skiing caused the tear or if Tony was genetically predisposed to develop such a tear.

Our jury had to decide between two causal accounts of Tony's labral tear.

> t_0. The collision caused the labral tear.
> t_3. The collision did not cause the labral tear; something else was its cause.

We had before us some "direct" evidence—the chiropractor's notes, the records from Tony's surgery, and the towing and body shop bills. The most important evidence, though, came from expert witnesses who could tell us about crashes of this sort, the causes of labral tears, and the like. As you might suspect, the experts for the plaintiff differed quite a bit in their testimony from the experts for the defense.

> e_2. Records from Tony's chiropractor, his surgery, and the bills from the towing company and body shop
> e_3. Differing expert accounts of the accident— Was it a T-bone or sideswipe?—and the forces generated
> e_4. Differing expert accounts of Tony's chiropractic history and his visits to his chiropractor following the accident
> e_5. Differing expert accounts of how such an accident could cause a labral tear

For me, and I believe for many of my fellow jurors, the key discrepancy in the expert testimony concerned the etiology of labral tears. Tony's expert witness was a former orthopedic surgeon who testified that labral tears almost always came from traumatic forces such as athletic injuries or car accidents and almost never from general wear and tear from an active lifestyle such as Tony's. Corey's expert witness, also an orthopedic surgeon, testified to exactly the opposite. He told us that most common labral tears came from insidious causes and go undiagnosed for several years.

> e_6. Differing expert accounts of the etiology of labral tears

The entire jury was told in no uncertain terms by the judge that we were required to decide the case solely on the basis of the evidence presented in the trial and that under no circumstances were we permitted to Google anything concerned with the trial. I know that, except for that clear instruction, I would have done a little quick and dirty online research on labral tears. When I did that after the trial was over, I came to the conclusion that the truth was sort of halfway in between these two experts—labral tears often result from traumatic injuries but also occur from the slow degeneration of the hip.

I hope you will remember from chapter 9, accepting testimony, including the legal testimony of expert witnesses, involves a two-step inference to the best explanation. In our case, the evidence would look something like the following:

> e_1. What was said in the testimony
> e_2. Context—sworn testimony in a civil trial
> e_3. Relevant biography—the professional credentials of the expert

t'_0. The expert genuinely believes what he or she said in the testimony.

___

t''_0. The expert believes what he or she said because what he or she said is true.

I can only speak for myself, but I would be willing to grant the absolute sincerity of every expert we listened to; t'_0 was always my best explanation of what each witness had to say. Although I could imagine rival explanation t'_1—he or she said it because he or she was paid to say it—being the most obvious, I never really felt this was what was going on.

We know as a matter of simple logic, however, that t''_0 cannot be the best explanation of what every expert testified to, since they explicitly contradicted each other in several instances. Labral tears can't *often* be the result of insidious causes while at the same time *almost never* being the effect of them. For almost half of the expert witnesses, their sincere beliefs had to be mistaken. The key question, of course, was, Who was right and who was wrong?

EXERCISES

1. When two events, *A* and *B*, are correlated (in time and space or statistically), what are the five possible causal relationships between *A* and *B* (one of these relationships is actually not a causal one in the strict sense)?

2. Use all the steps in the IBE recipe to assess the quality of evidence in the following causal argument.

    Obviously Sarah's failure to attend the lectures caused her poor philosophy grade. She has had regular absences for the past month or so, and her grade has gone down from a B+ to a C– during that time period.

QUIZ TWELVE

Given what you know from the following online posting from Oregon Public Broadcasting, use all the steps in the IBE recipe to assess the quality of evidence for the claim that "Ms. Silva's lung cancer was proximately and directly caused and its growth promoted by her exposures to the above contaminants from the Bullseye facility."

The complete article is available online at "Terminal Cancer Patient Sues Bullseye Glass in Portland." (https://www.opb.org/news/series/portland-oregon-air-pollution-glass/oregon -portland-bullseye-glass-terminal-cancer-patient-sues/)[7]

Notes

1 Nate Silver, *The Signal and the Noise* (New York: Penguin, 2012), 187.

2 *Concise Oxford Dictionary*, 6th ed. (1976), s.v. "correlation."

3 Andrew E. Dessler and Edward A. Parson, *The Science and Politics of Global Climate Change* (Cambridge: Cambridge University Press, 2007), 59.

4 Dessler and Parson, *Global Climate Change*, 73.

5 Al Gore, *An Inconvenient Truth* (Emmaus: Rodale, 2006), 67.

6 Peter Lipton, *Inference to the Best Explanation* (London: Routledge, 1991), 32.

7 Ryan Haas, "Terminal Cancer Patient Sues Bullseye Glass in Portland," OPB, June 15, 2016, https://www.opb.org/news/series/portland-oregon-air-pollution-glass/oregon-portland-bullseye-glass-terminal-cancer-patient-sues/.

Capital Punishment and the Constitution

The death penalty remains fraught with arbitrariness, discrimination, caprice, and mistake. . . . Rather than continue to coddle the Court's delusion that the desired level of fairness has been achieved and the need for regulation eviscerated, I feel morally and intellectually obligated simply to concede that the death penalty experiment has failed.

—JUSTICE BLACKMUN, *CALLINS V. COLLINS*[1]

Arguments from Pure Principle: For and against the Death Penalty

Americans are passionately divided about capital punishment. About 55 percent say that they are in favor of the death penalty, while about 41 percent are opposed.[2] The argument that one most often hears in its support appeals to basic principles of justice. The kinds of crimes that warrant death at the hands of the state are so brutal, violent, and just plain evil that it is only reasonable that murders would pay the ultimate price. Death penalty abolitionists appeal to contrary intuitions of basic principle. They argue

that the death penalty itself is brutal, violent, and just plain evil. Yes, murder is the most serious crime and deserves the most serious criminal punishment. But opponents believe that at this stage of society's development, life imprisonment without the possibility of parole is an incredibly serious form of punishment and to go any further crosses a moral line and degrades the basic moral foundations of our society. I am far from neutral on this debate. As long as I can remember having strong moral or political stances regarding anything, I have been a passionate opponent of the death penalty.

I would be happy and indeed proud to lay out for you my reasons for thinking capital punishment is morally wrong, but that is not my intention in this chapter. I will eschew my normative case against the death penalty for three reasons. One is simple pedagogy. This is a book about practical epistemology and evidence evaluation, not contemporary moral controversies. The second is that I want to explore the death penalty, not as a moral controversy, but as a constitutional issue. One where many of the skills we have been discussing in the last few chapters are directly relevant. Perhaps my main reason for refraining from resting my abolitionist case on basic principles of justice, decency, and integrity, however, is that I have become convinced that it would not work. Oh, sure, those of you who already agree with me will applaud my insight, rhetorical skill, and moral vision. But those of you who are in favor of capital punishment are very unlikely to be won over. The same goes in reverse. Arguments appealing to retributive justice resonate well with death penalty advocates but carry very little persuasive power with those of us who are opposed on moral grounds.

I want to rest my case against the death penalty on a strategy that I have taken from Supreme Court Justice Harry Blackmun, what I have called an "argument from contingent realities." Blackmun argues that the US Constitution may very well permit the use of the death penalty in the abstract, but given certain contingent facts about contemporary society, its current application violates the Constitution. Blackmun's concern, as we shall see, is that certain facts about the American criminal justice system almost guarantee that it will be administered in such a way that it is infected with "arbitrariness, discrimination, caprice, and mistake." He places particular emphasis on the notions of arbitrariness and caprice—the fact that the very similar kinds of murders result in wildly different criminal sentences. We see very violent multiple murders not even prosecuted as death penalty cases, think of the O. J. Simpson case, while John Spenkelink, claiming sexual assault and self-defense and offered a plea bargain of a jail sentence on a second-degree murder charge, was executed. I think Blackmun was absolutely right that we continue to see arbitrary and capricious administration in capital cases. But I want to extend his argument to focus on other contingent realities. I will argue that the statistics show that a disproportionate number of defendants, and victims, in capital cases are poor and that they are members of racial minorities.

Constitutional Texts

The US Constitution is justly heralded as a *written* document. The rules of the game of national government and the rights of the citizens are laid out in a beautiful legal text. Scholars, editorial writers, and Supreme Court justices often find themselves debating what this text means and usually what it means in a specific and controversial context. In these cases, the simple model from chapter 10 immediately encounters predictable problems. Yes, there is a written text, but this text is maddeningly vague, ambiguous, and unclear, at precisely those places where the scholarly, political, or legal debates are occurring in the first place.

What does it mean to talk of "due process of law," "equal protection of the law," "cruel and unusual punishments," or "respecting an establishment of religion"? And yes, this text had an author, but in this case, that author was a collective composed of the "founders," including, but not limited to, those at the Constitutional Convention (surely Jefferson counts) as well as those who authored its amendments. And what of those responsible for voting each time ratification was required? So what do we do about cases where the authors disagreed? Their words were at times (to say the least) unclear, they are all dead now, we're not really sure who to count or not in the collective, and there must have been cases where they disagreed with one another (think of slavery).

This doesn't, at least in my mind, mean that the model of textual interpretation we developed earlier must be abandoned for the Constitution. But it does mean the model is far from simple and will likely result in many controversial interpretations for even the fairest and most conscientious user.

Precedent

It's easy enough to imagine a system where every time an issue comes before a judge, she would simply exercise her professional knowledge and render the opinion that she believed is correct. We are lucky, though, that that is not our system. Consider what it would be like to never really have an idea about how a tricky case in torts or contracts would be decided. How could you conduct business or decide on what kind of insurance to have? After all, in our imagined system, each case would be decided

afresh and depend on that judge's view of the law and justice.

The English and American common law system puts a high premium on previous decisions by other courts and judges. The doctrine of *precedent* says the earlier decisions help define what the current state of the law is. There are many complications with this simple model. For one thing, there is a hierarchy of courts in our state and federal system. And precedent is only *binding* on lower courts following the decisions of higher courts. In addition, precedent only makes sense for "similar" kinds of cases for which the same articulated "principles" apply. Obviously, there's a good deal of room for disagreement about all this. Finally, courts, at least at the same or higher level, can *overturn* precedent on the grounds that the earlier court made a mistake or that circumstances had so radically changed that the earlier principles no make sense.

Now there is no higher court than our Supreme Court, but they do make it a practice to honor earlier Supreme Court precedent. This usually happens when they choose to not even hear a case because it is *settled* constitutional law. But even in those cases they do decide to hear, there is, and I believe there should be, great deference to earlier rulings. There are occasions, however, where the Court will, and again I believe should, explicitly overturn an earlier decision.

Inference to the Best Constitutional Interpretation

The constitutional text, and what we know of its authors, provides a good deal of data that needs to be explained.

e_1. The US Constitution says . . .

e_2. This text has many authors.

e_3. We know or can infer many things about the concrete attitudes and beliefs of these authors.

e_4. We know many things about the abstract meanings of many important constitutional principles that are articulated in the text.

e_5. There is often relevant constitutional precedent for the case at hand.

The Supreme Court does not have the luxury of sitting around and asking themselves what does the Constitution mean? Their business is mainly deciding whether a particular happening— a decision in a lower court, an action on the part of a legal official, or generally what they call a *state action*—offends a specific part of the Constitution. So in addition to all the textual data, there is also data about the occurrence that is claimed to be unconstitutional.

e_6. It has been alleged that a particular state action violates the guarantees to citizens within the Constitution.

So what's the best explanation of all this? Those of you who know anything about our Supreme Court no doubt are well aware of this, but it should be acknowledged up front. The best interpretation will usually be very controversial for everyday citizens, for scholars and pundits, and also for the justices themselves. Furthermore, there seems to be a pretty clear correlation between how many of the justices interpret the Constitution and who those justices are as people—their politics and their legal philosophy. Some become very cynical about all this

and see constitutional law as simply one more political game. I prefer the view that constitutional issues are incredibly difficult and that it is inevitable not only that they be intrinsically controversial but that equally smart and dedicated professionals, as virtually every justice is and has been, can hardly avoid bringing their backgrounds and beliefs into the process.

With all that then, we can simplify the explanatory candidates to two:

t_c. The state action does not violate the Constitution—it is *constitutional*.

t_{uc}. The state action does violate the Constitution—it is *unconstitutional*.

Some Key Constitutional Text

The first sort of evidence that Blackmun needs in his constitutional case against the death penalty is the constitutional language itself.

e_1. From the Fifth and Fourteenth Amendments: "[No person shall be] *deprived of life*, liberty, or property, without *due process of law*."

e_2. From the Eighth Amendment: "Cruel and unusual punishment [shall not be] inflicted."

e_3. From the Fourteenth Amendment: "[No State shall] deny to any person within its jurisdiction the *equal protection of the laws*."

This language, as it stands, is problematic to Justice Blackmun's case against the death penalty for two reasons. The first, of course, is that the language of due process, equal protection, and cruel and unusual punishment is abstract, vague, and inherently controversial. How those

words came to be in the Constitution, a fundamentally explanatory question, is the subject of deep historical and jurisprudential debate. The interpretive question of what they mean is even more controversial. The second problem, though, is more immediate. The language of the Fifth and Fourteenth Amendments strongly suggests that persons may be deprived of life by the state without violating their constitutional rights.

To address this second problem, Blackmun should appeal to a useful interpretive distinction first introduced by Ronald Dworkin.[3] Dworkin notes that the venerable methodology of authorial or original intent is ambiguous. Consider the following: You have been elected as the very first student member of the Faculty Personnel Committee. This is a huge tribute but also a huge responsibility. Your vote will help determine who is promoted, granted tenure, and, in some sad cases, fired. You do me the great honor of scheduling a meeting with me and asking my advice about how these personnel decisions should be made. I ask you to give me the weekend to collect my thoughts and we can discuss it at the beginning of the week. Bright and early next Monday, you show up at my office door, and it's time for me to put up or shut up. Suppose my advice goes as follows.

> Personnel decisions should always be made in the best interest of the university and its students. Since we are primarily a teaching institution, being a first-rate classroom instructor is an absolute precondition for tenure or promotion. We also value scholarship, so being engaged in active and productive research is also required.

Here's the problem. My little speech is a text, and I am its author. According to authorial intent

models, the words mean what I am trying to communicate. We both know that Professor Green is up for tenure. Being indiscrete and more than a tad unprofessional, I have let some of my students know that I think Green should not be granted tenure. I believe he enjoys a great reputation as a teacher because he is showy and an easy grader. I don't believe the students learn much in his classes at all. I also think his research is a joke. He's published several articles—that's true—but mainly in clubby journals edited by like-minded colleagues. So since you ask my advice about tenure, and you know my thoughts about the concrete case of Green, if you respect my advice, you should vote against Professor Green. Right?

Well, maybe not. My text didn't talk about Green at all. It appealed to abstract notions like "best interest of the university and its students," "being a first-rate classroom instructor," and "being engaged in active and productive research." You've looked at Green's record. You think the teaching evaluations are very impressive, and he really has more publications than I do. You think it's definitely in the best interest of the institution to tenure one of its brightest young stars. Dworkin argues that words can have both an *abstract intention* and a *concrete intention*.[4] You might attempt to honor my advice by voting along the lines of my concrete intention regarding Green. But Dworkin argues, and I certainly agree, that you do more honor to my advice when you focus on the abstract considerations such as best interest, first-rate teacher, and active and productive research. Of course, to do that honestly, it becomes your responsibility to assess Green against these abstract standards. The same distinction applies to the language in the Fifth, Eighth, and Fourteenth Amendments.

e$_4$. The authors of the Fifth, Eighth, and Fourteenth Amendments concretely intended that capital punishment did not violate the Constitution.

e$_5$. The authors of the Fifth, Eighth, and Fourteenth Amendments abstractly intended that the entire criminal justice system, including capital punishment, adhere to the theoretical standards of avoiding cruel and unusual punishments and be administered with due process of law and equal protection of the law.

The past almost fifty years are replete with important constitutional precedents on the death penalty. In these five decades, we have gone from a period in our history where, though constitutional and with defendants being sentenced to death, virtually no one was being executed (1968–1972); where capital punishment as it was then administered was ruled to be unconstitutional (1972–1976); where newer laws for the administration of capital punishment were deemed to be constitutional (1976); where there was a pretty steady ascendance in executions (1981–1999) to a recent decline in executions (2000–2018). Here are some of the highlights of this tumultuous constitutional history.

Some Key Constitutional Precedent

E$_6$. *MCGAUTHA V. CALIFORNIA*
402 U.S. 183 (1971)

The constitutional issues are succinctly stated in the case syllabus.

Petitioner in No. 203 was convicted of first-degree murder in California, and was sentenced to death. The penalty was left to the jury's absolute discretion, and punishment was determined in a separate proceeding following the trial on the issue of guilt. Petitioner in No. 204 was convicted of first-degree murder, and was sentenced to death in Ohio, where the jury, which also had absolute penalty discretion, determined guilt and penalty after a single trial and in a single verdict. Certiorari was granted to consider whether petitioners' rights were infringed by permitting the death penalty without standards to govern its imposition, and in No. 204, to consider the constitutionality of a single guilt and punishment proceeding.

The defendant's attorneys argued that such systems inevitably resulted in *arbitrary and capricious* administration of the death penalty. Justice Brennan in an unchallenged characterization of the then-common standards for capital sentences characterized the situation as follows:

Capital sentencing procedures . . . are purposely constructed to allow the maximum possible variation from one case to the next, and provide no mechanism to prevent that consciously maximized variation from reflecting merely random or arbitrary choice. [Justice Brennan, dissenting.]

In spite of this, however, Justice Harlan, writing for the Court, ruled that

petitioners contend that to leave the jury completely at large to impose or withhold the death penalty as it sees fit is fundamentally lawless, and therefore violates the basic command of the Fourteenth Amendment that no State shall deprive a person of his life without due process of law. Despite the undeniable surface appeal of the proposition, we conclude that the courts below correctly rejected it.

E₇. *FURMAN V. GEORGIA* 408 U.S. 238 (1972)

The case of *Furman v. Georgia* was unusual in many respects. It initiated the one and only time in our nation's history when the death penalty was determined to be unconstitutional. It was an exceedingly close (5 to 4) ruling, with the five justices in the majority so at odds about why capital punishment was cruel and unusual punishment that the Court issued a rare *pur curium* (by the court) instead of the standard opinion of the Court authored by one or more of the justices. Still, most legal analysts see the case as raising the same issues as *McGautha*, only phrased as an Eighth Amendment concern rather than a Fourteenth Amendment due process one. Justice Stewart's reasoning is the most often seen as the relevant precedent.

> *These death sentences are cruel and unusual in the same way that being struck by lightning is cruel and unusual. For, of all the people convicted of rapes and murders in 1967 and 1968, many just as reprehensible as these, the petitioners are among a capriciously . . . selected random handful upon whom the sentence of death has in fact been imposed. My concurring Brothers have demonstrated that, if any basis can be discerned for the selection of these few to be sentenced to die, it is the constitutionally impermissible basis of race. . . . But racial discrimination has not been proved, and I put it to one side. I simply conclude that the Eighth and Fourteenth Amendments cannot tolerate the infliction of a sentence of death under legal systems that permit this unique penalty to be so wantonly and so freakishly imposed.*

E₈. *GREGG V. GEORGIA* 428 U.S. 153 (1976)

The *Gregg v. Georgia* case did three things, two of which were to the dismay of death penalty abolitionists like your author. Perhaps most significantly, it ruled that capital punishment was not, *per se*, cruel and unusual punishment under the Eighth Amendment. It also ruled that new sentencing procedures initiated after *Furman* had successfully eliminated the problem of arbitrary and capricious administration of the death penalty in Georgia. But, and this is crucial to my argument, it reinforced the basic finding of *Furman* (in many respects, this is unsurprising, since the opinion was written by Justice Stewart who was quoted previously). Justice Stewart quotes both himself and Justice White.

> *While Furman did not hold that the infliction of the death penalty per se violates the Constitution's ban on cruel and unusual punishments, it did recognize that the penalty of death is different in kind from any other punishment imposed under our system of criminal justice. Because of the uniqueness of the death penalty, Furman held that it could not be imposed under sentencing procedures that created a substantial risk that it would be inflicted in an arbitrary and capricious manner. MR. JUSTICE WHITE concluded that "the death penalty is exacted with great infrequency even for the most atrocious crimes and . . . there is no meaningful basis for distinguishing the few cases in which it is imposed from the many cases in which it is not." . . . Indeed, the death sentences examined by the Court in Furman were "cruel and unusual in the same way that being struck by lightning is cruel and unusual. For, of all the people convicted of [capital crimes], many just as reprehensible as these, the petitioners [in Furman were] among a capriciously selected random handful upon whom the sentence of death has in fact been imposed. . . . The Eighth and Fourteenth Amendments cannot tolerate the infliction of a sentence of death under legal systems that permit*

this unique penalty to be so wantonly and so freakishly imposed."

E₉. *MCCLESKEY V. KEMP* 481 U.S. 279 (1987)

Warren McCleskey was a young black man who murdered a white police officer in the course of an armed robbery. At his appeal, evidence was introduced that seemed to show that "the Georgia capital sentencing process [was] administered in a racially discriminatory manner in violation of the Eighth and Fourteenth Amendments to the United States Constitution." Justice Powell sees the racial disparities in Georgia's death sentences (since the new law following *Furman*) as falling exclusively under the Equal Protection Clause. He then finds it relatively easy to dismiss the Fourteenth Amendment challenges to capital punishment.

> *Our analysis begins with the basic principle that a defendant who alleges an equal protection violation has the burden of proving "the existence of purposeful discrimination."* Whitus v. Georgia, *385 U.S. 545, 550 (1967). A corollary to this principle is that a criminal defendant must prove that the purposeful discrimination "had a discriminatory effect" on him.* Wayte v. United States, *470 U.S. 598, 608 (1985). Thus, to prevail under the Equal Protection Clause, McCleskey must prove that the decision makers in his case acted with discriminatory purpose. He offers no evidence specific to his own case that would support an inference that racial considerations played a part in his sentence.*

We shall have occasion to look at the data the Court was considering later in this chapter, but notice at this point how differently this case was decided compared to *Furman*. In *McGautha*, the Court had ruled that potentially arbitrary and capricious sentences did not, in and of themselves, constitute a denial of due process under the Fourteenth Amendment, but in *Furman*, they ruled that these same worries about procedural unfairness did constitute a kind of cruel and unusual punishment under the Eighth Amendment. One might have thought, therefore, that even if equal protection precedent required purposeful and particularized discrimination, the Court could have found that discriminatory sentencing is even worse than arbitrary and capricious sentencing and therefore counted as a very serious form of procedural cruelty under the Eighth Amendment. This was not their reasoning, though. And it's hard for this author not to conclude that the real reason had to do with Justice Powell's recognition that racial prejudice infects all the criminal justice system.

> *McCleskey's claim, taken to its logical conclusion, [p315] throws into serious question the principles that underlie our entire criminal justice system. The Eighth Amendment is not limited in application to capital punishment, but applies to all penalties. Solem v. Helm, 463 U.S. 277, 289–290 (1983); see Rummel v. Estelle, 445 U.S. 263, 293 (1980) (POWELL, J., dissenting). Thus, if we accepted McCleskey's claim that racial bias has impermissibly tainted the capital sentencing decision, we could soon be faced with similar claims as to other types of penalty.*

E₁₀. *CALLINS V. COLLINS* NO. 93–7054 (1994)

I want to conclude this lengthy, and far from neutral, review of death penalty jurisprudence with one final case. Justice Blackmun, a moral opponent of capital punishment but an early

supporter of its constitutionality, finally decided at the very end of his career that no amount of procedural tinkering could ever elevate capital sentences to the high standards imposed by the Eighth Amendment.

> *It is virtually self evident to me now that no combination of procedural rules or substantive regulations ever can save the death penalty from its inherent constitutional deficiencies. The basic question—does the system accurately and consistently determine which defendants "deserve" to die?—cannot be answered in the affirmative.*

His eloquent and impassioned dissent from the Court's denial of *certiorari* is doomed to be just a footnote in the history of capital punishment. But he does state a succinct and clear explanation of the Constitution's language and the Court's precedent.

> t_0. The death penalty must be imposed fairly and with reasonable consistency or not at all.

I am claiming that t_0 is the best explanation of the abstract intentions of the authors of the Bill of Rights, the authors of the Fourteenth Amendment, and the emerging body of constitutional law developed over the past two hundred years. Those of you who disagree with me—and I certainly realize that many of you will—have an obligation to articulate an interpretive theory you believe better explains all this. It is a challenge that I invite you to undertake. I remain hopeful once you have tried to find a better rival, you will come to agree with me that t_0 is the most plausible. Unfortunately, we may end up disagreeing but that is hardly surprising given

the controversial nature of the constitutional text with which we have been dealing.

Statistics and the Death Penalty

I want now to continue with my case against the death penalty by arguing that both fairness and reasonable consistency are demonstrably absent. My argument to this effect will depend on the analysis of statistical evidence.

I take it that legal historians would agree with me that capital punishment has, in the past, been applied in a manner that was clearly discriminatory. We would like to think, however, that we have made some progress in the area of racial justice. That is why the following data are so disappointing.

Professor Baldus examined more than 2,400 homicide cases in the state of Georgia during the period between 1974 and 1979. The dates are significant because the Georgia murder stature had been rewritten after *Furman v. Georgia* in order that death sentences not be administered in a "random and capricious manner." Here's a brief summary of what Professor Baldus discovered:

RACE	DEATH SENTENCE	PERCENTAGE
KILLER/VICTIM		
Black/white	50 of 223	22%
White/white	58 of 748	8%
Black/black	18 of 1443	1%
WHITE/BLACK		
Total by victim	2 of 60	3%
White	108 of 981	11%
Black	20 of 1503	1%

The original Baldus study controlled for more than two hundred nonracial variables such as

the defendant's record and the severity of the crime. When all the data were considered, the study concluded that murderers of white victims were 4.3 times as likely to receive the death penalty. Justice Brennan expressed this correlation in characteristically vivid language.

At some point in this case, Warren McCleskey doubtless asked his lawyer whether the jury was likely to sentence him to die. A candid reply to this question would have to tell McCleskey that few of the details of the crime or of McCleskey's past criminal record were more important than the fact that his victim was white. Furthermore, counsel would feel bound to tell McCleskey that defendants charged with killing white victims in Georgia are 4.3 times as likely to be sentenced to die as defendants charged with kill blacks.[5]

I have discussed the *McCleskey* case with hundreds of students in the last several years. Many simply refuse to accept the following data.

> e_{11}. When controlled for over two hundred non-racial variables such as the defendant's record and the severity of the crime, the Baldus study concluded that murderers of white victims were 4.3 times as likely to receive the death penalty.

It is, of course, true that life in the inner city is different from life in the suburbs and that black culture is in many ways different from white culture. The shocking figure that more than four times as many murderers of whites receive the death penalty takes all that into account. I know some of you will continue to believe that "statistics always lie." But the very same

techniques that tell us that cigarette smoking causes cancer or that so-and-so will win next month's election tell us that the connection between race and the death penalty in Georgia is for real. Thus the question before us is producing an explanation of why this correlation holds. There is no big mystery about the reason for this disparity. The original study contained the crucial data.

> e_{12}. District attorneys ask for a capital sentence in 70 percent of the cases involving a black defendant and a white victim. When the victim is black and the defendant is white, however, a mere 19 percent are even prosecuted as capital cases.

In one sense, the Baldus study's database is not a sample at all but an analysis of the entire population of homicides in Georgia from the time the state rewrote its aggravated murder statute in response to *Furman v. Georgia* to the conclusion of the study in 1979. For the purposes of the *Gregg* trial, this was ideal, since it was the laws and behavior of legal officials in Georgia that were at issue. But Justice Blackmun, and certainly yours truly, believe that capital punishment, in general, is discriminatory. We can treat the Baldus study as telling us something about the death penalty in this country.

> t'_0. Capital punishment in the United States is administered in a racially discriminatory manner.

Such an explanation of the data in the Baldus study immediately invites two rival explanations that raise very different issues of bias.

> t'_1. All the data comes from a state in the Deep South where there is a long history of racial discrimination.
> t'_2. All the data comes from the late 1970s, racial discrimination has greatly dissipated in the ensuing two generations.

I concede that these are legitimate counter-arguments, but I still believe that t'_0 is the best explanation. It's true that gathering all one's data from a single state or region of the country is a less-than-ideal polling technique, but sometimes one has to take the data that are available. Remember that medical researchers took the Framingham data very seriously, even though all of it came from the Northeast. As for the claim that attitudes about race have greatly improved since the latter half of the 1970s, I am of two minds. I would like to believe that your generation, and your parent's, is less racist than those who came of age in the '40s, '50s, '60s, and early '70s. I think there is some evidence for this. But at the same time, one need only turn on the TV or radio and be aware of what is going on in our country right now to see that whatever improvements we see with respect to race, we still have a hell of a long way to go.

My main reason for continuing to support t'_0, however, is that the Baldus study is not all the data that is available. In 1990, the United States General Accounting Office released a report, "Death Penalty Sentencing: Research Indicates a Pattern of Racial Disparities," that reviewed research from across the entire county. Here is their summary of their findings.

Our synthesis of the 28 studies shows a pattern of evidence indicating racial disparities in the charging, sentencing, and imposition of the death penalty after the Furman *decision.*

In 82 percent of the studies, race of the victim was found to influence the likelihood of being charged with capital murder or receiving the death penalty, i.e., those who murdered whites were found to be more likely to be sentenced to death than those who murdered blacks. This finding was remarkably consistent across data sets, states, data collection methods, and analytic techniques.[6]

A Causal Explanation of the Correlation

In *Furman*, the Supreme Court was concerned with the arbitrary and capricious actions of trial judges and particularly juries. It appears now, however, that the judgments, both arbitrary and prejudicial, of other legal officials are even more problematic. An obvious explanation of the Baldus data is the following.

> t''_0. The race of the murder victim causally influences the decision whether to seek the death penalty.

Given my earlier interpretation of the Eighth Amendment, this account of the murder statistics in Georgia seems to demand that the Supreme Court declare capital punishment, at least in the state of Georgia, to be unconstitutional.

As I hope by this point you are all already thinking, the crucial question is whether t_0 is really the best explanation. I, personally, cannot see any way that this could be a case of "reverse causation." Thus I reject any possibility that the following needs to be considered at all:

> t''_1. The decision to seek the death penalty causes the race of the victim.

I, also, find it pretty hard to explain the Baldus study results as simply a "statistical fluke." Such things are always possible, but modern statistical analysis guarantees us that they are exceedingly unlikely. Consequently, the following is also very low on my plausibility ranking:

> t''_2. It's just a coincidence that victims' race "correlated" with capital sentences in Georgia.

The only serious competitor I can imagine, therefore, is that there is some unnoticed "common cause" that is independently responsible for both the race of the homicide victims and the fact that their murderers received the sentences they did. The Baldus team tried to think of some of the possible factors in their original evaluation of the data. That's what they were up to when they performed the statistical tests that "controlled for over two hundred nonracial variables." Even when they did this, it turned out that murderers of white victims were 4.3 times as likely to receive death sentences. Maybe something else is responsible for the correlation, but we have yet to see what it is. Hence I am willing to take the following seriously as a potential rival explanation.

> t''_3. Some unidentified nonracial factor is responsible for the correlation of victim race and death sentences.

Since we have yet to even think of what this nonracial factor might be, I admit its possibility but rank it significantly lower than the causal explanation in t''_0.

Some Other Contingent Realities

My argument, so far, has depended on two contingent realities, and so, even if the Constitution permits capital punishment in the abstract, given the world we live in, the death penalty still remains arbitrary and capricious and, in at least some cases, racially prejudicial and is therefore unconstitutional. But there are at least two other contingent realities that make capital punishment even more constitutionally problematic.

I believe passionately that the Baldus study, and the others surveyed in the Government Accountability Office (GAO) report, tells us that racial prejudice plays a huge causal role in who receives the death penalty and who is executed. But I think that there may be other causal factors at work as well. Our nation does not gather data regarding socioeconomic class; we seem to believe that we are a "classless" society. Were such data readily available, I am quite certain it would show an even stronger correlation between poverty and the death penalty than the one we saw in the Baldus study. I am convinced that poor people are treated by the criminal justice system as second-class murder victims, just as we have seen minorities are. But I am also convinced that the death penalty is also a "poor man's punishment."[7] Those with the financial resources to hire first-class criminal lawyers, and make the state's murder trial very expensive, have a much greater chance of having their charges plea bargained down to a noncapital sentence.

The last contingent reality I want to mention seems to be actually changing some people's minds as an argument against the death penalty and changing the minds of some public officials such as governors. We now have a record of

several cases where defendants are potentially liable for capital charges, and in some cases, defendants charged and convicted in capital trials have subsequently been shown to be innocent for the crime they were charged with.[8] Some of us believe that demonstrably innocent prisoners have actually been executed.[9] The mere possibility that innocent defendants might be executed is certainly a worry that the current criminal justice system invites.

EXERCISES

1. What do you think is the strongest argument, moral or constitutional, in favor of the death penalty?
2. What do you think is the strongest argument, moral or constitutional, against the death penalty?
3. Why do so many studies show a consistent correlation between race, either of the victim or of the defendant, and capital sentences?

QUIZ THIRTEEN

In this chapter, I make a sustained argument that capital punishment, as it is now administered in our country, violates the Constitution. My argument depends on evidence for an interpretation of the Constitution, on evidence provided in a detailed statistical analysis of the death penalty (the Baldus study), and on a causal explanation of that statistical data. Your task is to assess the quality of the evidence that I marshal in defense of my thesis. You will need to utilize the tools of inference to the best explanation for an assessment of my evidence for the constitutional interpretation as well as the inference from a sample to a population and the inference from a correlation to a cause.

Notes

1 Callins v. Collins, 510 U.S. 1141 (1994). Justice Blackmun, dissenting.
2 Death Penalty Information Center, "Public Opinion about the Death Penalty," https://deathpenaltyinfo.org/public-opinion-about-death-penalty.
3 Ronald Dworkin, *A Matter of Principle* (Cambridge, MA: Harvard University Press, 1985), 48–55.
4 Dworkin, 48–55.
5 McCleskey v. Kemp, 481 U.S. 279 (1987). Justice Brennan, dissenting.
6 US General Accounting Office, *Death Penalty Sentencing: Research Indicates Pattern of Racial Disparities* (Washington, DC: General Accounting Office, 1990), https://www.gao.gov/assets/220/212180.pdf.
7 See, for example, J. Johnson and C. Johnson "Poverty and the Death Penalty," *Journal of Economic Issues* 35 (2001): 1–7; and S. Bright, "Counsel for the Poor: The Death Sentence Not for the Worst Crime but for the Worst Lawyer," *Yale Law Journal* 103, no. 7 (1994): 1835–83.
8 See Michael Radelet, Hugo Adam Bedau, and Constance Putnam, *In Spite of Innocence* (Boston: Northeastern University Press, 1992).
9 See John C. Tucker, *May God Have Mercy* (New York: W. W. Norton, 1997).

Evidence, Explanation, and Narrative

Examining law as narrative and rhetoric can mean many different things: examining the relation between stories and legal arguments and theories; analyzing the different ways that judges, lawyers, and litigants construct, shape, and use stories; evaluating why certain stories are problematic at trials; or analyzing the rhetoric of judicial opinions, to mention just a few particulars. But as a matter of general outlook, treating law as narrative and rhetoric means looking at fact more than rules, forms as much as substance, the language used as much as the idea expressed (indeed, the language used is seen as part of the idea expressed).

—PAUL GEWIRTZ[1]

Legal Storytelling

I am much taken these days with a trend in legal scholarship that I believe has direct relevance to the themes we are developing in this book. We have been concerned with notions of good reasoning and good evidence. Legal academics spend a good deal of time analyzing these concepts in the very specific context of the law. Consider, for example, the definition of legal reasoning put forward by Lief Carter:

In a nutshell, legal reasoning describes how effectively an opinion's blend of case facts, prior law, social background facts, and moral values create a legal outcome that makes some plausible sense of the moral and empirical world we know.[2]

This definition of legal reasoning seems overly narrow. Certainly, understanding how to unpack and evaluate appellate court opinions is an import legal skill and deserving of careful scholarly attention (we did a bit of this in analyzing Justice Blackmun's understanding of the death penalty and the Constitution). But as Carter certainly knows, appellate court judges are not the only legal reasoners. Trial lawyers

reason, as do their audiences—juries. Trial court judges reason. And academic lawyers, and a host of other legal scholars, reason. And sadly, not all legal reasoning counts as good legal reasoning. What is needed is something like a logic of legal reasoning. A surprising humanistic partnership of philosophy, particularly the philosophy of science, as well as literary theory, particularly narratology, offers a promising outline of just such a logic of legal reasoning. As you might have guessed, I believe that inference to the best explanation (IBE) forms the foundation of such a legal logic.

One view of legal storytelling sees it candidly as a method for presenting an argument.

> *The goal of storytelling in law is to persuade an official decision maker that one's story is true, to win the case, and thus invoke the coercive force of the state on one's behalf.[3]*

And many academic lawyers explicitly endorse IBE as the internal logic of the arguments that lawyers produce at trial.

> *The process of inference to the best explanation itself best explains both the macro-structure of proof at trial and the microlevel issues regarding the value of particular items of evidence. . . . The probability-based accounts, rather than being an alternative, are parasitic on the more fundamental explanation-based considerations.[4]*

This nicely captures my portrayal of the trial between Tony and Corey, and we will use IBE and legal narrative as a way of looking at a couple more murder trials directly.

As much as I admire the storytelling movement in the law, many of its most strident champions endorse a view of legal narrative that I find deeply problematic. Consider the following very useful summary paragraph by two thoughtful and sympathetic critics.

> *Many advocates of storytelling explicitly contrast rational argument and the more directly emotive power of stories. As Gerald Lopez tells us, "Stories and storytelling de-emphasize the logical and resurrect the emotive and intuitive." The "epistemological claim" of feminist narratives, according to Kathryn Abrams, is that there are ways of knowing other than "scientific rationality." Radical feminist scholars—especially those using narrative as a methodology—thus reject the linearity, abstraction, and scientific objectivity of rational argument. Mari Matsuda similarly recommends noncognitive ways to know the good.[5]*

I contend that these views are fundamentally mistaken. Now I certainly concede that stories can, and often do, reach intended audiences in ways that cold, structured syllogisms may not. I also grant that human emotion plays a significant role in our ability to understand and successfully navigate the physical and social world. But none of this shows that there is not an underlying logic to successful storytelling. Indeed, I will be arguing that this logic has remarkably close connections to "scientific rationality," and rather than being "noncognitive," it is (while not exactly demonstrating "linearity, abstraction, and scientific objectivity") highly structured and promises in many cases, if not objectivity, at least reliable intersubjectivity.

O. J. Simpson

Paul Thagard offers a quick and dirty summary of the prosecution's case in the O. J. Simpson trial.

At first glance, the evidence that O. J. Simpson was guilty of the murder of his ex-wife was overwhelming. Shortly after the time that the murder took place, he caught a plane to Chicago carrying a bag that disappeared, perhaps because it contained the murder weapon and bloody clothes. Police who came to Simpson's house found drops of blood in his car that matched his own blood and that of Ron Goldman. In Simpson's back yard, police found a bloody glove that was of a pair with one that was found at the scene of the crime, and they found a bloody sock in his bedroom. Simpson had a cut on his hand that might have been caused by a struggle with the victims who tried to defend themselves. Moreover, there was a plausible motive for the murder, in that Simpson had been physically abusive to his wife while they were married, and was reported to be jealous of other men who saw Nicole after the divorce.[6]

The state's evidence looks like this:

> e_1. The plane flight and missing bag
> e_2. The blood in Simpson's car matching his and Ron Goldman's
> e_3. The bloody glove and sock at Simpson's house
> e_4. Matching glove at the murder scene
> e_5. Simpson's history of jealousy and abuse

And of course, they are asking the jury to accept their explanation of all this data:

> t_0. O. J. Simpson murdered Nicole and Ron Goldman.

Simpson's attorneys get their say, as well.

The first task of the defense lawyers was to generate an alternative explanation of who killed Nicole Simpson and Ron Goldman. Based on Nicole's known history of cocaine use, they hypothesized that she was killed by drug dealers . . . In order to explain the circumstantial evidence linking O. J. to the crime scene, including the bloody car, glove and sock, the defense contended that the items had been planted by Los Angeles Police Department officers determined to frame Simpson for the crime.[7]

They offer some additional evidence:

> e_6. Nicole's history of cocaine use
> e_7. Mark Furman's history of racist behavior

And they propose a rival explanation of all the evidence.

> t_1. Drug dealers murdered Nicole and Ron Goldman, and officers for the Los Angeles Police Department framed O. J.

The jury gets the complete case:

> e_1. The plane flight and missing bag
> e_2. The blood in Simpson's car matching his and Ron Goldman's
> e_3. The bloody glove and sock at Simpson's house
> e_4. Matching glove at the murder scene
> e_5. Simpson's history of jealousy and abuse
> e_6. Nicole's history of cocaine use

e_7. Mark Furman's history of racist behavior

IBE can potentially lead us astray at this point. It appears that the jury must decide between the two competing explanations that the attorneys have proffered:

t_0. O. J. Simpson murdered Nicole and Ron Goldman.
t_1. Drug dealers murdered Nicole and Ron Goldman, and officers for the Los Angeles Police Department framed O. J.

This is mistaken on two counts. First, the jury should be considering, not the quite detailed rival explanation offered by Simpson's attorneys, but one that is spectacular in its vagueness and generality.

t_2. O. J. Simpson did not murder Nicole and Ron Goldman.

Now the jury will undoubtedly be troubled by the state's physical evidence and the well-established motive, so the defense needs to sow the seeds of doubt, which the more detailed account of drug dealers and a racist frame does so well. But Simpson is innocent until proven guilty, so the real rival is any account where he is in fact innocent. But even if we grant that t_0 is a better explanation than t_2, this will only show that the state has evidence that he is guilty, not that they have proven it *beyond a reasonable doubt*.

Abe and His Daughter

The case involved a businessman named Hamilton who had taken out a life insurance policy on his partner ten days before the partner was gunned down by a professional hit man. The district attorney (DA) was finding it easy to persuade the jury that the timing could not possibly be coincidental, and Abe had been racking his brain for an answer. Emma [Abe's seventeen-year-old daughter], finding that she simply couldn't get his attention, had decided to try to help him figure out a common-sense rebuttal to the DA's circumstantial case.

And she had.

"Daddy," she said, popping into his office late one night, "the answer is Chekhov."

"Why Chekhov?" Abe asked, his head still buried in the books.

"Because Chekov once told an aspiring dramatist that if you hang a gun on the wall in the first act, you had better use it by the third act. We read it in lit class."[8]

Alan Dershowitz is a first-class storyteller. His little anecdote about Abe and Emma is used to remind readers that narrative devices and expectations can have undesirable legal consequences. It is easy to read his essay as a subtle indictment of the legal narrative project. I think, however, that Abe and Emma teach us not to eschew law as narrative but to keep in mind that the best narratives will sometimes be messy, unexpected, and even defy simple narrative rules like Chekhov's. The DA told a plausible enough story about Hamilton. We are not privy to all the details in the story, but we can guess that they involved facts about Hamilton's relationship to his partner and perhaps information about Hamilton's finances. The key dramatic element, though, is the weird timing. A (large?) life insurance policy is taken out on the partner, ten days later the partner is gunned down. Obviously, Hamilton hired the hit man so that he could collect on the policy. Abe, however, tells

a very different story. Life is complicated and filled with coincidences.

He'd convinced the jury not to look at the Hamilton case as if it were a made-for-TV-movie, but rather as a slice of real life, full of irrelevant actions and coincidences. He'd asked the jurors how many of them had taken out life insurance on a loved one and what their neighbors would have thought if the loved one died shortly thereafter.[9]

Both the DA and Abe were not just telling stories; they were arguing a case before a jury. Let us assume that the facts were not in dispute and looked something like the following:

e_1. Hamilton and his partner had a strained personal and professional relationship.
e_2. Hamilton had recently encountered severe financial problems.
e_3. Hamilton had recently taken out a sizable life insurance policy on his partner.[10]
e_4. Ten days later his partner was gunned down by a professional hit man.

From the inference-to-the-best-explanation paradigm, the DA and Abe offer competing explanations.

t_0. Hamilton hired the hit man to gun down his partner so that he could collect on the life insurance.
t_1. Hamilton had nothing to do with his partner's murder. It was pure coincidence that the murder occurred so closely to the newly acquired life insurance policy.

Perhaps you're like me and are not quite sure which of these explanatory stories is the best.

I think that if I were the DA, I'd have asked the police for more investigation before bringing the case to trial. The standard in a murder trial like this is that the evidence must show that the defendant is guilty *beyond a reasonable doubt*. That means not only that t_0 must be a better explanation than t_1 but that it must be much, much, much better.

Stories That Make Sense of Things

Perhaps the most obvious question in this entire book is what exactly is an explanation in the first place? Science has long struck philosophers as a kind of paradigm of good reasoning. IBE comes directly from the philosophy of science and has been treated not only as a model of scientific evidence but as scientific discovery as well. Likewise, some of the most significant models of explanation come from the natural sciences and philosophers seeking to model scientific thinking.

We need to begin by noting that explanations are the result of things we *do*. We explain things. Little Johnny is an inquisitive kid. He asks a lot of questions: "Why do I have to go to bed now?" "Why was Aunt Jane so mad?" "Why do stars 'twinkle'?" Sometimes we decline to really answer his questions: "Because I said so!" "That's grown-up stuff; you wouldn't understand." "Gee, that's a good question—I don't know." Other times, however, we do him the courtesy of responding in as truthful and informative way as we can: "You have to get up early tomorrow, and besides, I need the rest now." "Well, I think you hurt her feelings." "It's complicated, but it has to do with light being refracted in the atmosphere." So what exactly is involved when

we respond to Johnny in these latter, more helpful ways?

Johnny asked questions about what was going on—his bedtime, Aunt Jane's anger, and the twinkling stars. Connie implicitly asked a big question too—How'd that lipstick stain get there? We considered similar implicit questions about the car outside Joe's bar, the observed red shifting, the identical exams, and those last two songs I heard traveling back from Portland. Might this suggest that explanations have to do with asking and answering questions? I believe this is the real key to understanding what an explanation is, and many philosophers agree with me.

> *An explanation is not the same as a proposition, or an argument, or a list of propositions; it is an* answer. *(Analogously, a son is not the same as a man, even if all sons are men, and every man is a son.) An explanation is an answer to a why-question. So, a theory of explanation must be a theory of why-questions.*[11]

Mary Ann and Wanda

In the 1990s, the songwriter Dennis Linde wrote a controversial song about friendship, spousal abuse, and murder, "Goodbye Earl."

> Lyrics to "Goodbye Earl" can be found here: https://www.azlyrics.com/lyrics/dixiechicks/ goodbyeearl.html. The Dixie Chicks performing the song can be found here: https://www .youtube.com/watch?v Gw7gNf_9njs.html.

The story told in the song is actually quite complicated, almost like a good short story or even a novel. In a nutshell, we meet Mary Ann and Wanda, high school best friends. After graduation, Mary Ann leaves town, and Wanda enters a sad relationship that culminates in marriage to a loser named Earl. Earl is violent and consistently batters Wanda. Wanda decides to divorce Earl and gets a restraining order. Unfortunately, Earl ignores it and assaults Wanda so severely that she ends up in intensive care. She calls her friend who immediately flies in and visits her in the hospital. There they decide that the only thing to do is to murder Earl. They subsequently poison him and dump his body in the lake. The police investigate but not with much enthusiasm. And the ladies, without a trace of guilt, buy some land and start a business and apparently live happily ever after.

My reason for telling you all of this is the plan that Mary Ann and Wanda cooked up in intensive care—Earl had to die! What were their reasons for thinking this? It's easy to schematize some of their central reasons.

> e_1. It wasn't two weeks after she got married that Wanda started gettin' abused.
> e_2. She finally got the nerve to file for divorce.
> e_3. Earl walked right through that restraining order and put her in intensive care.
>
> ---
>
> t_0. Earl had to die.

In this little argument, the ladies' reasons seem to function something like the reasons for Connie's suspicion did. They seem to provide evidence in support of their theory about what had to be done. But there are important differences as well. Connie's theory was about what had happened. Her method was akin to a police detective's or a historian's or a scientist's. Mary Anne and Wanda's

theory is not about what happened but about the right course of action in the circumstances.

There is a crucial difference between the two arguments that any devotee of inference to the best explanation will note. The second bit of reasoning is not explanatory in the same way the first is. The smooching hypothesis explains the lipstick stain, the extended absence from the record hop, and the boyfriend's lame excuse. The Earl-has-to-die hypothesis doesn't even attempt to explain the pattern of abuse, the divorce, the restraining order, or the assault. This would seem to indicate that inference to the best explanation will be of little use in deciding whether Mary Anne and Wanda's reasons were strong enough to justify the murder.

For many years, I would have completely agreed with this sentiment. I would have insisted that IBE was useful to the police in investigating what happened to Earl or even in understanding the origins of the ladies' beliefs about what had to be done but that a different kind of argument was needed to attempt to justify their action. Now, I'm not so sure. There are important similarities between the two stories. Connie's story offers an explanation of what happened. We deem her diagnosis reasonable because we judge her story as superior to alternative stories about what happened—the laundry detergent story or the revenge narrative. Although the normative recommendation regarding Earl is not an explanation of any of the facts, the whole story does offer an account of what the ladies did and why they think they were normatively justified. So it seems relevant to ask whether the Earl-has-to-die story is superior to other stories that friends, loved ones, counselors, lawyers, and the like would have no doubt spun had the ladies given them a chance.

Geneva and *Brown v. Board of Education*

Consider a story that might have been a synopsis of a movie—a mystery, a science-fiction story, a satirical sci-fi movie such as *Get Out*—or something more literary like a short story or novel.

The black students, every one of them, had vanished on the way to school. Children who had left home on foot never appeared. Buses that had pulled away from their last stop loaded with black children had arrived at schools empty, as had the cars driven by parents or car pools. Even parents taking young children by the hand for their first day in kindergarten or in preschool had looked down and found their hands empty, the children suddenly gone.[12]

But the quote actually comes from a scholarly discussion of race, law, and the famous *Brown v. Board of Education* case. Why would a respected constitutional scholar tell such a crazy story? Richard Delgado and Jean Stefancic diagnose three related reasons that *critical race theorists* employ legal narrative. They allow for an "Opening [of] a Window onto Ignored or Alternative Realities."[13] In addition, legal storytelling gives scholars a way of "Counterstorytelling."[14] And finally, they provide a "Cure for Silencing."[15] These are all important and noble academic undertakings. But I fear Delgado and Stefancic have left out the most obvious and important reason Derrick Bell constructs his stories. He does not simply desire to give voice to perspectives that have been silenced nor present an alternative reality nor even, though this gets closer to his underlying motivation, does he modestly present a counterstory to the received interpretation of *Brown v. Board of Education*. I take him to

be advocating and arguing that his view of *Brown* is superior to the received view.

It is worth pausing to consider the elaborate narrative structure that Bell uses to construct the stories in *And We Are Not Saved*. His two main characters are an unnamed narrator (who bears an uncanny resemblance to Derrick Bell himself) and a somewhat magical colleague named Geneva Crenshaw. Each story begins with a "chronicle." Sometimes the chronicle is dependent on Geneva's magical powers, as in "The Chronicle of the Constitutional Contradiction," where she travels back in time to address the Constitutional Convention and warn them of dire consequences, and moral disgrace, of enshrining the institution of slavery in the Constitution. Other chronicles, like "The Sacrificed Black Schoolchildren," are naked allegories that Bell refers to as "fairy tales." Following each chronicle, there is an extended discussion of the chronicle between the narrator and Geneva. The stories, thus, blend fantasy and the time-honored philosophical trope of fictional dialogue.

The narrative of the disappearing (or sacrificed) black school children and the ensuing dialogue are used to critique the accepted reading of *Brown* as a historical and constitutional triumph. Geneva argues that the Court's rejection of legal segregation had more to do with whites' interests, as a result of the Cold War and our nation's international reputation, than it did in achieving moral and constitutional justice for black schoolchildren. She also argues that the sad history of public education since *Brown* demonstrates a failure to achieve anything remotely close to equal public education. She advocates for a very different decision and gives voice to what she believes the Court should have ruled:

1. *Even though we encourage voluntary desegregation, we will not order racially integrated assignments of students or staff for ten years.*
2. *Even though "separate but equal" no longer meets the constitutional equal-protection standard, we will require immediate equalization of all facilities and resources.*
3. *Blacks must be represented on school boards and other policy-making bodies in proportions equal to those of the black students in each school district.*[16]

Geneva's evidence has a familiar structure:

e_1. "The Supreme Court's decision in *Brown v. Board of Education* should be seen as furthering the nation's foreign and domestic interests. . . ."[17]

e_2. The history of desegregation in St. Louis (and many other districts) where *Brown* was first resisted and the fact that when finally ordered to desegregate, these districts used the newly increased funding to improve largely white schools

e_3. The harm to black students who were bussed to largely white schools

e_4. The many excellent black schools that were destroyed by *Brown*

e_5. The blatant inequality and de facto segregation that still exists in many school districts

t_0. The Court should have ruled as Geneva suggests.

This argument looks much more like the one prosecuted by Mary Ann and Wanda than the

cases made in the O. J. Simpson trial or by Abe. The recommended ruling in *Brown*, indeed Bell's entire reading of the case, does not explain, at least in a scientist's or detective's sense, any of the evidence. And just as we needed a standard to judge the evidential success or failure of all these arguments, we need a standard with which to assess Geneva's evidence.

Fabula and Sjuzet

Here comes some highfalutin technical terminology. It comes from (yet some more jargon) narratology: "The branch of knowledge or literary criticism that deals with the structure and function of narrative and its themes, conventions, and symbols."[18] Literary critics in the Russian formalist tradition distinguished between the basic bare bones of the story, or the plot, and the way the story was told. The story, or narrative, they labeled the *fabula*; the specific telling of the story, its narrative discourse, they called the *sjuzet*. The same story regarding a day's worth of action can be told in a single sentence proceeding forward or backward and from a first-person or a third-person point of view.

> *When I woke up, I packed two loaded guns and a ski mask, drove to the bank, robbed it, and was back in time for dinner.*

> *I was back in time for dinner, having robbed the bank to which I had driven with a ski mask and two loaded guns just after my nap.*

> *He loved that old familiar, yet always strangely new, sensation of being someone else inside his ski mask, a pistol in each hand, watching the frightened teller*

count out a cool million. Nothing like it to wake a guy up. Nothing like it to give him a good appetite.[19]

A single fabula and three very different sjuzets.

This distinction has obvious relevance to academic lawyers. Trial lawyers don't just present facts for juries to consider; they tell them stories. The facts were not in much dispute in the O. J. Simpson trial nor in the case of Hamilton and his partner. It's not just that the Los Angeles County District Attorney's Office and O. J.'s "dream team" told different stories by offering alternative explanations of the facts; they told them in very different ways to the jury. Many scholars believe that O. J. was acquitted because his lawyers were better storytellers. We know that Abe's ability to tell his story effectively was instrumental in getting Hamilton off: "After he'd won, several jurors told him that his TV argument turned them around."[20] The Dixie Chicks do a pretty good job of telling Mary Ann and Wanda's story. But I'm pretty skeptical of their judgment that Earl had to die. When I've tried to tell my rival narrative to students, I have to not only add some reminders about the dangers of vigilante justice but carefully frame my remarks so that I don't sound indifferent about the seriousness of domestic abuse nor naïve about the protection that the criminal justice system can provide for Wanda. I can tell you firsthand that talking to students about global warming, the death penalty, *Brown v. Board of Education*, or Mary Ann and Wanda requires every bit as much attention to the sjuzet of my story as to its fabula.

I have a dear friend who truly despises all talk of narrative in the context of political arguments. He believes that the facts should speak

for themselves and that rational people should be able to agree on what the facts tell us. I wish that were true, but I doubt that it is. It's not just in the law or political theory that the way a story is told is relevant to whether the story convinces its audience. This is often the case in science, scholarly disagreements, and family arguments over Thanksgiving dinner.

Inference to the Best Narrative

As we saw with Mary Ann and Wanda, and with Derrick Bell and Geneva, we often offer evidence for theories or positions that don't explain any of the data provided in the evidence. We offer the prediction that global warming will continue to increase. We defend it with evidence from basic physics and chemistry, the historical record, and the testimony of respected scientists. But the prediction doesn't explain any of this. Derrick Bell offered a constitutional analysis of *Brown v. Board of Education*, but this analysis doesn't explain the history of race in this country nor what happened, and what did not happen, in the years since *Brown* was decided. Mary Ann and Wanda offer a moral justification for murdering Earl, but this justification doesn't explain the abuse, the divorce, or the assault. It would be nice to have a general tool for evaluating evidence in these kinds of arguments.

So how might we do this? I have already suggested that we can capture much of the structure of the reasoning that seems to unite Connie's diagnosis, and Mary Anne and Wanda's proposed course of action, by treating both their arguments as narratives (i.e., stories) that attempt to "make sense" of the relevant facts.

We have seen that inference to the best explanation rests on a comparative procedure where we evaluate the success of competing explanatory stories. How are we to accomplish this? You will remember that at the beginning of chapter 5, we considered Gilbert Harman's answer to this question:

In making this inference one infers, from the fact that a certain hypothesis would explain the evidence, to the truth of that hypothesis. In general, there will be several hypotheses which might explain the evidence, so one must be able to reject all such alternative hypotheses before one is warranted in making the inference. Thus, one infers, from the premise that a given hypothesis would provide a "better" explanation for the evidence than would any other hypothesis, to the conclusion that the given hypothesis is true.[21]

I believe we can extend Harman's method to encompass not just straightforwardly explanatory stories such as Connie's but also normative stories such as Mary Ann and Wanda's and Geneva Crenshaw's. We arrive at a kind of comparative reasoning I am calling *inference to the best narrative*. Notice how nicely the concept of story replaces hypothesis, and making sense can be substituted for explanation.

In making this inference, one infers from the fact that a certain *narrative* would *make sense of* the *reasons* to the *truth* of *the story*. In general, there will be several *narratives* that might *make sense of* the *reasons*, so one must be able to reject all such alternative *narratives* before one is warranted in making the inference. Thus

one infers from the premise that a given *narrative* would *make better sense of the reasons* than would any other *narrative* to the conclusion that the given *true*.

Just as with inference to the best explanation, we face the obvious question of what are the criteria for one normative narrative to be better than another.

EXERCISES

1. Why do the narratives about Hamilton and his partner invite the use of IBE to determine the quality of the evidence each lawyer presents for what happened, but the narratives about Wanda and Earl seem to preclude the use of IBE as a tool for assessing what Mary Ann and Wanda should do?

2. Who is Geneva Crenshaw? How does she fit into the material in this chapter?

3. What is the difference between fabula and sjuzet? Is this distinction helpful to understand the success or failure of an argument?

QUIZ FOURTEEN

Here are two narratives about immigration and the Deferred Action for Childhood Arrivals (DACA) program and the proposed DACA bill. Use "inference to the best narrative" to determine the quality of evidence each author has for his or her narrative. Which narrative make the most sense of things as you understand them. Feel free to do a little research and inform yourself a little more about the DACA debate and indeed the whole immigration debate. Also feel free to offer your own rival narrative about all this.

Narrative One: "I'm a Dreamer. I'd Have Nothing If It Weren't for DACA," http://fortune .com/2017/09/21/daca-dreamer-immigration/.[22]

Narrative Two: "Paul Ryan to Push DACA Amnesty for Millions of Illegal Aliens before Leaving Congress," https://www.breitbart.com/politics/2018/04/13/paul-ryan-to-push-daca-amnesty-for -millions-of-illegal-aliens-before-leaving-congress/.[23]

Notes

1 Paul Gewirtz, "Narrative and Rhetoric in the Law," in *Law's Stories*, ed. Peter Brooks and Paul Gewirtz (New Haven, CT: Yale University Press, 1996), 3.

2 Lief H. Carter, *Reason in Law*, 5th ed. (New York: Longman, 1988), 4.

3 Gewirtz, "Narrative and Rhetoric," 5.

4 Michael S. Pardo and Ronald J. Allen, "Juridical Proof and the Best Explanation," *Law and Philosophy* 27, no. 3 (2008): 223.

5 Daniel A. Farber and Suzanna Sherry, "Legal Storytelling and Constitutional Law: The Medium and the Message," in Brooks and Gewirtz, *Law's Stories*.

6 Paul Thagard, *Hot Thought* (Cambridge, MA: MIT Press, 2006), 136.

7 Thagard, 138–39.

8 Alan M. Dershowitz, "Life Is Not a Dramatic Narrative," in Brooks and Gewirtz, *Law's Stories*, 99.

9 Dershowitz, 100.

10 I am dying to know if this was reciprocal and if the partner had a newly acquired life insurance policy on Hamilton.

11 Bas van Fraassen, *The Scientific Image* (Oxford: Oxford University Press, 1980), 134.

12 Richard Delgado and Jean Stefancic, eds., *The Derrick Bell Reader* (New York: New York University Press, 2005), 268.

13 Richard Delgado and Jean Stefancic, *Critical Race Theory* (New York: New York University Press, 2012), 45.

14 Delgado and Stefancic, 46.

15 Delgado and Stefancic, 47.

16 Derrick Bell, *And We Are Not Saved* (New York: Basic Books, 2008), 112.

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18 "Narratology," Google, https://en.oxforddictionaries.com/definition/narratology.

19 H. Porter Abbott, *The Cambridge Introduction to Narrative* (Cambridge: Cambridge University Press, 2008), 15–16.

20 Dershowitz, "Dramatic Narrative," 100.

21 G. Harman, "The Inference to the Best Explanation," *Philosophical Review* 74, no. 1 (1965): 89.

22 Ms. Guzman, "I'm a Dreamer. I'd Have Nothing If It Weren't for DACA," *Fortune*, September 21, 2017, http://fortune.com/2017/09/21/daca-dreamer-immigration/.

23 John Binder, "Paul Ryan to Push DACA Amnesty for Millions of Illegal Aliens before Leaving Congress," *Breitbart*, April 13, 2018, https://www.breitbart.com/big-government/2018/04/13/paul-ryan-to-push-daca-amnesty-for-millions-of-illegal-aliens-before-leaving-congress/.

Explanatory Virtue and Truth

Whenever we investigate anything—black holes or the causes of the First World War or the demography of the Cayman Islands or the ambiguity of Yeats's poetry—our intrinsic goal is to find the truth about something. If we did not have that goal, we would not be inquiring.

—RONALD DWORKIN[1]

Two Huge Problems

David H. Glass clearly articulates the two biggest challenges inference to the best explanation:

> *Despite its intuitive plausibility, IBE faces two key challenges. First, how exactly is IBE to be understood and made precise? There are various conceptions of the nature of explanation, but assuming some of these are suitable for IBE this still leaves the question as to how one explanation should be compared against another so that the best explanation can be identified. Second, what is the connection between explanation and truth? Is there any reason for thinking that the best explanation is likely to be true? Or to put it another way, does IBE track truth? Of course, no approach should be expected to lead to the truth in every instance, but if IBE is to be accepted as a rational mode of inference, there must be some reason for thinking that it provides a good strategy for determining the truth.[2]*

Inference to the best narrative (IBN) inherits these same problems. How should one narrative be compared against another so that the best narrative can be identified? And is there any reason for thinking that the best narrative is

likely to be true? Does it provide a good strategy for determining the truth? But inference to the best narrative invites a third challenge. Does it even make sense to talk about truth in contexts involving violent ex-husbands or constitutional success or failure? All three of these challenges must be addressed, if not definitively answered.

Gilbert Harman foresaw Glass's first challenge in his initial treatment of inference to the best explanation.

> *There is, of course, a problem about how one is to judge that one hypothesis is sufficiently better than another hypothesis. Presumably such a judgment will be based on considerations such as which hypothesis is simpler, which is more plausible, which explains more, which is less ad hoc, and so forth. I do not wish to deny that there is a problem about explaining the exact nature of these considerations; I will not, however, say anything more about this problem.*[3]

One might ask why is there is any problem in the first place. Harman seems to answer his own question about explanatory virtue. The best explanation must be determined by the standards of simplicity, plausibility, completeness, and not being ad hoc. The superficial answer is obvious. His list of explanatory virtues is incomplete ("and so forth"), the virtues can work against one another—the simplest account may not be the most complete—and each one is vague and overly general. Just as with inference to the best explanation, we face the obvious question of what are the criteria for one narrative to be better than another. Here, I think Harman's little checklist, however vague, is helpful. The better narrative will be the one that best exemplifies the following characteristics:

- It will tend to provide the most complete story.
- It will tend to provide the simplest story.
- It will provide the most plausible story.
- It will provide the least ad hoc story.

But fleshing out these criteria for explanatory and narrative success is clearly unfinished business in the philosophy of science and narratology.

As serious as this problem clearly is, I don't believe that it is as serious as the skeptics make it out to be. I know how to speak, understand, read, and write English. I know that the English sentence "Colorless green ideas sleep furiously," though nonsensical and probably self-contradictory, is grammatically correct. According to a dominant tradition in Western epistemology, if I am right about my linguistic skills, I should be able to plainly articulate the rules I have used to recognize the grammatically of the green ideas sentence.

> *Obviously, every speaker of a language has mastered and internalized a generative grammar that expresses his knowledge of his language. This is not to say that he is aware of the rules of the grammar or even that he can become aware of them.*[4]

Chomsky concedes that the rules of this generative grammar may be cognitively inaccessible and certainly difficult to articulate. Jason Stanley vigorously demurs:

> *Knowing how to do something is the same as knowing a fact. It follows that learning how to do something is learning a fact. For example, when you learned how to swim, what happened is that you learned some facts about swimming. . . . You know how to perform*

activities solely in virtue of your knowledge of facts about those activities.[5]

Socrates clearly articulated this epistemological principle 2,500 years ago—"and that which we know we must surely be able to tell."[6]

I side, however, with Michael Polanyi when he says, "We can know more than we can tell."[7] He uses a very apt example:

This fact seems obvious enough; but it is not easy to say exactly what it means. Take an example. We know a person's face, and can recognize it among a thousand, indeed among a million. Yet we usually cannot tell how we recognize a face we know. So most of this knowledge cannot be put into words.[8]

Polanyi introduces the technical term *tacit knowledge* to label knowledge or skills that "cannot be put into words." Polanyi is surely engaging in purposeful hyperbole. Most skills can be put into words, but these words are usually vague and general, and at times, the words are downright misleading.

The essence of Glass's first problem—"how one explanation should be compared against another so that the best explanation can be identified"—is that most of the defenders and critics of inference to the best explanation seem to seek something that I believe is unattainable. They seem to be searching for a kind of mechanical algorithm that validates an objective determination of one explanation being superior to another explanation. Perhaps the biggest temptation for insisting on a list of necessary and sufficient conditions for being the best explanation or story (or a better explanation or story) is the persistent illusion that all things we are skilled

at can be articulated in clear, concise recipes or formulae. This is precisely the Plato and Stanley article of faith—"that which we know we must surely be able to tell." We should know that is a mistake.

Consider how remarkable it is that major league hitters can hit ninety-five-mile-an-hour fastballs.

A typical major league fastball travels about 10 feet in just the 75 milliseconds that it takes for sensory cells in the retina to confirm that a baseball is in view and for information about the flight path and velocity of the ball to be relayed to the brain. The entire flight of the baseball from the pitcher's hand to the plate takes just 400 milliseconds. And because it takes half that time merely to initiate muscular action, a major league batter has to know where he is swinging shortly after the ball leaves the pitcher's hand—well before it's even halfway to the plate. . . . A batter could just as well close his eyes once the ball is halfway to home plate. Given the speed of the pitch and the limitations of our physiology, it seems to be a miracle that anybody hits the ball at all.[9]

So how do they do it? There are the clichés—"Keep your eye on the ball," "Don't open up too soon," and the like. But these don't tell you how it's done; they are mnemonics to help skilled hitters get back on track when they are in slumps. No one has yet, and I insist never will, articulate the logical criteria for hitting major league fastballs. This emphatically does not mean, however, that the hitting, not the describing, can't be done. This skill, like many others, is a kind of tacit knowledge.

My mentor, Larry Wright, tells an important story:

Virtually everyone who has survived past infancy has a more or less well developed set of perceptual skills. These skills may be generally described as the ability to tell what's going on (sometimes) simply by seeing it . . . This ability to tell what's going on—or what's gone on—even when we are not confronting it directly. We can often tell what has happened from the traces it leaves. We can tell there was a frost by the damaged trees; we know it rained because the mountains are green; we can tell John had some trouble on the way home from the store by the rumpled fender and the broken headlight. We reconstruct the event from its telltale consequences. It is this diagnostic skill we exploit in the most basic sort of inductive arguments; it is the foundation of our ability to evaluate evidence.[10]

This quasi-perceptual skill is what allows us to see what's going on and what's true or at least what's the best bet given what we know. And the fact that the precise nature of this skill has proven incredibly difficult to articulate in no way counts against its existence and utility. Can anyone seriously doubt that Pete Rose knew how to hit because he could not say how he was able to hit?

Literary Darwinism

Wright talks of a "diagnostic skill," "the ability to tell what's going on." I'd characterize it as a skill at *making sense of things*. What is the source of this skill? The answer to this question leads us directly to Glass's second worry—"Does IBE track truth?" I am committed, of course, to a resounding affirmative answer. But I certainly owe the inference-to-the-best-explanation and inference-to-the-best-narrative skeptics at least an outline of "some reason for thinking that it provides a good strategy for determining the truth."

What is sometimes called literary Darwinism traces human storytelling back to evolutionary origins of modern human cognition.

Minds exist to predict what will happen next. They mine the present for clues they can refine with help from the past—the evolutionary past of the species, the cultural past of the population, and the experiential past of the individual—to anticipate the immediate future and guide action. To understand events as they happen, with limited time, knowledge, and computational power, minds have evolved to register the regularities pertinent to particular species and infer according to rough-and-ready heuristics.[11]

This little narrative assumes that we are pretty good at "predict[ing] what will happen next." But it explains much more than the ubiquity of human storytelling; it accounts for our general ability to make sense of things, to explain what's going on.

We can tell stories to explain things, from a child's or a country's pouty "They started it" to why the world is as it is according to myth or science. . . . Why has the richest explanatory story of all, the theory of evolution by natural selection, been so little used to explain why and how stories matter?[12]

Inference to the best explanation (IBE) and inference to the best narrative (IBN) track the truth because they rely, at base, on quasi-perceptual skills that were selected for precisely to do this job.

Consider this explanatory narrative:

Babies may have little control over their bodies, but they can willingly move their heads and eyes. And

what a baby looks at can tell you something about how it sees the world. This is because babies are like adults in some regards. If they see the same thing over and over again, they get bored and look away. If they see something new or unexpected, they look longer. Thus, analyzing looking time can tell what babies think of as being "the same thing," and what they see as "new or unexpected."[13]

The above two-stage inference to the best explanation—differential gaze times being explained as boredom or surprise and then as "same" or "new"—is the methodological presupposition for a host of fascinating experiments in the study of infant cognitive development. Paul Bloom provides a nice summary of some of these results:

1. *Cohesion: If a hand pulls at an object, babies expect the entire object to go with the hand; if it comes off in pieces, they are surprised, showing an expectation that objects are* cohesive.

2. *Continuity: Imagine a stage with two vertical barriers separated in space. A small object, like a box, goes behind the barrier on the left, continues between the barriers, goes behind the barrier on the right, and comes out the other side. Adults see this is a single object, and so do babies. Now imagine that a box goes behind the barrier on the left, there is a pause, and then the box emerges for the screen on the right, never appearing in the gap. Adults assume there are two boxes here, not one. Babies make the same assumption; they expect* continuity.[14]

Why do we find differential gaze times for the hand pulling the object and it remaining whole, and the hand pulling the object and it coming off in pieces? Babies expect objects to be cohesive.

Why the perception of a single box in the first experimental scenario with the box and the barriers but the perception of two boxes in the second scenario? Babies expect continuity. But where do these expectations come from? Bloom's answer is a classic blend of nature and nurture.

These results show that although babies enter the world with a foundational understanding of what objects are and how they act, it is incomplete, and this foundation grows. Some of the improvement might be due to maturation of the brain—like the rest of the body, the brain changes rapidly in the early years of life, and this might cause corresponding increases in knowledge. But some of the improvement is plainly due to experience."[15]

And finally, what explains this foundational understanding of objects and how they act? This knowledge is clearly innate. Natural selection has hardwired infant brains to expect cohesion and continuity. It is easy to see the adaptive value for human infants having rudimentary understanding not just of objects and "folk physics" but also of agency and social relationships. Certainly, shared understanding of folk physics, agency, and social relationships are the cornerstones of the sort of the practical explanatory skill that would have been of value in hunter-gather times.

Sally and Ann

Let me tell you two stories about Sally and Ann. Sally prizes her special marble. When she leaves, she always places it in a basket and carefully covers it with a soft blanket. Ann has been hiding and watching Sally's little ritual. After Sally has gone home for lunch, Ann removes Sally's

marble from under the blanket and hides it in a nearby box. Sally returns after lunch and goes to retrieve her marble. She goes right to the box and finds it there! Why? Well, because that's where the marble is! The second story begins just as the first, but things take a turn when Sally returns from lunch. Sally goes straight for the basket and is heartbroken not to find her marble under the blanket. Why does she do this? Well, that's where she remembers putting it before lunch.

When shown a puppet version of the beginning of the Sally and Ann stories and then asked to predict where Sally will go to look for her marble, children younger than around four typically predict the box because they know that's where the marble is. But between four and five, children's predictions dramatically change. They now realize that Sally will look in the basket because that's where she would remember putting it.

Why do the more cognitively mature children simply recognize that the Sally-goes-to-the-basket narrative is significantly better than the Sally-goes-to-the-box account? They have begun to develop what is often called a "theory of mind."

> *Theory of mind allows a much more precise and multiperspectival understanding of social event. Because we understand beliefs as the basis for forming desires, goals and intentions, and because we understand the sources of belief, we automatically and effortlessly track what other might know about a situation and can therefore understand their behavior more finely. . . . Almost automatically we track what others can know, and that makes all the difference to our capacity to cooperate or compete.*[16]

Even back in hunter-gather times, our human ancestors were very skilled social explainers.

Contemporary cognitive science provides a very plausible account of the origins of this skill.

> *[Mind reading] is used by cognitive scientists, interchangeably with "Theory of Mind," to describe our ability to explain people's behavior in terms of their thoughts, feelings, beliefs, and desires. . . . This adaption must have developed during the "massive neurocognitive evolution" which took place during the Pleistocene (1.8 million to 10,000 years ago). The emergence of a Theory of Mind "module" was evolution's answer to the "staggeringly complex challenge faced by our ancestors, who needed to make sense of the behavior of other people in their group, which could include up to 200 individuals."*[17]

If this is right, and I certainly think it is, it suggests a somewhat surprising inversion in our thinking about explanation. Rather than extrapolating from the more "basic" notion of a causal explanation to account for our narrative skills, it might actually be that our ability to construct narratives about the behavior and motives of those in our social groups is what leads to the wider ability to construct scientific or causal narratives in situations where agents are conspicuously absent.

Disagreement

But wait a second you may well counter. How can I possibly claim that our skills, both innate and learned, at explaining and making sense of things, are reliable enough foundation for a general logical procedure such as inference to the best explanation or inference to the best narrative? Clearly rival explanations and rival narratives are not just possible but strongly

endorsed by equally intelligent and reflective evidence assessors. The district attorney and Abe held dramatically different interpretations regarding Hamilton and the murder. I believe Mary Ann and Wanda should have placed more confidence in the criminal justice system and not murdered Earl; the ladies saw things very differently. Intellectual disagreement seems to count heavily against my claims for explanatory and narrative skill. How can Justice Blackmun and Justice Scalia be skilled constitutional explainers and story judges when they see things so dramatically differently with respect to the death penalty and the Constitution? These worries are legitimate and require attention and potential solutions.

A big part of the story to be told here is one of simple intellectual modesty. One can be very skilled at something and at the same time fail spectacularly at exercising the skill. We are all skilled at recognizing faces. But we still misperceive all the time—"Hi Joanie! Oh, sorry, you look just like my mother-in-law." Major league hitters perform the minor miracle of hitting ninety-five-mile-an-hour fastballs, but they also swing wildly, miss, and look foolish, and lest we forget, they fail to get base hits between two-thirds and three-quarters of the time. Furthermore, the skills that I am basing my argument upon were developed, honed, and tested in hunter-gatherer times. They can only be applied to science and the law by extension.

> *Humans* do not *readily engage in [the highly abstract reasoning required in modern science, philosophy, government, commerce, and law]. In most times, places, and stages of development consists of quantities "one," "two," and "many" . . . Their political philosophy is based on kin, clan, tribe and vendetta, not on the social contract. . . . And their morality is a mixture of intuitions of purity, authority, loyalty, conformity, and reciprocity, not generalized notions of fairness and justice . . . Nevertheless, some humans were able to invent the different components of modern knowledge, and all are capable of learning them.*[18]

Please don't misread my meaning here. I'm really good at spotting my mother-in-law, I'm in awe of the hitting prowess of the guys on my fantasy team, and as a teacher, I know firsthand that students, even the mediocre ones, can cast aside kin, clan, and vendetta and learn to embrace the social contract and justice and fairness.

Truth

Let's see if we can do a little better than the trivial definition of "truth" I offered in chapter 3—truth $=_{df}$ not-false. Inference to the best narrative is unapologetic about a close connection between narrative superiority and truth. The best story does not guarantee truth, but it does constitute evidence for what the truth is. Perhaps there is a better yet story that no one has thought to tell—that's certainly been the case at specific points in the history of science. Perhaps, as I believe is often the case with many narratives, the best story is one that actually combines elements and insights from the competing narratives. But this is the nature of evidence generally. Even the strongest evidence can point in the wrong direction—evidence is not logical proof. But none of this implies that we should disregard evidence. Indeed, what choice do we really have but to base all our considered

judgments, not just in law and scholarship, but in every aspect of our lives, on what the best available evidence tells us is likely true?

Legal, constitutional, and scholarly truth, just like truth in science and regarding violent ex-husbands, remains philosophically problematic. I agree with Peter Kosso that the most intuitive sense of truth—at least in most explanatory contexts—is the correspondence theory, but that correspondence must be inferred from coherence.

> *Though truth is correspondence with the facts it cannot be recognized by its correspondence. We cannot rely on the facts to guide proofs of scientific theories, since the facts are irretrievably at the outer end of the correspondence relation. . . . So any indicators of truth must be internal. . . . The process of justifying, then, is a process of comparing aspects of the system, and the accomplishment of justification is the demonstration of coherence among the aspects.[19]*

Such a model captures our intuitions about what really happened to Nicole and Ron or at the record hop. There aren't just stories to be told about these happenings, but clearly, some stories are better than others—stories that point us to the truth. We believe that there's a world out there, though we will never see it from the God's eye perspective, and in this world, things happened involving O. J., Connie's boyfriend, and the rest. These external happenings play a significant role in what counts as true.

Things get much trickier, however, when we consider the best narrative concerning *Brown*

v. Board of Education or Mary Ann and Wanda's predicament. We are still confident that there is a best story or, at least, stories that are significantly better than others. But where does narrative superiority now point? What of the standard jurisprudential questions of how to interpret a statute, a line of precedent, or a constitutional text? Or even how to interpret the sad events confronting Mary Ann and Wanda? To reiterate the previous argument, I claim that in these cases we tell stories that try to make sense of the relevant texts and precedent as well as Earl's violent behavior and Geneva's story about *Brown*. When we tell these stories, we tell them with passion and conviction. We are convinced that our story is the best or, at least, a heck of a lot better than the other stories that are out there. Does inference to the best narrative not so much *discover* the truth but actually *create* the truth? This would be a mischaracterized insight. The insight, of course, is that few of us believe there is a Platonic heaven where moral and interpretive truth live and to where we can retreat to adjudicate controversies involving Earl's murder or how we should understand *Brown v. Board of Education*. But it is mischaracterized because truth is not being created in the way Derrick Bell was able to make up his story about the disappearing black schoolchildren. It makes perfectly good sense to insist that there is an "objectively" best narrative, even when reasonable people disagree about what it is. And what other laudatory title would we bestow on such a superior narrative other than "true"?

EXERCISES

1. How can a major league hitter possibly hit a ninety-five-mile-an-hour fastball if he can't say how he does it?
2. What do the two Sally and Ann stories tell us about our ability to make sense of what others do?
3. Is there an objective truth about what happened to Hamilton's partner? Is there an objective truth about what Mary Ann and Wanda should do? What does all this say about the notion of truth in the first place?

QUIZ FIFTEEN
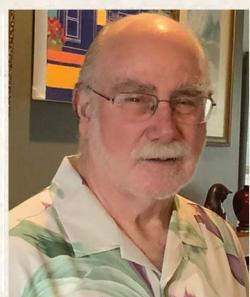
What are the two problems for inference to the best explanation (and for inference to the best narrative) that were identified by David H. Glass? What is my proposed solution to these two problems? Do you think my solution works? Why, or why not?

Notes

1 Ronald Dworkin, *Justice for Hedgehogs* (Cambridge, MA: Harvard University Press, 2011), 152.

2 David H. Glass, "Inference to the Best Explanation: Does It Track Truth?," *Synthese: An International Journal for Epistemology, Methodology and Philosophy of Science* 185, no. 3 (2012): 411–27.

3 Gilbert Harman, "The Inference to the Best Explanation," *Philosophical Review* 74, no.1 (1965): 88–89.

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Inferring and Explaining is a book in practical epistemology. It examines the notion of evidence and assumes that good evidence is the essence of rational thinking. Evidence is the cornerstone of the natural, social, and behavioral sciences. But it is equally central to almost all academic pursuits and, perhaps most importantly, to the basic need to live an intelligent and reflective life. The book further assumes that a particular model of evidence—*Inference to the Best Explanation*—not only captures the essence of (good) evidence but suggests a very practical, and pedagogically useful, procedure for evidence evaluation.

The book is intended primarily for two sorts of introductory courses. First and foremost are courses in critical thinking (or informal or practical logic). In addition, however, the book has application in more general courses (or major sections of courses) in introductory philosophy.

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