

PHIL 110 Logic and Critical Thinking
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Textbook

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Chapter 1

Chapter 1

Chapter One: Questions, Problems, and World Views

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Before getting into any of the more analytic details of logical reasoning, let's consider the ways in which ideas 'play out' in the world, and the way we arrive at most of our beliefs. Most textbooks on modern logic assert that the basic unit of logic is the statement – a simple sentence which can be either true or false. But it seems to me that statements have to come from somewhere, and that they do not emerge from nothing. People do not come to believe things at random, or by magic. To my mind, the most obvious places where statements are born are one's intellectual environments, one's problems, and the questions that you and others in your environment tend to ask. Good thinking also begins in situations which prompt the mind to think differently about what it has taken for granted so far.

1.1 Intellectual Environments

Where does thinking happen? This may sound as if it's a bit of a silly question. Thinking, obviously, happens in your mind. But people do more than just think their own thoughts to themselves. People also share their thoughts with each other. Thoughts do not remain confined within your own brain: they also *express themselves* in your words and your actions. I'd like to go out on a bit of a limb here, and say that thinking happens not only in your mind, but **also any place where two or more people gather to talk to one another and share their ideas with each other**. In short, thinking happens wherever two or more people could have a dialogue with each other. In that dialogue, at least two people (but possibly many more) can express, share,

trade, move around, examine, criticize, affirm, reject, modify, argue about, and generally communicate their own and each other's ideas.

The importance of dialogue in reasoning is perhaps most important, and also most obvious, when we are reasoning about moral matters. The philosopher Charles Taylor said:

Reasoning in moral matters is always reasoning with somebody. You have an interlocutor, and you start from where that person is, or with the actual difference between you; you don't reason from the ground up, as though you were talking to someone who recognized no moral demands whatever.¹

What Taylor says about moral reasoning also applies to other things we reason about. Whenever you have a conversation with someone about whether something is right, wrong, true, false, partially both, and so on, you do not start the conversation from nothing. Rather, you start from your own beliefs about such things, and the beliefs held by your partner in the conversation, and the extent to which your beliefs are the same, or different, as those of the other person. It is not by accident that Plato, one of the greatest philosophers in history, wrote his books in the form of dialogues between Socrates and his friends. Similarly, French philosopher Michel Foucault observed that especially among Roman writers, philosophy was undertaken as a social practice, often within institutional structures like schools, but also through informal relations like friendships and families. This

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¹ Taylor, *Malaise of Modernity*, pg. 32

social aspect of one's thinking was considered normal and even expected:

When, in the practice of the care of the self, one appealed to another person in whom one recognised an aptitude for guidance and counseling, one was exercising a right. And it was a duty that one was performing when one lavished one's assistance on another...²

So, to answer the question 'Where does thinking happen?' we can say: 'any place where two or more people can have a conversation with each other about the things that matter to them'. And there are lots of such places. Where the Romans might have listed the philosophy schools and the political forums among those places, we today could add:

- Movies, television, pop music, and the entertainment industry
- Internet-based social networks like Facebook and YouTube
- Streets, parks, and public squares
- Pubs, bars, and concert venues
- Schools, colleges, and universities
- Mass media
- Religious communities and institutions
- The arts
- The sciences
- Courtrooms and legal offices
- Political settings, whether on a small or large scale
- The marketplace, whether local or global
- Your own home, with your family and friends
- Can you think of any more places like this?

In each of the places where thinking happens, there's a lot of activity. Questions are asked, answers are explored, ideas are described, teachings are presented, opinions are argued over, and so on. Some questions are treated as more relevant than others, and some answers meet with greater approval than others. It often happens that in the course of this huge and complicated exchange, some ideas become more influential and more prevalent than others. You find this in the way certain words, names, phrases or definitions

1.1 Intellectual Environments

get used more often. And you find it as certain ways to describe, define, criticize, praise, or judge things are used more often than others. The ideas that are expressed and traded around in these ways and in these places, and especially the more *prevalent* ideas, form **the intellectual environment** that we live in.

Most of the time, your intellectual environment will roughly correspond to a social environment: that is, it will correspond (at least loosely) to a group of people, or a community that you happen to be part of. Think about all the groups and communities that you belong to, or have belonged to at one time or another:

- Families
- Sports teams
- The student body of your college
- The members of any social club you have joined
- The people at your workplace
- Your religious group (if you are religious)
- People who live in the same neighbourhood of your town or city
- People who speak the same language as you
- People who are roughly the same age as you
- People who come from the same cultural or ethnic background
- People who like the same music, movies or books as you
- People who play most of the same games as you
- Can you think of any more?

An intellectual environment will have a character of its own. That is, in one place or among one group of people, one idea or group of related ideas may be more prevalent than other ideas. In another place and among other people, a different set of ideas may dominate things. Furthermore, several groups may have very similar intellectual environments, or very different ones, or overlapping ones. Also note that you probably live in more than one social environment, and so you are probably hearing ideas from more than one intellectual environment too.

An intellectual environment, with its prevalent ideas, surrounds everyone almost all the time, and it profoundly influences the way people think. It's where we learn most of our basic ideas about life and the

world, starting at a very early age. It probably includes a handful of stock words and phrases that people can use to express themselves and be understood right away. This is not to say that people get all of their thoughts from their environment. Obviously, people can still do their own thinking wherever they are. And this is not to say that the contents of your intellectual environment will always be the same from one day to the next. The philosopher Alasdair MacIntyre observed that an intellectual tradition is often a continuity of conflict, and not just a continuity of thought. But this is to say that wherever you are, and whatever community you happen to be living in or moving through, the prevalent ideas that are expressed and shared by the people around you will influence your own thinking and your life in profound and often unexpected ways.

By itself, this fact is not something to be troubled about. Indeed, in your early childhood it was probably very important for you to learn things from the people around you. For instance, it was better for a parent to tell you not to touch a hot barbecue with your bare hand, than for you to put your hand there yourself and find out what it feels like. But as you grow into adulthood, it becomes more and more important to know what one's intellectual environment is really like. It is very important to know what ideas are prevalent there, and to know the extent to which those ideas influence you. For if you know the character and content of the intellectual environment in which you live, you will be much better able to do your own thinking. You might end up agreeing with most, or even all of the prevalent ideas around you. But you will have agreed with them for your own reasons, and not (or not primarily) because they are the ideas of the people around you. And that will make an enormous difference in your life.

Some intellectual environments are actually hostile to reason and rationality. Some people become angry, feel personally attacked, or will deliberately resist the questioning of certain ideas and beliefs. Indeed, some intellectual environments hold that intellectual thinking is bad for you! Critical reasoning sometimes takes great courage, especially when your thoughts go against the prevalent ideas of the time and place where you live.

1.2 World Views

Eventually, the ideas that you gathered from your intellectual environment, along with a few ideas of your own that you developed along the way come together in your mind. They form in your mind a kind of plan, a picture, or a model of what the world is like, and how it acts, and so on. This plan helps you to understand things, and also helps you make decisions. Philosophers sometimes call this plan a **world view**.

Think for a moment about some of the biggest, deepest and most important questions in human life. These questions might include:

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- What should I do with my life? Where should I go from here? Should I get married? What career should I pursue? Where is my place in the world? How do I find it? How do I create it?
- Is there a God? What is God like? Is there one god, or many gods? Or no gods at all? And if there is, how do I know? And if there's not, how do I know?
- Why are we here? Why are we born? Is there any point to it all?
- What is my society really like? Is it just or unjust? And what is Justice?
- Who am I? What kind of person do I want to be?
- What does it mean to be an individual? What does it mean to be a member of society?
- What happens to us when we die?
- What do I have to do to pass this course?
- Just what are the biggest, deepest and most important questions anyway?

These are philosophical questions. (Well, all but one of them.) Your usual way of thinking about these questions, and others like them is your world view. Obviously, most people do not think about these questions all of the time. We are normally dealing with more practical, immediate problems. What will I have for dinner tonight? If the traffic is bad, how late might I be? Is it time to buy a new computer? What's the best way to train a cat to use the litter-box?

But every once in a while, a limit situation will appear, and it will prompt us to think about higher and

deeper things. And then the way that we think about these higher and deeper things ends up influencing the way that we live, the way we make choices, the ways that we relate to other people, and the way we handle almost all of our problems. The sum of your answers to those higher and deeper questions is called your ‘world view’.

The word ‘world view’ was first coined by German philosopher Albert Schweitzer, in a book called “The Decay and Restoration of Civilization”, first published in 1923. Actually, the word that Schweitzer coined here is the German word *Weltanschauung*. There are several possible ways to translate this word. In the text quoted above, as you can see, it’s translated as “theory of the universe”. It could also be translated as “theory of things” or “world conception”. Most English speakers use the simpler and more elegant sounding phrase “world view”. Here’s how Schweitzer himself defined it:

The greatest of the spirit’s tasks is to produce a theory of the universe. What is meant by a theory of the universe? It is the content of the thoughts of society and the individuals which compose it about the nature and object of the world in which they live, and the position and the destiny of mankind and of individual men within it. What significance has the society in which I live and I myself in the world? What do we want to do in the world? What do we hope to get from it? What is our duty to it? The answer given by the majority to these fundamental questions about existence decides what the spirit is in which they and their age live. (Schweitzer, *The Decay and Restoration of Civilization*, pg. 80-1)

Schweitzer’s idea here is that a world-view is more than a group of beliefs about the nature of the world. It is also a **bridge between those scientific or metaphysical beliefs, and the ethical beliefs about what people can and should do in the world**. It is the intellectual narrative in terms of which the actions, choices, and purposes of individuals and groups make sense. It therefore has indispensable practical utility: it is the justification for a way of life, for individuals and for whole societies. In this sense, a world view is not just something you ‘have’; it is also something

that you ‘live with’. And we cannot live without one. “For individuals as for the community,” Schweitzer said, “life without a theory of things is a pathological disturbance of the higher capacity for self-direction.” (Schweitzer, *ibid*, pg. 86)

Let’s define a world view as follows: **A world view is the sum of a set of related answers to the most important questions in life**. Your own world view, whatever it is, will be the sum of your own answers to your philosophical questions, whatever you take those questions to be, and whether you have thought about them consciously or not. Thus your world view is intimately tied to your sense of who you are, how you want to live, how you see your place in your world and the things that are important to you. Not only your answers to the big questions, but also your choice of which questions you take to be the big questions, will form part of your world view. And by the way, that’s a big part of why people don’t like hearing criticism. A judgment of a world view is often taken to be a judgment of one’s self and identity. But it doesn’t have to be that way.

Some world views are so widely accepted by many people, perhaps millions of people, and are so historically influential, perhaps over thousands of years, that they have been given names. Here are a few examples:

MODERNISM: referring to the values associated with contemporary western civilization, including democracy, capitalism, industrial production, scientific reasoning, human rights, individualism, etc.

HELIOCENTRISM: the idea that the sun is at the centre of our solar system, and that all the planets (and hundreds of asteroids, comets, minor planets, etc.) orbit around the sun.

DEMOCRACY: the idea that the legitimacy of the government comes from the will of the people, as expressed in free and fair elections, parliamentary debate, etc.

CHRISTIANITY: The idea that God exists; that humankind incurred an ‘original sin’ due to the events in the Garden of Eden, and that God became Man in the person of Jesus to redeem humanity of its original sin.

ISLAM: The idea that God exists, and that Moham-

med was the last of God's prophets, and that we attain blessedness when we live by the five pillars of submission: daily prayer, charity, fasting during Ramadan, pilgrimage to Mecca, and personal struggle.

MARXISM: The idea that all political and economic corruption stems from the private ownership of the means of production, and that a more fair and just society is one in which working class people collectively own the means of production.

DEEP ECOLOGY: The idea that there is an important metaphysical correlation between the self and the earth, or that the earth forms a kind of expanded or extended self; and that therefore protecting the environment is as much an ethical requirement as is protecting oneself.

THE AGE OF AQUARIUS / THE NEW AGE: The idea that an era of peace, prosperity, spiritual enlightenment, and complete happiness is about to dawn upon humankind. The signs of this coming era of peace can be found in astrology, psychic visions, Tarot cards, spirit communications, and so on.

And some of these world views may have other, sub-views bundled inside them. For instance:

- | | |
|-----------|-------------------------|
| Democracy | a. Liberalism |
| | b. Conservatism |
| | c. Democratic Socialism |
| Buddhism | a. Mahayana |
| | b. Theravada |
| | c. Tibetan Bon-Po |
| | d. Zen |

Clearly, not all world views are the same. Some have different beliefs, different assumptions, different explanations for things, and different plans for how people should live. Not only do they produce different answers to these great questions, but they often start out with different great questions. Some are so radically different from each other that the people who subscribe to different world views might find it very difficult to understand each other.

In summary, your world view and the intellectual environment in which you live, when taken together,

form the basic background of your thinking. They are the source of most of our ideas about nearly everything. If you are like most people, your world view and your intellectual environment overlap each other: they both support most of the same ideas. Sometimes there will be slight differences between them; sometimes you may find differences so large that you may feel that one of them must be seriously wrong, in whole or in part. Differing world views and differing intellectual environments often lead to social and personal conflict. It can be very important, therefore, to consciously and deliberately know what your own world view really is, and to know how to peacefully sort out the problems that may arise when you encounter people who have different world views.

1.3 Framing Language

One of the ways that your intellectual environment and your world view expresses itself is in the use of framing language. These are the **words, phrases, metaphors, symbols, definitions, grammatical structures, questions, and so on which we use to think and speak of things in a certain way**. We frame things by describing or defining them with certain interpretations in mind. We also frame things by the way we place emphasis on certain words and not on others. And we frame things by interpreting and responding selectively to things said by others.

As an example, think of some of the ways that people speak about their friendships and relationships. We say things like "We connected," "Let's hook up," "They're attached to each other," and "They separated." We sometimes speak of getting married as "getting hitched." These phrases borrow from the vocabulary of machine functions. And to use them is to place human relations within the frame of machine functions. Now this might be a very useful way to talk about relationships, and if so, then it is not so bad. But if for some reason you need to think or speak of a relationship differently, then you may need to invent a new framing language with which to talk about it. And if this is the only framing language you've ever used to talk about relationships, it might be extremely difficult for you to

think about relationships any other way.

As a thought experiment, see if you can invent a framing language for your friendships and relationships based on something else. Try using a framing language based on cooking, or travel, or music, or house building, as examples.

Here's another example of the use of framing language. Consider the following two statements:

"In the year 1605, Guy Fawkes attempted to start a people's revolution against corruption, inherited privilege, and social injustice in the British government"

"In the year 1605, Guy Fawkes planned a terrorist attack against against a group of Protestant politicians, in an attempt to install a Catholic theocracy in Britain."

Both of these statements, taken as statements of fact, are true. But they are both framed very differently. In the first statement, Fawkes is portrayed as a courageous political activist. In the second, he is framed (!) as a dangerous religious fanatic. And because of the different frames, they lead the reader to understand and interpret the man's life and purposes very differently. This, in turn, leads the reader to draw different conclusions.

In other situations, the use of framing language can have serious economic or political consequences. Consider, as an example, the national debate that took place in the United States over the Affordable Health Care Act of 2009. The very name of the legislation itself framed the discussion in the realm of market economics: the word 'affordable' already suggests that the issue has to do with money. And most people who participated in that national debate, including supporters and opponents and everything in between, spoke of health care as if it is a kind of market commodity, which can be bought or sold for a price. The debate thus became primarily a matter of questions like who will pay for it (the state? individuals? insurance companies?), and whether the price is fair. But there are other ways to talk about health care besides the language of economics. Some people frame health care as a human right. Some frame it as a form of organized human

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compassion, and some as a religious duty. But once the debate had been framed in the language of market economics, these other ways of thinking about health care were mostly excluded from the debate itself.

As noted earlier, it's probably not possible to speak about anything without framing it one way or another. But your use of framing language can limit or restrict the way things can be thought of and spoken about. They can even prevent certain ways of thinking and speaking. And when two or more people conversing with each other frame their topic differently, some unnecessary conflict can result, just as if they were starting from different premises or presupposing different world views. So it can be important to monitor one's own words, and know what frame you are using, and whether that frame is assisting or limiting your ability to think and speak critically about a particular issue. It can also be important to listen carefully to the framing language used by others, especially if a difference between their framing language and yours is creating problems.

And speaking of problems: this leads us to the point where the process of critical thinking begins.

1.4 Problems

Usually, logic and critical thinking skills are invoked in response to a need. And often, this need takes the form of a **problem** which can't be solved until you gather some kind of information. Sometimes the problem is practical: that is, it has to do with a specific situation in your everyday world.

For example:

- Perhaps you have an unusual illness and you want to recover as soon as possible.
- Perhaps you are an engineer and your client wants you to build something you've never built before.
- Perhaps you just want to keep cool on a very hot day and your house doesn't have an air conditioner.

The problem could also be theoretical: in that case, it has to do with a more general issue which impacts

your whole life altogether, but perhaps not any single separate part of it in particular. Religious and philosophical questions tend to be theoretical in this sense.

For example:

- You might have a decision to make which will change the direction of your life irreversibly.
- You might want to make up your mind about whether God exists.
- You might be mourning the death of a beloved friend.
- You might be contemplating whether there is special meaning in a recent unusual dream.
- You might be a parent and you are considering the best way to raise your children.

The philosopher Karl Jaspers described a special kind of problem, which he thought was the origin of philosophical thinking. He called this kind of problem a *Grenzsituationen*, or a “**limit situation**”.

Limit situations are moments, usually accompanied by experiences of dread, guilt or acute anxiety, in which the human mind confronts the restrictions and pathological narrowness of its existing forms, and allows itself to abandon the securities of its limitedness, and so to enter new realm of self-consciousness.³

In other words, a limit situation is a situation in which you meet something in the world that is unexpected and surprising. It is a situation that more or less forces you to acknowledge that your way of thinking about the world so far has been very limited, and that you have to find new ways to think about things in order to solve your problems and move forward with your life. This acknowledgement, according to Jaspers, produces anxiety and dread. But it also opens the way to new and (hopefully!) better ways of thinking about things.

In general, a limit situation appears when something happens to you in your life that you have never experienced before, or which you have experienced very rarely. It might be a situation in which a long-standing belief you have held up until now suddenly

shows itself to have no supporting evidence, or that the consequences of acting upon it turn out very differently than expected. You may encounter a person from a faraway culture whose beliefs are very different from yours, but whom you must regularly work with at your job, or around your neighbourhood. You may experience a crisis event in which you are at risk of death. A limit situation doesn't have to be the sort of experience that provokes a nervous breakdown or a crisis of faith, nor does it have to be a matter of life and death. But it does tend to be the type of situation in which your usual and regular habits of thinking just can't help you. It can also be a situation in which you have to make a decision of some kind, which doesn't necessarily require you to change your beliefs, but which you know will change your life in a non-trivial way.

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1.5 Observation

Thus far, we have noted the kinds problems that tend to get thinking started, and the background in which thinking takes place. Now we can get on to studying thinking itself. In the general introduction, I wrote that clear critical thinking involves a process. The first stage of that process is *observation*.

When observing your problem, and the situation in which it appears, try to be as **objective** as possible. Being objective, here, means **being without influence from personal feelings, interests, biases, or expectations, as much as possible**. It means observing the situation as an uninvolved and disinterested third-person observer would see it. (By 'disinterested' here, I mean a person who is curious about the situation but who has no personal stake in what is happening; someone who is neither benefitted nor harmed as the situation develops.) Although it might be impossible to be totally, completely, and absolutely objective, still it certainly is possible to be objective *enough* to understand a situation as clearly and as completely as needed in order to make a good decision.

When you are having a debate with someone it is often very easy, and tempting, to simply accuse your opponent of being **biased**, and therefore in no position to understand something properly or make

³ Stanford encyclopaedia of philosophy, online edition, entry on Karl Jaspers.

decisions. If someone is truly biased about a certain topic, it is rational to doubt what someone says about that topic. But having grounds for reasonable doubt is not the same as having evidence that a proposition is false. Moreover, having an opinion, or a critical judgment about something, or a world view, is not the same as having a bias. Let us define a bias here as **the holding of a belief or a judgment about something even after evidence of the weakness or the faultiness of that judgment has been presented**. We will see more about this when we discuss Value Programs.

22 For now, just consider the various ways in which we can eliminate bias from one's observations as much as possible. Here are a few examples:

- Take stock of how clearly you can see or hear what is going on. Is something obstructing your vision? Is it too bright, or too dark? Are there other noises nearby which make it hard for you to hear what someone is saying?
- Describe your situation in words, and as much as possible use value-neutral words in your description. Make no statement in your description about whether what is happening is good or bad, for you or for anyone else. Simply state as clearly as possible what is happening. If you cannot put your situation into words, then you will almost certainly have a much harder time understanding it objectively, and reasoning about it.
- Describe, also, how your situation makes you feel. Is the circumstance making you feel angry, sad, elated, fearful, disgusted, indignant, or worried? Has someone said something that challenges your world view? Your own emotional responses to the situation is part of what is 'happening.' And these too can be described in words so that we can reason about them later.
- Also, observe your instincts and intuitions. Are you feeling a 'pull,' so to speak, to do something or not do something in response to the situation? Are you already calculating or predicting what is likely to happen next? Put these into words as well.
- Using numbers can often help make the judgment more objective. Take note of anything in the situation that can be counted, or measured mathematically: times, dates, distances, heights, shapes, angles, sizes, monetary values, computer bytes (kilobytes, megabytes, etc.), and so on.

1.5 Observation

- Take note of where your attention seems to be going. Is anything striking you as especially interesting or unusual or unexpected?
- If your problem is related to some practical purpose, take note of everything you need to know in order to fulfill that purpose. For instance, if your purpose is to operate some heavy machinery, and your problem is that you've never used that machine before, take note of the condition of the safety equipment, and the signs of wear and tear on the machine itself, and who will be acting as your "spotter," and so on.
- If other people are also observing the situation with you, consult with them. Share your description of the situation with them, and ask them to share their description with you. Find out if you can see what they are seeing, and show them what you are seeing. Also, try to look for the things that they might be missing.

Separating your observations from your judgments and opinions can often be difficult. But the more serious the problem, the more important it can be to observe something non-judgmentally, *before* coming to a decision. With that in mind, here's a short exercise: which of the following are observations, and which are judgments? Or, are some of them a bit of both?

- That city bus has too many people on it.
- The letter was delivered to my door by the postman at 10:30 A.M.
- The two of them were standing so close to each other that they must be lovers.
- The clothes she wore suggested she probably came from a very rich family.
- The kitchen counter looked like it had been recently cleaned.
- He was swearing like a sailor.
- The old television was too heavy for him to carry.
- There's too much noise coming from your room, and it's driving me crazy!
- The latest James Bond film was a lot of fun.
- The latest James Bond film earned more than \$80 million in its first week.
- I hate computers!

- The guy who delivered the pizza pissed me off because he was late.

1.6 Questions

Perhaps more than the problems do, good questions get the mind thinking as well. Questions express doubts, identify problems, call for solutions and demand answers. Indeed we might not fully understand the nature of a given problem until we have asked a decent question about it. Moreover, the best answers to one's questions tend to become ideas, beliefs, propositions, theories, arguments and world views. These, in turn, guide our lives and our choices in numerous ways. But some kinds of questions are better than others, and it can be important to discern the differences between them.

Good questions are:

1. **TENACIOUS.** We cannot easily put them away or ignore them.

2. **DIRECT.** They address the actual problem that you are facing, and not a tangential or unrelated issue.

3. **SEARCHING.** When you pose a good question, you don't already know the answer. You might have a rough or vague idea of what the answer might be, but you don't know for sure yet, and you are committed to finding out. Or, you might have several possible answers, and you want to find out whether any of them are good answers, or which one is the best.

4. **SYSTEMATIC.** Although you don't have a clear answer to your question, still your question is associated with a method or a plan, even if only a loose one, with which you can search for an answer. In other words: even when you don't know the answer, you still know what you're doing, and you're not scrambling in the dark. You have an idea where to look for an answer. And you are covering every place where a useful answer could be found, leaving nothing out.

5. **USEFUL.** The process of answering a good question actually helps you solve your problem.

6. **OPEN.** There might be more than one possible correct answer. (There can also be more than one possible wrong answer.) With several good answers

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to your question, you may have to do a lot more work to find which of them is the best one, if your circumstance requires you to pick just one answer. But that work is ultimately very useful, and almost always leads us to better quality answers.

7. **FERTILE.** Some of the better answers to the question prompt more good questions. In this way, good questions can keep the mind active.

8. **CONTROVERSIAL.** A good question is often one which addresses itself to beliefs, ideas, ways of living, etc., which people normally take for granted. It may even be a question that no one else or very few others are asking. This does not necessarily mean that the questioner is being aggressive or confrontational. It should still be a searching question, and a direct question, and so on. But with a controversial question, the questioner often places herself at odds, in some way, with those who are committed to the beliefs being questioned, or who might not want the question asked at all. Indeed a controversial question can sometimes place the questioner in some danger by the very act of asking it. That danger might be social: by asking the question, she might risk being cold-shouldered or ostracized by her friends. Or it might be physical: by asking the question, she might place herself at odds against politically or economically powerful people and institutions, such as the law or one's employer.

The more of these qualities that a question has, the better a question it is. There are also several kinds of bad questions. Here are a few examples:

RHETORICAL QUESTIONS. This is a question in which the questioner already knows the answer, and is trying to prompt that same answer from his or her listeners. Although rhetorical questions can be interesting and perfectly appropriate in poems or storytelling, in a nonfiction text or in a more 'straight talk' conversation they are stylistically weak. Rhetorical questions are often plain statements of belief or of fact merely phrased in the form of a question. So it is generally better to state the belief or the fact directly as a proposition. Also, it's always possible that someone else will answer the rhetorical question in an unexpected

way. Rhetorical questions can also be used as forms of verbal aggression. They position the questioner as the controller of the debate, and they place others on the defensive, and make it harder for them to contribute to the debate as an equal.

LEADING QUESTIONS. These are questions that are designed to manipulate someone into believing something that they may or may not otherwise believe. Normally, leading questions come in a series, and the series is designed to make someone predisposed to respond to the last question in the series in a particular way. Leading questions are often used in a form of political campaigning called ‘push polling’ (to be discussed in the chapter on Reasonable Doubt).

LOADED OR COMPLEX QUESTIONS. A loaded question is one that cannot be given a straight answer unless the person answering it accepts a proposition that he or she might not want to accept. (More discussion of this kind of question appears in the chapter on Fallacies.) Like rhetorical questions, loaded questions can also be used aggressively, to control a debate and to subordinate the other contributors.

OBSTRUCTIONIST QUESTIONS. This is the kind of question that someone asks in order to interrupt someone else’s train of thought. Obstructionist questions often look like good questions, and in a different context they may be perfectly reasonable. But the obstructionist question is designed distract a discussion away from the original topic, and prevent the discussion from reaching a new discovery or a clear decision. Typically, the obstructionist question asks about definitions, or pushes the discussion into a very abstract realm. It may also involve needlessly hair-splitting the meaning of certain words. In this sense an obstructionist question is much like the fallacy of ‘red herring’. As an example, someone might obstruct a discussion of whether same-sex couples should be allowed to marry by saying: “Well, that all depends on what you mean by ‘marriage’. What is marriage, anyway?”

FRAMING QUESTIONS. The framing question uses specific words, terms, and phrases to limit the way a certain topic can be discussed. There’s probably no such thing as a question that doesn’t frame the answers that flow from it, even if only in a small way. But it is

possible to ‘cook’ or to ‘rig’ a question such that the only direct answers are ones which remain within a certain limited field of assumptions, or within a certain limited world view. Framing questions may even share some of the qualities of good questions: they might allow more than one answer, or they might open the way to further questions. But they are also like loaded questions in that they presuppose a certain way of thinking or talking about the topic, and you can’t give a straight answer unless you reply within the bounds of that way of thinking and talking.

EMPTY QUESTIONS. A question is empty when it has no answer. Sometimes people will declare a question to be empty when in fact it is ‘open’: but a question with more than one possible good answer is not an empty question. So it is important to understand the difference between the two. A question is empty when all its answers lead to dead ends: when, for instance, the best answers are neither true nor false, or when different answers are nothing more than different descriptions of the same situation, or when the question cannot be given a direct answer at all. Such questions might be interesting for artistic or religious or similar purposes, and they can be the basis for some beautiful poems and meditations, or some very enjoyable comedy. But reasoning about such questions in a logical or systematic way doesn’t produce any new discoveries. An empty question cannot tell you anything you don’t already know.

By the way: when you are trying to observe a situation as objectively as possible before making a decision about it, you can also try to observe the way other people are talking about it. What kind of questions are they asking? What kind of framing language are they using in their descriptions? This, too, is part of the first stage in the process of reasoning.

And before moving on: there are things you should look for in a good answer to a good question. One of those things is that a good answer can be expressed in the form of a proposition. But we will see more about propositions a little later on.

1.7 Differing World Views

Perhaps the most difficult things to observe and question are your own beliefs. So let's look at how to do exactly that.

Once in a while, you are going to encounter differences between your world view and the intellectual environment in which you live. And you are also likely to encounter differences between your world view and other people's world views, and differences in the intellectual environments of different religions, political arrangements and cultures. And in some of those situations, you will not be able to just stand back and 'live and let live'. A judgment may have to be made, for instance about which world view you are personally prepared to live by, or which one you will support with your money or your votes or your actions in your community. You are also going to occasionally discover places where your world view doesn't "work," that is, places where it clearly does not help you understand the world, nor do what you want it to do.

Remember, you probably subscribe to several world views at the same time, some religious, some political, some cultural, some philosophical or scientific. In fact you probably subscribe to two or three world views at the same time, without consciously realizing it. Again, there's nothing wrong with that: we probably wouldn't be able to think about anything if we didn't have one.

But not all world views are created the same. Some are problematic, whether in great or small ways. Some are seriously faulty. If some part of your world view is faulty, this can muddle your thinking, and create conflict between you and other people. Thus it is very important to learn to tell the difference between a faulty world view and an acceptable one.

Some world views are faulty because **their ideas concerning the nature of the world have been proven wrong through scientific discovery**, such as the Ptolemaic model of the solar system, the 'four elements' theory of matter or the 'four humours' theory of medicine. Others are faulty because **their political and moral consequences have turned out to be very destructive**. Mediaeval feudalism, Soviet communism,

Nazism, racism, sexism, and prejudice, are the best-known examples of morally faulty world views. Some world views that are deeply faulty may have one or two features that seem very appealing and plausible. The way the sun rises in the east and sets in the west certainly makes it look as if the earth is standing still and the sun is traveling around it, as the Ptolemaic world view suggests. The 'four humours' theory of medicine seems to correspond elegantly to the 'four elements' theory of matter. Under Soviet communism, from Stalin's time in the early 1940's until the fall of the Berlin Wall in 1989, nobody was unemployed. And in Nazi Germany, productive and high-achieving workers could receive a free holiday trip, paid for by the government. But these apparent benefits should not blind you to the moral and empirical failures of a faulty world view.

Schweitzer described three properties that he thought **an acceptable world view** had to have. In his view, an acceptable world view had to be: **rational**, **ethical**, and **optimistic**. Let's see how Schweitzer explains each of these points in turn.

First, an acceptable world view is rational when it is the product of a lot of careful thinking about the way things really are.

"Only what has been well turned over in the thought of the many, and thus recognised as truth, possesses a natural power of conviction which will work on other minds and will continue to be effective. Only where there is a constant appeal to the need of a reflective view of things are all man's spiritual capacities called into activity." (Schweitzer, *ibid* pg. 86-7.)

This is stipulated in order that the world view may help people come to an understanding of the world and of one another. A world-view derived from unreflective instincts and impulses, in his view, cannot properly reflect reality, nor will it have sufficient power to motivate people to take action when they should.

Now, Schweitzer's words in that quotation might seem very circular. It may look as if he's saying 'a world view is rational when it's rational'. But what I suspect Schweitzer had in mind is something like this. A

world view is rational when lots of people examine it carefully and critically, and in so doing, they determine whether or not it is actually able to explain things. Thus an acceptably rational world view **corresponds appropriately and usefully to the world as people actually experience it**. In that sense, a rational world view is a highly realistic one.

Second, an acceptable world view is ethical when it can tell us something about the difference between right and wrong, and when it can help us become better human beings.

“Ethics is the activity of man directed to secure the inner perfection of his own personality... From the ethical comes ability to develop the purposive state of mind necessary to produce action on the world and society, and to cause the co-operation of all our achievements to secure the spiritual and moral perfection of the individual which is the final end of civilization.”
(ibid pg. 94-5)

It’s important to note here that when Schweitzer speaks of a world view as ‘ethical’, he is not saying that an acceptable world view has to include certain specific moral statements. He is not saying, for example, that an ethically acceptable world view must be Christian, or that it must be Liberal, or whatever. Rather, he is saying that it has to have *something* to say about what is right or wrong, and *something* to say about how we can become better human beings, *whatever that something might be*. One world view might say that it is always wrong to harm animals, for instance. Another might say it can be right to harm animals under certain conditions. A third might claim that it is never wrong to harm animals. The point is not that one of these three possibilities is acceptable and the others aren’t. The point is that all three of them are robust propositions about morality, regardless of whether you agree or disagree with them. Thus all three of those examples can be part of an acceptable world view.

It can often be tempting to say that a world view is unacceptable or invalid because it asserts moral claims that you find disagreeable. Doing so can make you look strong-willed and more certain of your values. But

it can also create unnecessary conflict with others who are just as strongly committed to their own different world views. Remember, it is possible to acknowledge that a world view is ‘acceptable’ in Schweitzer’s sense, while at the same time disagreeing with it.

Schweitzer’s third criteria for an acceptable world view is that it must be optimistic. By this he means that it must presuppose that life on earth is valuable and good.

“That theory of the universe is optimistic which gives existence the preference as against non-existence and thus affirms life as something possessing value in itself. From this attitude to the universe and to life results the impulse to raise existence, in so far as our influence can affect it, to its highest level of value. Thence originates activity directed to the improvement of the living conditions of individuals, of society, of nations and of humanity.” (Schweitzer, *ibid*, pp. 93-4)

Overall, according to Schweitzer, a world view that is not rational, not optimistic, and not ethical, whether in whole or in part, is (to that extent) a problematic or a faulty world view.

1.8 Value Programs

One important type of faulty world view is the kind which Canadian philosopher John McMurtry called a “value program.” Value programs are world views which have the following two qualities:

- There’s at least one proposition about values that cannot be questioned under any circumstances or for any reason, even when there is evidence available which shows that the proposition is weak, open to reasonable doubt, or even clearly false.
- Acting on the unquestionable proposition, and behaving and making choices as if that proposition is true, tends to cause a lot of preventable harm to people, or to their environments.

Here are McMurtry’s own words, to describe what value programs are like:

In the pure-type case, which will be our definition of a value program, all people enact its prescriptions and functions as presupposed norms of what they all ought to do. All assume its value designations and value exclusions as givens. They seek only to climb its ladder of available positions to achieve their deserved reward as their due. Lives are valued, or not valued, in terms of the system's differentials and measurements. All fulfill its specified roles without question and accept its costs, however widespread, as unavoidable manifestations of reality. In the strange incoherence of the programmed mind, the commands of the system are seen as both freely chosen and as laws of nature, or God... Those who are harmed by the value program are ignored, or else blamed for falling on its wrong side, because its rule is good and right. Its victims must, it is believed, be at fault. A value program's ideology is in great part devoted to justifying the inevitability of the condition of the oppressed.⁴

McMurtry added to his discussion that world views become value programs not due to a fault in human nature, but rather due to a kind of social or psychological conditioning: "...it is not 'human nature' that is the problem. The problem is not in how we are constructed, but in the inert repetition of the mind, a condition that does not question socially conditioned value programs."⁵

It's usually easy to identify value programs from history: mediaeval feudalism, for instance. But perhaps the more important questions are:

- What are the value programs of our time?
- Are you, or the people around you, unknowingly subscribing to a value program?
- Are there propositions in your intellectual environment which cannot be questioned, or which can be questioned but only at great personal risk?
- Is anyone harmed through the ways you live your life in accordance with the teachings of your world view? How are those harms explained? And are those explanations justifiable? Why or why not?
- In what ways, if at all, does your world view meet, or fail to meet, Schweitzer's three criteria for acceptability?

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⁴ McMurtry, "Unequal Freedoms" (Garamond, 1998) pg. 6

⁵ Ibid

As an exercise, have a look at this short list of world views of our time, and think about whether any of them are value programs, and why (or why not):

- Representative parliamentary democracy.
- Free-market capitalism.
- Human rights.
- The 'trickle-down' theory of economics.
- The right to bear arms.
- The pro-choice movement.
- The pro-life movement.
- Manifest Destiny.
- The 'fandom' of any professional sports team.
- The official platform of any major political party.
- The teachings, doctrines, and creeds of any major religion.

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1.9 World Views, Civilization, and Conflict

In 1993, American historian and political scientist Samuel Huntington published a paper called "A Clash of Civilizations?" In that paper he defined 'civilization' as "the highest cultural grouping of people and the broadest level of cultural identity people have short of that which distinguishes humans from other species."⁶ The idea here is like this. Think of the biggest grouping of people that you feel part of, such that the only grouping of people that is larger than that one is the human race as a whole. You will probably find yourself thinking about more than just your country or your religion, or those who speak the same language as you. Rather, you will find yourself thinking of people who share a few simple concepts in their world views, even while they live in different countries or speak different languages. With this definition in mind, Huntington thought that there are nine civilizations active in the world right now: Western, Latin American, Slavic, Middle Eastern, African, Hindu, Chinese, Buddhist, and Japanese. Huntington also thought that some countries, such as Ethiopia, and Turkey, are 'torn' countries. In a torn country, some forces in that country are working to transition the country from one civilization to another, while at the same time other forces in the same country resist that transition.

⁶ Huntington, "A Clash of Civilisations?" Foreign Affairs, Summer 1993

Huntington further argued that differences in world view and civilization are going to be the basis for all future armed conflict.

“...the fundamental source of conflict in this new world will not be primarily ideological or primarily economic. The great divisions among humankind and the dominating source of conflict will be cultural. Nation states will remain the most powerful actors in world affairs, but the principal conflicts of global politics will occur between nations and groups of different civilizations.” (Huntington, *ibid.*)

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Finally, Huntington also gives a particular privilege to religion. In his view, economic globalisation has had the effect of reducing the importance of the nation-state in shaping and defining personal identity. Religion, he says, has taken its place, since religion “... provides a basis for identity and commitment that transcends national boundaries and unites civilizations” (*ibid.*)

The important question here, of course, is whether or not Huntington’s claim about the inevitability of conflict is correct.

1.10 Exercise for Chapter One: How Much Variety Is In Your World?

I have more than one thousand people on my Facebook list. So I see lot of “memes” every day. Memes are ideas, expressed in pictures and videos and quotations and so on, which people share with each other, and the more they are shared the more their movements seem to take on a life of their own. One day I thought it would be fun to save them to a database, and tag them according to the kind of messages they express. What would I discover? Were there some kinds of memes that are more popular than others? What are these things really telling me about the thoughts and feelings of the people around me? And what are they telling me about myself?

The original idea was to take a kind of “snapshot” of the content of my (online) intellectual environment over four days to see what was in it. My basic rules

were simple. I would take only the pictures which appeared while I happened to be online. That way, I wouldn’t have to be online all day. And I also promised myself not to deliberately change my web surfing habits during those days, so that I wouldn’t get an artificial result. I also didn’t track the links to blog posts, news articles, videos, or other online media. Just to be simple, I only tracked the photos and images. And I only tracked the ones that someone on my list shared after having seen it elsewhere. That way, each of these pictures had passed a kind of natural selection test. Someone had created the image and passed it on to someone who thought it worthy of being passed on to a third person.

After the first few hours, I had about 50 memes for my collection. And I already noticed a few general trends. So I started tagging the samples into what appeared to be the four most obvious categories: Inspirational, Humorous, Political, and Everything Else. The Humour category was already by far the largest, with more samples than the other categories combined. At the end of the first day, there was enough variety in the collection that I could create sub-categories. The largest of which was “Humour involving cats or kittens.” No surprise there, I suppose.

But at the end of the second day, with about 200 samples in my collection, I started to notice something else, which was much more interesting. A small but significant number of these samples had to do with social, political, or religious causes other than those that I personally support. Some promoted causes that were reasonably similar to my values, but I have never done all that much to support them. For instance, I’ve nothing against vegetarianism, but I’m not vegetarian myself. So I labeled those ones the “near” values, because they are not my values, but they are reasonably close, and I felt no sense of being in conflict with them. Then I noticed that some of my samples were for causes almost directly opposed to the ones I normally support. So instead of “un-friending” people with different political views than me, I saved and tracked their political statements just as I did everybody else’s. And I labeled those statements the “far” values, because they expressed values fairly distant from my own.

So now I could look at all these images and put them in three broad groups: Common values, Near values, and Far values. And in doing so, I had discovered a way to statistically measure the real variety of my intellectual environment, and the extent to which I am actually exposed to seriously different world views. Let's name this measurement your 'Intellectual Environment Diversity Quotient'. Or, to be short about it, your 'DQ'.

At the end of four days, I had 458 pictures, and I had tagged them into six broad categories: Inspirational, Humour, Religion, Causes, Political, and Foreign Language. Here's how it all turned out. (Note here that if some of these numbers don't seem to add up, that is because some samples were tagged more than once, as they fit into two or (rarely) three categories.)

TOTAL SIZE OF THE DATASET: 458 (100.0%)
Inspirational images: 110 (24.0%) *Humour*: 225 (49.1%)
Religion: 36 (7.8%) *Causes*: 148 (32.3%) *Political*: 47 (10.2%) *Foreign language*: 11 (2.4%)

And by the way, only 5 of them asked the recipient to "like" or "share" the image.

Now, for the sake of calculating how much real difference there is in my intellectual environment, we have to look at just the images expressing social, political, religious, or philosophical values of some kind. This doesn't necessarily exclude the inspirational or comic pictures that had some kind of political or moral message, because as mentioned, a lot of the pictures got more than one tag. As it turned out, around half of them were making statements about values. (That, by the way, was also very interesting.)

Here's the breakdown of exactly what my friends were posting pictures about. And as you can see, there's a lot of variety. But what is interesting is not how different they are from each other. What's interesting is how many of them are different from my own point of view. You can figure this for yourself by comparing the memes in your own timeline to what you say about yourself in your own FB profile, or by just deciding with each image, one at a time, how far you agree or

disagree with each one. But in either case you have to be really honest with yourself. In this way, calculating your DQ is not just about taking a snapshot of your intellectual environment. It's also about knowing yourself, and making a few small but serious decisions about what you really stand for.

TOTAL RELIGION, CAUSES, & POLITICAL:
 231 (100.0%)

TOTAL RELIGIOUS: 36 (15.5%)
Buddhism: 4 (1.7%) *Christianity*: 6 (2.5%) *Pagan*: 8 (3.4%) *Northern / Asatru*: 6 (2.5%) *Aboriginal / First Nations*: 3 (1.2%) *Taoism*: 1 (0.4%) *Hindu*: 1 (0.4%) *Any*: 6 (2.5%) *Atheism*: 1 (0.4%)

TOTAL CAUSES: 148 (64.0%)
Against cruelty to animals: 3 (1.2%) *Against religious proselytization*: 3 (1.2%) *Support education, science, critical thinking*: 19 (8.2%) *Pro-vegetarian*: 1 (0.4%) *Organic and/or backyard gardening*: 3 (1.2%) *Feminism / anti-violence against women*: 3 (1.2%) *Feminism / sexual power relations*: 7 (3.0%) *Feminism / body image*: 5 (2.1%) *Anti-war*: 4 (1.7%) *Israel-Iran antiwar solidarity*: 3 (1.2%) *Support for soldiers / war veterans*: 8 (3.4%) *Support for retired military dogs*: 2 (0.8%) *Support gun ownership*: 3 (1.2%) *Race relations, anti racism*: 1 (0.4%) *Support gay marriage / LGBT pride*: 10 (4.3%) *Support environmentalism*: 5 (2.1%) *Support universal health care in America*: 1 (0.4%) *Support the student protest in Quebec*: 3 (1.2%) *Against fascism and Neo-Nazism*: 1 (0.4%)

TOTAL PARTY POLITICAL: 47 (20.3%)
Right wing: 8 (3.4%) *Left wing*: 36 (15.5%) *Centre*: 3 (1.2%)

Now for the sake of figuring your DQ, we need to look at the percentage of value-expressing memes that are near to my values, and the percentage of those which are distant. That's the measure of how much of the intellectual environment you live in could really challenge you, if you let it.

TOTAL: 231 / 100.0%

Common values = 150 / 64.9%

Near values = 64 / 27.7%

Far values = 17 / 7.3%

So, my DQ, rounded off, is **28** and **7**.

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Now, you might be thinking, if I did the experiment on a different day, I'd collect different samples, and I'd get a different result. This was especially clear in the humorous pictures, because some of them depended on the time of year for their effect. For example, I got a lot of Douglas Adams references, because one of the days I was collecting the images was "Towel Day". I also got a lot of Star Wars images because I was collecting my samples on May the 4th. Similar effects can also influence the memes that were expressing values, for instance if the dataset is collected during a religious holiday. Therefore, the figure I just quoted above might not be very accurate. Well, to address that possibility, I ran the experiment again two weeks later. And here's what I got the second time.

SECOND SET = 470

TOTAL RELIGION, CAUSES, POLITICAL, SECOND SET: 243 (100.0%)

Common values = 157 (64.6%)

Near values = 77 (31.6%)

Far values = 9 (3.7%)

As you can see, it's a slightly different result. The total collection was larger, and there were a lot fewer distant values represented. And among the comic pictures, there were a lot more references to Doctor Who. But overall it wasn't a big difference. In fact the fraction of pictures which expressed some kind of value was still about 50%, just as before. So if I add the second set to the first, and do the math again, I can get a more accurate result, like this:

BOTH SETS COMBINED = 474 (100.0%)

Common values = 307 (64.7%)

Near values = 141 (29.7%)

Far values = 26 (5.4%)

New DQ = **30** and **4**.

Now, I don't know whether that figure is high or low, because I have no one else's data to compare it to. And I also don't know whether it would be good or bad to have a high DQ, or a low one, because, well, that's a value statement too!

But what I do know is that I can now accurately measure the extent to which my intellectual environment has a real range of different ideas and opinions. I can measure how much "otherness", social or religious or political "other-ness", exists in my world. I can also measure how much I prefer the somewhat less stressful company of people who think more or less the same way I do. Or, I can also measure the extent to which my intellectual environment serves only as a kind of echo-chamber, repeating back to me my own ideas without examining them very deeply.

But the really fun part of this experiment is that you can do it too! What's your DQ?

Chapter Two: Habits of Good and Bad Thinking

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We have seen some of the problems that can arise when different world views and different intellectual environments come into conflict with each other. Now let us look at some of the problems that can arise when a given world view comes into conflict with *itself*. There are various ways that people think, and various ways people pull their world views together, which actually make it harder for people to find the truth about anything, communicate with each other effectively, and solve their problems. And there are other ways people think which make it easier to communicate, solve problems, and discover truths. I shall call these things ‘good and bad thinking habits’.

Note that I call these principles of thinking ‘habits’ rather than rules. This is because there are various exceptions to each of them. There can occasionally be situations in which a good thinking habit might be inappropriate, or in which a bad thinking habit might be very useful. But such exceptions tend to be very rare. You will almost always be thinking rationally and clearly when your thinking follows the good habits and avoids the bad habits.

The bad habits tend to arise in two ways. They arise because of **how we think**: these bad habits are mostly psychological factors such as fears, motivations, and attitudes. Bad habits also arise because of **what we think**: these habits arise when our thinking involves problematic beliefs. Again, thinking in terms of such bad habits are not signs that one’s thinking is *necessarily* or *inevitably* wrong. (In this way, they are different from the fallacies, which we will discuss later on.)

They do, however, tend to make one’s thinking very

weak, and very vulnerable to criticism and objection. They also tend to make one’s views and beliefs easily manipulated by other people. When they form a prominent part of one’s intellectual environment, they tend to introduce faults into one’s world view.

2.1.1 Self-Interest

On its own, self interest need not be a bad thing. Most people make decisions at least in part on the basis of what they think will benefit them. Self-interest can be a problem when you advance some argument or defend some world view only because you personally stand to benefit if it’s true, and for no other reason.

The notion of self-interest has an important place in some specialized forms of reasoning, such as game theory and economics. We find it in sources as ancient as Aristotle: his claim that everyone by nature desires happiness was the starting place for his theory of ethics. We find it in the work of John Stuart Mill, who made the pursuit of ‘utility’, meaning pleasure or personal benefit, the basis of his theory of ethics, called Utilitarianism. Adam Smith, widely regarded as ‘the father of modern economics’, also placed self-interest at the centre of his work. To Smith, self-interest was a normal part of rational human behaviour, and often a very self-defeating kind of behaviour. But in a properly functioning economy, Smith reasoned, businesspeople and investors would direct their self-interest toward public goods.

Self-interest also plays an important part in a branch of mathematics called game theory. Without

going into a lot of detail about each of these writers and others who were like them, let it suffice to say that self-interest is a very powerful psychological force in people's minds. All the writers mentioned here are very careful to specify the ways in which self-interest is rational and useful, and the ways in which it is irrational and even damaging. For this reason, some logicians prefer to separate 'intelligent self interest' from ordinary selfishness and egotism. Intelligent self-interest looks for the 'bigger picture', sees the ways in which one's own interests can align with other people's interests, is willing to sacrifice short-term benefits for the sake of longer-term benefits, and recognizes that some kinds of benefits or advantages for the self are not really worth pursuing.

Self-interest tends to get in the way of good reasoning when people have a strong emotional or economic stake in something that looks like it might be under threat from others. In such situations, people tend to get passionate and emotional, and this almost always clouds their judgments. If you secretly want something to be true, and you stand to benefit from it being true (for instance, if you might make money that way), but there's little or no reason for it to be true, you may inadvertently misinterpret the evidence, or discount contradictory evidence, or invent rationalizations that have little or no logical strength. This can lead you to a faulty understanding of your situation, and as a result you are more likely to make bad decisions.

2.1.2 Saving Face

Among the various ways that people are self-interested, most people are also interested in having a good reputation, and being liked or even admired by others around them. No one, or almost no one, enjoys having their faults, weaknesses, harmful actions, or foolish choices pointed out to them by others. Moreover nobody, or almost nobody, likes to be proven wrong by others. And this, by itself, is not a bad thing. But because of this interest, people sometimes cover up their mistakes. Or, if it is shown to them that some of their ideas or beliefs are unworkable or absurd, they might continue to argue in favour of them anyway, in

order to avoid admitting that the other person might be right. When we do this, we are falling into the habit of saving face.

The habit of saving face is in some ways related to a condition described by psychologists called "**cognitive dissonance**". This is what happens when someone is confronted with, or contemplates, two or more beliefs that cannot both be true at the same time. (Especially these two contradictory thoughts: "I am a good person" and "I caused someone harm".) Most people are strongly psychologically disposed to avoid having contradictions like that in their thoughts. And most people don't like to have muddled thoughts like that pointed out to them by others: it makes us look foolish. And so people tend to invent self-interested reasons to reject one or other of the contradicting beliefs, with the real purpose of restoring their sense of self worth. But this can sometimes blind us to the truth, or even prevent people from finding out what the truth really is.

Examples:

"Only six people came to the company picnic. I was on the organizing team. But it wasn't my job to send out the invitations."

"I got an 'F' on that essay. But I'm getting an 'A' in all my other classes. Clearly, the professor doesn't know what he's doing."

"Jim has been my best friend for ten years and he's always been nice to me. So I just can't believe he is the one who stole the old man's wallet. You must be mistaken."

"Sally has been my best friend for ten years. But tonight she stole my wallet. I guess she was a bad person all along, and she just tricked me into thinking she was a good person."

2.1.3 Peer Pressure

All of us are members of various communities and social groups, as we saw in the discussion of world

views and intellectual environments. Each of those groups tends to have a few prevalent ideas, practices, and beliefs, that form part of the group's identity. Here let us add that most of these groups also exert a bit of psychological pressure on the members to accept the group's prevalent ideas, practices, and beliefs. Sometimes that pressure can be very subtle, and very limited. You might get nothing more than an odd look or a cold shoulder if you say something that doesn't fit with the group's main beliefs. Other times, it might be very overt and unambiguous, and perhaps connected to threats of punishment for non-conformity. You might be shut out of the group's decision-making process, or not invited to the group's events anymore, or (if one's non-conformity is persistent) even targeted with malicious gossip or threats of violence. Thus, people tend to keep their dissenting views to themselves, or they change their views to better fit the group. Now, the ideas shared by the group might be right, or they might be wrong, or they might be somewhere in between. But the number of people who believe those ideas has nothing to do with whether those ideas are any good. Problems almost always arise when someone accepts an idea or a world view *only* because it is an idea or a world view favoured by the group he or she belongs to, and for no other reason.

2.1.4 Stereotyping and Prejudice

Since we are speaking of peer pressure: a community or social group might have a few beliefs about people who belong to other groups. The group might look up to other groups, or down upon them, or attribute some quality or behavioral trait to all of them. This becomes a bad habit when there is little or no real evidence that all members of that other group share that quality. We might build stereotypes of people based on how they are characterised in entertainment media, or on your experiences meeting one or two members of that group. But in terms of the actual evidence to support the stereotype, the 'sample size' is always too small. It's usually based on only a handful of cases, and then generalized to a massively larger group. In this way it is a case of the fallacy of hasty generalization. In fact, the

sample size can be as small as zero: some people develop stereotypes without any evidence at all. They've just been taught to think that way by their intellectual environment. Stereotyping almost always treats people as tokens of a type, almost never as individuals with their own distinct qualities. In this way, it prevents us from knowing the truth about individuals, and can even prevent us from knowing the truth about the various groups that person might belong to.

As stereotyping is the assumption that all members of a given social group are somehow basically the same; so too is prejudice a hostile or harmful judgment about the merit or the worth of people in that group, assigned on the basis of a stereotypical assumption. One of the ideas that a group might pressure its members to believe is the idea that one's own group is better than other groups. This almost always leads people to see the ideas and world views of rival groups in the very worst possible light. And it leads people to treat members of the rival group badly. Racism, sexism, religious discrimination, classism, poor-bashing, and able-ism, are all examples of this. Prejudice is also hurtful when the qualities it assigns are qualities that subordinate people or which deny them full membership in the human race. There might be a spectrum of intensity, which at one end attributes only a few relatively minor bad qualities such as foolishness or uncleanness, and which at the other might incite strong feelings of hate or fear, such as criminality, emotional instability, animalistic physical features, disease, or even a secret conspiratorial agenda. But in any case, stereotyping and prejudice almost always prevents people from seeing things and people as they truly are.

Why do prejudiced beliefs persist? The main reason is because those beliefs are supported by peer pressure. When among prejudiced people, uttering a disparaging remark about the target group might be actually encouraged and rewarded in various ways: smiles, happy laughter, welcoming gestures, and approving words. In this way, prejudiced beliefs persist when people do not think for themselves, but rather when they allow other (prejudiced) people to do their thinking for them.

2.1.5. Excessive Skepticism

It is usually very healthy to be a little bit skeptical of things, and not to take things at face value all the time. Some people, however, believe that we cannot truly know anything unless we can be absolutely certain of it, and that we are beyond any possible doubt about it. That level of skepticism is almost always too much.

Excessive skepticism tends to appear when people try to estimate the riskiness of some activity. The excessively skeptical person tends to make a ‘big deal’ of the risks involved, and might be unwilling to do anything until he is satisfied that everything is absolutely safe and certain. Or he might be unwilling to do something because ‘it’s never been tried before’. But it’s often the case that we have to act even in situations where success is very uncertain, and there is no way to absolutely guarantee safety. The moon landings from 1969-72 are good examples here. No one really knew whether the missions would succeed, or fail, or even end in total disaster. (At one time, astronomers thought that the dark ‘seas’ on the moon were made of sand, and they worried that the landing craft would sink!) The excessively skeptical person weighs the risks too heavily, and often ends up unable to act because of that skepticism. He may even try to prevent others from acting, because of his own doubts.

Excessive skepticism can also appear in matters that are almost purely theoretical. For instance, some people might doubt the reality of the world outside their own minds. It can be fun to speculate about whether or not we are being deceived by Descartes’ Evil Genius, or whether we are all living inside a computer-generated virtual reality. Sometimes it can be fun to ask ‘How do you know?’ in an infinite regress, the way small children sometimes do.

But most of the time, we don’t need to have such high standards for certainty. It is enough that one’s beliefs are beyond *reasonable* doubt; they do not have to be beyond *all possible* doubt. As a rule of thumb, remember that **doubt based on speculation without evidence is not reasonable doubt**. It’s not enough to say that something is doubtful because some alternative explanation might be possible. It’s also important

2.1.5 Excessive Skepticism

to say something about how probable the alternative explanation really is. If an alternative explanation is possible but very unlikely, and there isn’t much evidence for it, then it isn’t a good basis for skepticism. So if you dreamed last night that you ran away to a foreign country and married your worst enemy, then that ‘might’ be because in some parallel universe that’s exactly what you did. But there’s no evidence to support that possibility, so it’s best to discount it as a reasonable explanation for your dream.

We shall see more about skepticism among the good thinking habits, and later on we’ll see it again in the discussion of reasonable doubt.

2.1.6 Intellectual Laziness

This is the habit of “giving up too soon,” or deliberately avoiding the big questions. This is the habit we indulge when we say things like: “thinking that way is too confusing,” or “your questions drive me crazy,” or “these questions cannot be answered, you just have to accept it.” Laziness also appears when you answer a philosophical question with a witty quotation from a movie or a popular song, as if that’s all that needs to be said about the topic. Some people actually go to great efforts to defend their laziness, with complex arguments for why intellectually enquiring or scientifically minded people “can’t handle the mystery of things,” or why they want to “take away the beauty and the magic of the world.”

A variation of intellectual laziness is **willed ignorance**. This is the habit of deliberately preventing oneself from answering hard questions or acknowledging relevant facts. Some people prefer to live in a kind of bubble, where serious challenges to their world views never appear. And while it can be a sign of integrity to preserve the core values of one’s world view, it is also the case that deliberately shutting out facts or realities that challenge one’s world view can lead one to make poor decisions. Your world view might hold that some questions are unanswerable, or that some questions are not allowed to be asked. Similarly, you might prevent yourself from acknowledging facts or realities that could serve as evidence of the wrongness

of some part of your world view. Willful ignorance actually takes some effort, and perhaps isn't precisely the same as laziness. But it has the same basic effect: it prevents people from learning things that they may need to know, and so makes it more likely that they will make bad decisions, or turn their world views into value programs.

Some people might even argue that there is no such thing as 'Truth,' with a big capital T, referring to statements about the ultimate things like God, or justice, or knowledge, or reality. They might believe that it is pointless to claim that any given idea or belief or explanation of such things is true, no matter how well supported it might be by the facts or by logic. There might be an appeal to some kind of relativism as the reason for why there's no such thing as an ultimate truth. And in that sense, this line of thinking is not truly lazy: it goes to some effort to seriously defend the claim that no one can make a serious claim about such things. But the real function of such assertions is to justify a refusal to think deeply and carefully about the things that matter. It may be the case that there are, or that there are not, ultimate truths about such things. But the intellectually lazy or willfully ignorant person does none of the work needed to find out. They actually do not know, and they have made their ignorance into a kind of rule for their thinking.

It might not be polite or kind to name this habit 'laziness,' but that's what it really is. Just as one can be lazy at practical tasks like cleaning your house, you can be lazy in your thinking about pressing problems or important questions. And just as laziness in your practical affairs can hurt you eventually, there are times when lazy thinking can cause you great trouble later on, too. Lazy thinking can make it easier for others to manipulate and deceive you, for instance. And it can also paralyze you into doing nothing in situations where decisions must be made.

2.1.7 Relativism

Philosophical arguments are often presented in the form of debates. Sometimes there are two positions that are opposed to each other, and each side presents

2.1.7 Relativism

arguments that support their position while showing the problems with the opposing position. Consider, as an example, a debate about the moral permissibility of the death penalty. The speakers might take these two positions:

A: The death penalty is morally permissible (for reasons x, y, z).

B: The death penalty is not morally permissible (for reasons a, b, c).

When assessing the evidence for these claims, philosophers are trying to establish whether it is true or false that the death penalty is morally permissible. In this case the moral permissibility of the death penalty is being treated like a fact. Often beginning philosophers are not comfortable with treating moral, epistemic, or aesthetic claims as being either right or wrong. Philosophical claims are not scientific claims for which we can provide empirical evidence, and often both sides provide very compelling arguments. This can make it seem as if both sides are right. Sometimes it makes sense to search for a middle ground, however, it is not always possible or desirable. It is, furthermore, a contradiction to say that the death penalty both is and is not morally permissible. When is it morally permissible? What makes the death penalty morally permissible in some cases but not others? More needs to be said.

Relativism is the view that a claim is only true or false relative to some other condition. There are many varieties of relativism: but the two most common kinds are:

- **Subjective relativism**, also known as **Personal Belief relativism**, is the claim that the truth about anything depends on what someone believes. It is the view that all truth is in the 'eye of the beholder'; or that something is true *if (and only if) someone believes it to be true*, and then it is true *for that person*, and perhaps only for that person. In ethics, subjective relativism is the idea that an action is morally right if the person doing that action believes it to be morally right. Nothing makes an action right or wrong except the judgment of the person doing it.

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- **Cultural Relativism** is the idea that something is true, or right, etc., because it is generally believed to be so by some culture or society. Further, it is true, or right, etc., for *that* society.

Here we will examine relativism about truth as it pertains to philosophical claims about ethics and knowledge that you are likely to encounter in an introductory class. As relativism is very appealing to beginning philosophers, it is important to look at some different kinds of relativistic arguments, the problems with them, and some of the typical reasons for adopting a relativistic position.

One reason to adopt relativism is that philosophical claims, particularly ethical claims, can seem very subjective. With so much debate it can seem as if there are no correct answers, and that what is right or wrong can be different for different individuals. Alice believes the death penalty is okay and Barbara believes it is wrong, and who are we to tell them what to believe?

The problem with accepting this kind of relativism is that it makes a claim true or false relative to someone's beliefs, and takes beliefs to be above any justification. While it may seem arrogant to challenge other people's beliefs, examining what we take to be true and why is one of the basic components of philosophy. It isn't enough to say "Alice believes that X is okay, so X is right for her," perhaps Alice has never examined her beliefs, or came to hold them because she was given false information. Investigating what we believe and why can help us to have consistent beliefs, and also to be confident and conscientious in our ethical choices.

While it is respectful to consider others' points of view, differences in perspective does not entail that philosophical questions are entirely subjective. Learning how to carefully consider and assess reasons and justifications is part of studying philosophy. In some arguments disagreement between conclusions can mask similarities in underlying beliefs. For instance, two people can agree that murder is unjustified killing and disagree about what deaths count as murder. Alice might believe that the death penalty is state sanctioned murder, and so oppose it. Barbara might believe that a

death that is sanctioned by the state is always justified. Their disagreement over the death penalty is then not only about whether it is right or wrong, but over acceptable justifications for taking someone's life.

Someone else might note that some cultures accept action X while some do not, and argue that X is morally permissible relative to culture. This is known as cultural relativism. Often students accept cultural relativism because they want to be sensitive to cultural differences. Different cultures have different practices, but can we say that a culture allowing the death penalty means it is sometimes morally permissible? There are two problems with this approach. One is that it does not allow people within a culture to disagree with the practice. If someone from culture A wants to argue against the death penalty they could not do so on moral grounds—their culture permitting it makes it a morally acceptable act. Another problem is changes in cultural practices. We want to say that slavery was abolished because people realized that it was wrong to treat people as property, not that it became immoral once the practice stopped.

There is a difference between issues that are moral and those that are social norms or matters of etiquette. In some cases it makes sense to accept cultural relativism about social practices, but in others it might seem as if some other factor, such as human rights, trumps concerns for cultural variation. It can be difficult to determine when we should and when we should not challenge the practices or beliefs of other cultures, but it requires rational inquiry and a sensitive analysis of the arguments that demands more than knee-jerk relativism.

The problems with relativism do not mean that we have to accept the view that ethical or epistemic truths are universal and absolute. There is a great deal of conceptual space between individual relativism and accepting a general moral principle. Likewise, there are ways to be culturally sensitive while challenging the practices of our own and other cultures. Some concepts that seem natural or objectively true to us may turn out to be contingent—if a culture has three rather than two concepts of gender we might reconsider why we think about gender as we do. Being open to other

cultures' beliefs and attitudes can be very important to learning to see things in a different light, but it does not mean that we have to accept them without good reasons.

2.1.8 The Consequences of Bad Habits

The consequences of living with and falling into these bad thinking habits can be very serious. For instance, they can:

- Make you more vulnerable to being intimidated, bullied, or manipulated by others;
- Make you less able to stand up for yourself, or for others in need;
- Make it harder to tell the difference between truth and lies;
- Make you more dogmatic and closed-minded;
- Make you less flexible, less creative, and less ready to handle unpredictable changes in your situation.
- Lead you to justify moral decisions that needlessly harm people, including yourself;
- Lead you to suppress or ignore evidence that goes contrary to your beliefs, even if that evidence is very reliable;
- Provoke confusion or anger when presented with reasons why one's beliefs might be problematic or faulty;
- Prevent serious philosophical thinking about the most important problems in our lives;
- Prevent personal growth, maturity, and self-awareness.

With these observations in mind, let's look at some good habits.

2.2.1 Curiosity

As an intellectual habit, curiosity is the desire for knowledge. To be an intellectually curious person, you have to be the sort of person for whom the usual explanations of things are not enough to satisfy you. The curious person wants to find out more about whatever is new, strange, or interesting in the world. When something different, unusual, unexpected, or even weird and scary appear, the curious person doesn't

hide from them or pretend they are other than what they are. She faces them directly, and makes an honest attempt to investigate them. And she does not settle for things to remain mysterious. Indeed part of the task of the philosopher, as it is with the scientist, is to render things un-mysterious: it is to understand things as completely as possible. Good rational thinkers love mysteries and puzzles: but they don't just stand back and "appreciate" them. They also try to figure them out.

It is precisely by being intellectually curious that good reasoning helps prevent closed minded dogmatism. Curiosity leads to discovery, invention, expanded awareness of the world, and of the self. Sometimes it leads to beauty; sometimes it leads to power. Most of all, it leads to, just as it depends on, a sense of wonder. Those who think that rationality is a set of rules for thinking which limit or constrain your experiences, or who think that rationality kills the sense of creativity and imagination, are simply wrong – and there's no polite way to say it. And it's probable that such people have actually limited their own experiences by excluding from their minds the most powerful, most inquisitive, and most successful way of knowing the world ever devised.

2.2.2 Self-Awareness

Above the entrance to the famous Oracle of Delphi, the religious centre of the classical Greek world, was written the phrase *γνῶθι σεαυτόν*. In English, this means 'know yourself'. The idea was that people who wanted to enter the temple should have done a sustained exercise in personal soul-searching, to be fully honest about their own individual character and habits, and also to be honest about human nature (especially human mortality).

Self-awareness involves knowing your own presuppositions, desires, biases, world views, and so on. It involves knowing your habits, faults, desires, powers, and talents. And it involves knowing something about what it means to be a thinking human being. This is a more difficult prospect than it appears to be. Some people do not find out what their own world view is until someone else says or does something which

challenges it. But it is an essential quality: those who do not know themselves tend to make poor decisions, and are easily manipulated by others.

2.2.3 Health

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As unrelated as it may seem, taking care of your physical health is actually a good thinking habit. If you are feeling unwell, or sleep-deprived, or under stress, or for whatever reason physically uncomfortable, then it will be harder for you to observe and understand your situation, and harder to reason about it clearly. Good health, as a thinking habit, involves getting enough exercise, eating healthy real food and avoiding junk food, bathing regularly, and getting enough sleep. It also involves taking care of your mental health: and one of the simplest ways to do that is to take time every day for leisure activities that are restful.

A study conducted by psychologists in Japan found that people who gazed on forest scenery for twenty minutes produced 13.4% less salivary cortisol, a stress hormone. Walking in forests and natural settings also helped reduce high blood pressure, and reduce heart rate fluctuations. As these effects became more known, some municipalities in Japan created “forest therapy” programs for stressed-out factory workers.⁷ High-stimulation activities like video games, action films, intensely athletic sports, and anything that gets your adrenaline rushing, can be a lot of fun, but they’re not restful. I’m not saying you should avoid such things altogether. But good critical thinking requires calm, and peace, and quiet. To be better able to calm yourself when you need to think, give around twenty minutes or more, every day, to something genuinely relaxing, such as walking in a forest, or meditating, or reading, or cooking and eating a proper meal. Don’t be multitasking at the same time. If you are experiencing a lot of frustration dealing with a certain problem, you will probably have an easier time of it after a shower, a healthy dinner, a walk in the park with a friend and a dog, and a good night’s sleep.

2.2.3 Health

2.2.4 Courage

Sometimes, your process of thinking about things will lead you to possibilities or conclusions that you won’t like, or which your friends or associates won’t like. Sometimes, you might reach a conclusion about something that might land you in trouble with your boss at work, or your teacher, your priest, your government, or anyone who has some kind of power, authority, or influence in your life. Expressing that conclusion or that thought might land you in some amount of danger: you might risk being fired from your job, or ostracized from your community. Depending on the situation, and the idea you are expressing, you might find yourself excluded, angrily criticized, ignored, arrested, imprisoned, or even killed. Even in countries where the freedom of speech and of expression and of the press is guaranteed by constitutional law, people can still run great risks by speaking their minds, even when their words are true.

Courageous thinking means thinking and expressing the dangerous thought anyway. It means **thinking and speaking without fear**. It means committing yourself to what you rationally judge to be the best conclusion, whether you like it or not, and whether your friends or your ‘betters’ like it or not. And this is a lot harder to do than it sounds. Strong social forces like the desire to be welcomed and included and loved, or strong institutional forces like laws or corporate policies, can lead people to keep quiet about ideas that might be controversial.

Questions and arguments can require personal courage when they challenge a very important part of one’s world view. Consider the following examples:

- What if there is no god?
- What if there is no objective moral right or wrong?
- What if a very popular or charismatic person is telling half-truths or lies?
- At my workplace, am I participating in or benefitting from something unjust, or evil?
- What if life has no purpose or meaning?

People who take such questions seriously, and who consider answers that are radically different from the answers provided by their world views, may experience a lot of self-doubt or even despair. They may find that they have to change their lives. Even the mere act of posing the questions, aside from the attempt to answer them, can land people in trouble with their friends and families. Strong social forces might pressure the questioner to not ask certain questions, or to answer them only in acceptable ways. In such situations, it can take great courage to ask such questions, and to do one's own thinking in search of a decent answer.

Questions and arguments can require public or political courage when they challenge some arrangement in your social world. It could be something as simple as choosing to support a different professional sports team other than the one based in your home city, or the one supported by all your friends and family. Or, it could be something as complex and dangerous as opposing a policy of a large corporation that you work for, or which has a significant presence in the area where you live. It can take a lot of courage to criticize the actions of some entity with political power, especially when that entity can threaten people who disagree with it. If you criticize your employer, you might lose your job. If you criticize your government, you might be arrested. If you criticize your church leaders, you might be shamed, denounced, or dismissed from the church. As the philosopher Voltaire wrote, "It is dangerous to be right in matters on which the established authority is wrong."

The classical Greek language gives us a word for statements that require this kind of courage: **parrhesia**, which roughly translates as 'bold speech'. The person who makes such a bold statement is called a *parrhesiastes*. Two qualities are necessary for a proposition to count as parrhesia. One is that the speaker incurs some personal risk from various social or political forces. The second is that the speaker's words must be true. (Thus, a person who creates controversy for the sake of creating controversy is not a parrhesiastes.) Today we might call such people '**whistle-blowers**': individuals who act like referees in a game who stops some player who breaks the rules. Whistle-blowers

are people who draw public attention to some act or policy of moral wrongdoing in their workplaces, their governments, or in any other social group to which they belong. Whistleblowers often face all kinds of problems: harassment, defamation of their reputations, job losses, lawsuits, vandalism of their homes and vehicles, and in some cases death threats. But no public cause has ever succeeded "by itself", without courageous people willing to speak out in favour of it. To be a courageous thinker means to care more for the truth than for one's personal interests (and sometimes, more than for one's safety). But it also means to be an agent for necessary changes.

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2.2.5 Healthy Skepticism

Earlier, we characterized 'excessive skepticism' as a bad habit. But there is another side of skepticism that is very healthy. Healthy skepticism is **the general unwillingness to accept that things are always what they appear to be**. It is the unwillingness to take things for granted, or to accept that things are as you have been told they are by anyone else, no matter who they are, or what their relation is to you.

This does not mean we have to doubt absolutely everything, nor does it mean we cannot trust anyone. It does, however, mean that we do not jump to conclusions. Healthy skepticism is to be slow to accept the popular explanations for things. It prefers to investigate many possibilities before settling on the best available explanation.

Healthy skepticism is also known as 'reasonable doubt'. We'll see more of that in a later chapter.

2.2.6. Autonomy

To think with autonomy simply means to think for yourself, and not to let other people do your thinking for you. Autonomous thinking is thinking that does not blindly accept what you have been told by parents, friends, role models of every kind, governments, newspaper columnists, or anyone who could have an influence on your thinking.

No one else can do your thinking for you. And

you are under no obligation to follow anybody's party line. Your only obligation for thinking, if it is an 'obligation' at all, is to think clearly, consistently, rationally, and (where necessary) courageously.

At the end of some curious, courageous, and skeptical soul-searching, you might decide that your world view should be more or less the same as that which is held by your family, friends, role models, and other influences. That is okay – the point is that the world view is now yours, and not handed to you by others.

2.2.8 Precision

There are a lot of words in every language that have more than one meaning. This is a good thing: it allows us more flexibility of expression; it is part of what makes poetry possible; and so on. But for the purpose of reasoning as clearly and as systematically as possible, it is important to use our words very carefully. This usually means avoiding metaphors, symbols, rhetorical questions, weasel words, euphemisms, tangents, equivocations, and 'double speak'. When building a case for why something is true, or something else is not true, and so on, it is important to say exactly what one means, and to eliminate ambiguities as much as possible.

The simplest way to do this is to craft good definitions. A definition can be imprecise in several ways; here are some of them.

- *Too broad*: it covers more things than it should.
- *Too narrow*: it covers too few things.
- *Circular*: the word being defined, or one of its closest synonyms, appears in the definition itself.
- *Too vague*: The definition doesn't really say much at all about what is being defined, even though it looks like it does.

Example of a broad definition: "All dogs are four-legged animals." (Does that mean that all four-legged animals are dogs?)

Example of a narrow definition: "All tables are furniture pieces placed in the dining rooms of houses and used for serving meals." (Does that mean that tables in other rooms used for other purposes are not 'true' tables?)

Example of a Circular definition: "Beauty is that which a given individual finds beautiful." (This actually tells us nothing about what beauty is.)

Example of a vague definition: "Yellowism is not art or anti-art. Examples of Yellowism can look like works of art but are not works of art. We believe that the context for works of art is already art."⁹ (And I don't know what this means at all.)

42 2.2.7 Simplicity

Sometimes you may find that things are more complex or more elaborate than they appear to be at first. And it is often the job of reason to uncover layers of complexity behind appearances. Still, if you have two or more explanations for something, all of which are about as good as each other, the explanation you should prefer is the simplest one.

This principle of simplicity in good reasoning is sometimes called **Ockham's Razor**. It was first articulated by a Franciscan monk named Brother William of Ockham, who lived from 1288 to 1348. His actual words were "Entia non sunt multiplicanda sine necessitate."⁸ In English, this means 'No unnecessary repetition of identicals'. This is a fancy way of saying, 'Well it's possible that there are twenty-three absolutely identical tables occupying exactly the same position in space and time, but it's much simpler to believe that there's just one table here. So let's go with the simpler explanation.' Ockham's original point was theological: he wanted to explain why monotheism is better than polytheism. It's simpler to assume there's one infinite God, than it is to assume there are a dozen or more.

Ockham's idea has also been applied to numerous other matters, from devising scientific theories to interpreting poetry, film, and literature. Other ways to express this idea go like this: "All other things being equal, the simplest explanation tends to be the truth," and "The best explanation is the one which makes the fewest assumptions."

⁸ William of Occam, *Sentences of Peter Lombard*, (ed. Lugd., 1495), i, dist. 27, qu. 2, K.

⁹ Marcin Lodyga and Vladimir Umanets, "Manifesto of Yellowism", retrieved from www.thisisyellowism.com, 8 July 2010 / 17 February 2012.

2.2.9 Patience

Good philosophical thinking takes time. Progress in good critical thinking is often very slow. The process of critical thinking can't be called successful if it efficiently maximizes its inputs and outputs in the shortest measure of time: we do not produce thoughts in the mind like widgets in a factory.

The reason for this is because good critical thinking often needs to uncover that which subtle, hard to discern at first, and easy to overlook. I define subtlety as 'a small difference or a delicate detail which takes on greater importance the more it is contemplated.' As a demonstration, think of how many ways you can utter the word 'Yes', and mean something different every time. This also underlines the importance of precision, as a good thinking habit. As another example: think of how the colour planes in a painting by Piet Mondrian, such as his 'Composition with Yellow, Blue, and Red' have squares of white framed by black lines, but none of the white squares are exactly the same shade of white. You won't notice this if you look at the painting for only a few seconds, or if you view a photo of the painting on your computer screen, and your monitor's resolution isn't precise enough to render the subtle differences. But it is the job of reason to uncover those subtleties and lay them out to be examined directly. And the search for those subtleties cannot be rushed.

2.2.10 Consistency

When we looked at what a world view is, we defined it as 'the sum of a set of related answers to the most important questions in life.' It's important that one's world view be consistent: that your answers to the big questions generally cohere well together, and do not obviously contradict each other. Inconsistent thinking usually leads to mistakes, and can produce the uncomfortable feeling of cognitive dissonance. And it can be embarrassing, too. If you are more consistent, you might still make mistakes in your thinking. But it will be a lot easier for you to identify those mistakes, and fix them.

Consistency also means staying on topic, sticking

to the facts, and following an argument to its conclusion. Obviously it can be fun to explore ideas in a random, wandering fashion. But as one's problems grow more serious, it becomes more important to stay the course. Moreover, digressing too far from the topic can also lead you to commit logical fallacies such as Straw Man, and Red Herring.

2.2.11 Open-ness and open-mindedness

Being open-minded means listening to others, taking their views seriously, and treating their ideas with respect even while critically examining them (a difficult thing to do, but not impossible). It also means not resorting to fear and force when promoting one's own views, but rather presenting them in a way that leaves them open to the critical scrutiny of others. In philosophy this is sometimes called "**the principle of charity**." The Principle of Charity requires speakers and listeners to interpret and understand each other's ideas in the very best possible light. Listeners must assume that other speakers are rational (unless you have good reasons to assume otherwise), and that what they say is rational, even if that rationality is not immediately obvious. Philosophers do this partially as a kind of professional courtesy to each other. Open-ness and open-mindedness does not, however, mean that we have to accept everyone's ideas as equally valid. Open mindedness is not the same as assuming that all things are true; it is also not the same as relativism. Rather, the open-minded person looks for the best explanation for things, whether he or she personally likes that explanation or not, and whether it fits with his or her world view or not. She is open to the idea that she might be wrong about something, or that her world view might be partially faulty, or that her thinking about something that matters to her may have to change. But she does not change her thinking at random: she is interested in the truth, whatever it might be.

An open-minded person may still find that some ideas, arguments, and explanations are better than others. But if we are open-minded, then we can be more confident that we have understood other

people's views properly: we will not fall into the logical trap of the straw man (see the chapter on Fallacies).

It is also much easier to find common ground with others, which is an essential step in quelling conflict. And if we reject some idea, we will have rejected it for the right reasons. Open-mindedness also helps prevent intellectual or ideological differences from descending into personal grudges.

Open-mindedness is also helpful in other ways. Suppose that some friends of mine and I went on a picnic in the park, but soon after we got to our picnic site it started to rain. One member of the party might say the rain was caused by ghosts or supernatural creatures who live in the park and who don't want us to picnic there. Another might say that the rain was caused by air pressure changes in the upper atmosphere. Now the open-minded person is not necessarily the one who accepts that both explanations are equally possible, and leaves it at that. The open-minded person is the one who goes looking for the evidence for each explanation. If he doesn't find the evidence for one of those explanations, he rejects it and goes in search of the evidence for another one. The closed-minded person, by contrast, is the one who picks the explanation he likes best, whether or not there's any evidence for it, and then refuses to consider any alternative explanation. Closed-mindedness is one of the signs that someone's mind is occupied by a value program. As a rule of thumb, the closed-minded person is usually the one who is quickest to accuse other people of being closed-minded, especially when his own ideas are criticized.

The point of that example is to show how open-mindedness helps people arrive at good explanations for things that happen. It does not mean that all explanations for things are equally 'valid'. We do not have to put unlikely or weird explanations on the same footing as those with verifiable evidence or a consistent logical structure. But it can mean that every explanation or idea which appears to be sound, at least at first glance, is given a fair examination, no matter where that explanation came from, or who thought of it first.

2.2.12 Asking for help

So far, I have been stressing good thinking habits that one can practice on one's own. Good thinking tends to require independence and autonomy. And problems often arise when we allow other people to have too much influence over one's own thinking, such as when we allow ourselves to be influenced by peer pressure. However, it can also be helpful to ask others who you respect and admire, or who you believe may have relevant knowledge, to help you. And while it is important to make your own decisions about your own life, there's nothing wrong with asking others who you trust to offer you advice and guidance. And even if you do not ask anyone to offer suggestions, it can sometimes be helpful to hear a different point of view, or just to talk things over with someone who can be both critical and appreciative. The shared wisdom and experience of one's friends, elders, and associates can often lead to different perspectives and better decisions. Others people, for instance, can offer possibilities that you might not have thought of. Or they might know things that you didn't know, and thus point you in new directions. Or they might have faced a similar problem or situation in the past, and their description of their experience might help clarify something about your own situation. As an example, here's the Roman philosopher Seneca describing how some kind of social interaction is important for one's personal intellectual growth: "Skilled wrestlers are kept up to the mark by practice; a musician is stirred to action by one of equal proficiency. The wise man also needs to have his virtues kept in action; and as he prompts himself to do things, so he is prompted by another wise man."¹⁰

A lot may depend on who you choose to ask for advice, how much you trust them, and how often you go to them. But the overall point here is that knotty and complicated problems need not always be handled alone. A habit of asking one's elders, peers, colleagues, and friends for help can often help clarify one's thinking, and lead to better solutions.

2.3 A few summary remarks for Chapter Two

None of the bad habits of thinking *necessarily* or *inevitably* lead to unsound arguments, false beliefs, or faulty world views. They are not the same as *fallacies* (to be discussed in chapter 5.) An argument can be strong and sound even if its conclusion coincides with the speaker's personal interests, or even if it coincides with the presuppositions of the speaker's culture, etc. The bad habits are, however, **signs that one's thinking is probably not fully clear, critical, and rational**. It may even mean that one has given up the search for the truth of the matter too soon.

Similarly, the good habits, by themselves, do not guarantee that one's thinking will always be perfectly rational, but they do make one's thinking *very much more likely* to be rational.

2.4 Exercises for Chapter Two.

Consider the following situations, and ask yourself which of the good thinking habits should be applied here, and what might happen if some of the bad habits are applied instead.

- You come home at the end of the day and someone sitting on the ground near your door appears to be crying. Perhaps he is injured, or emotionally distraught. Other people passing by seem to be taking no notice, and may even be crossing the street to avoid him.
- Someone who you are fairly close to, such as a member of your family, or a colleague at your workplace, or someone you count as a good friend, unexpectedly utters a nasty racist or sexist or politically prejudiced joke. By his tone of voice and body language, you can tell that he expects you to agree with him or to go along with it.
- Someone you are fairly close to tells you that he has just been diagnosed with a medical condition that carries a strong social stigma, such as cancer, or AIDS. Or, he says he is coming "out of the closet" about his sexual preferences, or that he is changing his religion. He tells you that most of his other friends have stopped associating with him because of this situation.
- Someone who you counted on to do something for you,

for instance someone with whom you have a contract, fails to uphold his promises. This person has failed you numerous times before, but you're fairly sure that confronting this person might have bad consequences for you. For instance, it might result in a lost friendship, or a malicious gossip campaign against you, a loss of money spent on the arrangement, etc.

- A friend of yours at your school, your workplace, or a social club you belong to, has been accused of a crime. The police haven't been called because all the evidence against that person is circumstantial, and it's mostly a matter of one person's word against another's. But around half of your friends are gossiping about that person as if he's obviously guilty, and the other half of your friends are certain he's innocent.
- Have you ever been in a similar situation? What were your thoughts about it? And what did you do?

Chapter 2

Chapter 2

2.1 The Basics of Logical Analysis

2.1.1 What Is Logic?

In Logic, the object of study is reasoning. This is an activity that humans engage in—when we make claims and back them up with reasons, or when we make inferences about what follows from a set of statements.

Like many human activities, reasoning can be done well, or it can be done badly. The goal of logic is to distinguish good reasoning from bad. Good reasoning is not necessarily effective reasoning; in fact, as we shall see, bad reasoning is pervasive and often extremely effective—in the sense that people are often persuaded by it. In Logic, the standard of goodness is not effectiveness in the sense of persuasiveness, but rather correctness according to logical rules.

In logic, we study the rules and techniques that allow us to distinguish good, correct reasoning from bad, incorrect reasoning.

Since there is a variety of different types of reasoning, since it's possible to develop various methods for evaluating each of those types, and since there are different views on what constitutes correct reasoning, there are many approaches to the logical enterprise. We talk of logic, but also of logics. A logic is just a set of rules and techniques for distinguishing good reasoning from bad.

So, the object of study in logic is human reasoning, with the goal of distinguishing the good from the bad. It is important to note that this approach sets logic apart from an alternative way of studying human reasoning, one more proper to a different discipline: psychology. It is possible to study human reasoning in a merely descriptive mode: to identify common patterns of reasoning and explore their psychological causes, for example. This is not logic. Logic takes up reasoning in a prescriptive mode: it tells how we ought to reason, not merely how we in fact typically do.¹

2.1.2 Basic Notions: Propositions and Arguments

Reasoning involves claims or statements—making them and backing them up with reasons, drawing out their consequences. Propositions are the things we claim, state, assert.

¹Psychologists have determined, for example, that most people are subject to what is called “confirmation bias”—a tendency to seek out information to confirm one’s pre-existing beliefs, and ignore contradictory evidence. There are lots of studies on this effect, including even brain-scans of people engaged in evaluating evidence. All of this is very interesting, but it’s psychology, not logic; it’s a mere descriptive study of reasoning. From a logical, prescriptive point of view, we simply say that people should try to avoid confirmation bias, because it can lead to bad reasoning.

Propositions are the kinds of things that can be true or false. They are expressed by declarative sentences.² ‘This book is boring’ is a declarative sentence; it expresses the proposition that this book is boring, which is (arguably) true (at least so far—but it’s only the first page; wait until later, when things get exciting!

Other kinds of sentences do not express propositions. Imperative sentences issue commands: ‘Sit down and shut up’ is an imperative sentence; it doesn’t make a claim, express something that might be true or false; either it’s obeyed or it isn’t. Interrogative sentences ask questions: ‘Who will win the World Cup this year?’ is an interrogative sentence; it does not assert anything that might be true or false either.

Only declarative sentences express propositions, and so they are the only kinds of sentences we will deal with at this stage of the study of logic. (More advanced logics have been developed to deal with imperatives and questions, but we won’t look at those in an introductory textbook.)

EXERCISES

Which of the following sentences are statements and which are not?

1. No one understands me but you.
2. Alligators are on average larger than crocodiles.
3. Is an alligator a reptile or a mammal?
4. An alligator is either a reptile or a mammal.
5. Don’t let any reptiles into the house.
6. You may kill any reptile you see in the house.
7. East Africans are not the best distance runners.
8. Obama is not a Democrat.
9. Some humans have wings.
10. Some things with wings cannot fly.
11. Was Obama born in Kenya or Hawaii?
12. Oh no! A grizzly bear!
13. Meet me in St Louis.
14. We met in St Louis yesterday.
15. I do not want to meet a grizzly bear in the wild.

²We distinguish propositions from the sentences that express them because a single proposition can be expressed by different sentences. ‘It’s raining’ and ‘Es regnet’ both express the proposition that it’s raining; one sentence does it in English, the other in German. Also, ‘John loves Mary’ and ‘Mary is loved by John’ both express the same proposition.

The fundamental unit of reasoning is the argument. In logic, by ‘argument’ we don’t mean a disagreement, a shouting match; rather, we define the term precisely:

Argument = a set of propositions, one of which, the conclusion, is (supposed to be) supported by the others, the premises.

If we’re reasoning by making claims and backing them up with reasons, then the claim that’s being backed up is the conclusion of an argument; the reasons given to support it are the argument’s premises. If we’re reasoning by drawing an inference from a set of statements, then the inference we draw is the conclusion of an argument, and the statements from which its drawn are the premises.

We include the parenthetical hedge–“supposed to be”–in the definition to make room for bad arguments. Remember, in Logic, we’re evaluating reasoning. Arguments can be good or bad, logically correct or incorrect. A bad argument, very roughly speaking, is one where the premises fail to support the conclusion; a good argument’s premises actually do support the conclusion.

To support the conclusion means, again very roughly, to give one good reasons for believing it. This highlights the rhetorical purpose of arguments: we use arguments when we’re disputing controversial issues; they aim to persuade people, to convince them to believe their conclusion.³ As we said, in logic, we don’t judge arguments based on whether or not they succeed in this goal– there are logically bad arguments that are nevertheless quite persuasive. Rather, the logical enterprise is to identify the kinds of reasons that ought to be persuasive (even if they sometimes aren’t).

2.1.3 Recognizing and Explicating Arguments

Before we get down to the business of evaluating arguments–deciding whether they’re good or bad–we need to develop some preliminary analytical skills. The first of these is, simply, the ability to recognize arguments when we see them, and to figure out what the conclusion is (and what the premises are).

What we want to learn first is how to explicate arguments. This involves writing down a bunch of declarative sentences that express the propositions in the argument, and clearly marking which of these sentences expresses the conclusion.

Let’s start with a simple example. Here’s an argument:

³Reasoning in the sense of drawing inferences from a set of statements is a special case of this persuasive activity. When we draw out reasonable conclusions from given information, we’re convincing ourselves that we have good reasons to believe them.

You really shouldn't eat at McDonald's. Why? First of all, they pay their workers very low wages. Second, the animals that go into their products are raised in deplorable, inhumane conditions. Third, the food is really bad for you. Finally, the burgers have poop in them.⁴

The passage is clearly argumentative: its purpose is to convince you of something, namely, that you shouldn't eat at McDonald's. That's the conclusion of the argument. The other claims are all reasons for believing the conclusion—reasons for not eating at McDonald's. Those are the premises.

To explicate the argument is simply to clearly identify the premises and the conclusion, by writing down declarative sentences that express them. We would explicate the McDonald's argument like this:

McDonald's pays its workers very low wages.

The animals that go into their products are raised in deplorable, inhumane conditions.

McDonald's food is really bad for you.

Their burgers have poop in them.

You shouldn't eat at McDonald's.

We separate the conclusion from the premises with a horizontal line, and we put a special symbol in front of the conclusion, which can be read as “therefore.”

Speaking of ‘therefore’, it's one of the words to look out for when identifying and explicating arguments. Along with words like ‘consequently’ and ‘thus’, and phrases like ‘it follows that’ and ‘which implies that’, it indicates the presence of the conclusion of an argument. Similarly, words like ‘because’, ‘since’, and ‘for’ indicate the presence of premises.

⁴I know, I know. But it's almost certainly true. Consumer Reports conducted a study in 2015, in which they tested 458 pounds of ground beef, purchased from 103 different stores in 26 different cities; all of the 458 pounds were contaminated with fecal matter. This is because most commercial ground beef is produced at facilities that process thousands of animals, and do it very quickly. The quickness ensures that sometimes—rarely, but sometimes—a knifecut goes astray and the gastrointestinal tract is nicked, releasing poop. It gets cleaned up, but again, things are moving fast, so they don't quite get all the poop. Now you've got one carcass—again, out of hundreds or thousands—contaminated with feces. But they make ground beef in a huge vat, with meat from all those carcasses mixed together. So even one accident like this contaminates the whole batch. So yeah, those burgers—basically all burgers, unless you're grinding your own meat or sourcing your beef from a local farm—have poop in them. Not much, but it's there. Of course, it won't make you sick as long as you cook it right: 160 F is enough to kill the poop-bacteria (E-coli, etc.), so, you know, no big deal. Except for the knowledge that you're eating poop. Sorry.

Premise Indicators	Conclusion indicators
since	therefore
because	so
for	hence
as	thus
given that	implies that
seeing that	consequently
for the reason that	it follows that
is shown by the fact that	we may conclude that

We should also note that it is possible for a single sentence to express more than one proposition. If we added this sentence to our argument—‘McDonald’s advertising targets children to try to create lifetime addicts to their high-calorie foods, and their expansion into global markets has disrupted native food distribution systems, harming family farmers’—we would write down two separate declarative sentences in our explication, expressing the two propositions asserted in the sentence—about children and international farmers, respectively. Indeed, it’s possible for a single sentence to express an entire argument. ‘You shouldn’t eat at McDonald’s because they’re a bad corporate actor’ gives you a conclusion and a premise at once. An explication would merely separate them.

Paraphrasing

The argument about McDonald’s was an easy case. It didn’t have a word like ‘therefore’ to tip us off to the presence of the conclusion, but it was pretty clear what the conclusion was anyway. All we had to do was ask ourselves, “What is this person trying to convince me to believe?” The answer to that question is the conclusion of the argument.

Another way the McDonald’s argument was easy: all of the sentences were declarative sentences, so when we explicated the argument, all we had to do was write them down. But sometimes argumentative passages aren’t so cooperative. Sometimes they contain non-declarative sentences. Recall, arguments are sets of propositions, and only declarative sentences express propositions; so if an argumentative passage contains non-declarative sentences (questions, commands, etc.), we need to change their wording when we explicate the argument, turning them into declarative sentences that express a proposition. This is called paraphrasing.

Suppose, for example, that the McDonald’s argument were exactly as originally presented,

except the first sentence were imperative, not declarative:

Don't eat at McDonald's. Why? First of all, they pay their workers very low wages. Second, the animals that go into their products are raised in deplorable, inhumane conditions. Third, the food is really bad for you. Finally, the burgers have poop in them.

We just switched from 'You shouldn't eat at McDonald's' to 'Don't eat at McDonald's.' But it makes a difference. The first sentence is declarative; it makes a claim about how things are (morally, with respect to your obligations in some sense): you shouldn't do such-and-such. It's possible to disagree with the claim: Sure I should, and so should everybody else; their fries are delicious! 'Don't eat at McDonald's', on the other hand, is not like that. It's a command. It's possible to disobey it, but not to disagree with it; imperative sentences don't make claims about how things are, don't express propositions.

Still, the passage is clearly argumentative: the purpose remains to persuade the listener not to eat at McDonald's. We just have to be careful, when we explicate the argument, to paraphrase the first sentence—to change its wording so that it becomes a declarative, proposition-expressing sentence. 'You shouldn't eat at McDonald's' works just fine.

Let's consider a different example:

I can't believe anyone would support a \$15 per hour minimum wage. Don't they realize that it would lead to massive job losses? And the strain such a policy would put on small businesses could lead to an economic recession.

The passage is clearly argumentative: this person is engaged in a dispute about a controversial issue—the minimum wage—and is staking out a position and backing it up. What is that position? Apparently, this person opposes the idea of raising the minimum wage to \$15.

There are two problems we face in explicating this argument. First, one of the sentences in the passage—the second one—is non-declarative: it's an interrogative sentence, a question. Nevertheless, it's being used in this passage to express one of the person's reasons for opposing the minimum wage increase—that it would lead to job losses. So we need to paraphrase, transforming the interrogative into a declarative—something like 'A \$15 minimum wage would lead to massive job losses'.

The other problem is that the first sentence, while a perfectly respectable declarative sentence, can't be used as-is in our explication. For while it's clearly being used by to

express this person's main point, the conclusion of his argument against the minimum wage increase, it does so indirectly. What the sentence literally and directly expresses is not a claim about the wisdom of the minimum wage increase, but rather a claim about the speaker's personal beliefs: 'I can't believe anyone would support a \$ 15 per hour minimum wage'. But that claim isn't the conclusion of the argument. The speaker isn't trying to convince people that he believes (or can't believe) a certain thing; he's trying to convince them to believe the same thing he believes, namely, that raising the minimum wage to \$ 15 is a bad idea. So, despite the first sentence being a declarative, we still have to paraphrase it. It expresses a proposition, but not the conclusion of the argument.

Our explication of the argument would look like this:

Increasing the minimum wage to \$ 15 per hour would lead to massive job losses.
The policy would put a strain on small businesses that might lead to a recession.
/ Increasing the minimum wage to \$ 15 per hour is a bad idea.

EXERCISES

Which of the following are arguments? If it is an argument, identify the conclusion of the argument.

1. The woman in the hat is not a witch since witches have long noses and she doesn't have a long nose.
2. I have been wrangling cattle since before you were old enough to tie your own shoes.
3. Albert is angry with me so he probably won't be willing to help me wash the dishes.
4. First I washed the dishes and then I dried them.
5. If the road wasn't icy, the car wouldn't have slid off the turn.
6. Albert isn't a fireman and he isn't a fisherman either.
7. Are you seeing that rhinoceros over there? It is huge!
8. The fact that obesity has become a problem in the U.S. is shown by the fact that obesity rates have risen significantly over the past four decades.
9. Bob showed me a graph with the rising obesity rates and I was very surprised to see how much they've risen.
10. Albert isn't a fireman because Albert is a Greyhound, which is a kind of dog, and dogs can't be firemen.

11. Charlie and Violet are dogs and since dogs don't sweat, it is obvious that Charlie and Violet don't sweat.

12. The reason I forgot to lock the door is that I was distracted by the clown riding a unicycle down our street while singing Lynyrd Skynyrd's "Simple Man."

13. What Bob told you is not the real reason that he missed his plane to Denver.

14. Samsung stole some of Apple's patents for their smartphones, so Apple stole some of Samsung's patents back in retaliation.

15. No one who has ever gotten frostbite while climbing K2 has survived to tell about it, therefore no one ever will.

Enthymemes: Tacit Propositions

So sometimes, when we explicate an argument, we have to take what's present in the argumentative passage and change it slightly, so that all of the sentences we write down express the propositions that are in the argument. This is paraphrasing. Other times, we have to do even more: occasionally, we have to fill in missing propositions; argumentative passages might not state all of the propositions in an argument explicitly, and in the course of explicating their arguments, we have to make these implicit, tacit propositions explicit by writing down the appropriate declarative sentences.

There's a fancy Greek word for argumentative passages that leave certain propositions unstated: enthymemes. Here's an example:

Hillary Clinton has more experience in public office than Donald Trump; she has a much deeper knowledge of the issues; she's the only one with the proper temperament to lead our country. I rest my case.

Again, the argumentative intentions here are plain: this person is staking out a position on a controversial topic—a presidential election. But notice, that position—that one should prefer Clinton to Trump—is never stated explicitly. We get reasons for having that preference—the premises of the argument are explicit—but we never get a statement of the conclusion. But since this is clearly the upshot of the passage, we need to include a sentence expressing it in our explication:

Clinton has more experience than Trump.

Clinton has deeper knowledge of issues than Trump.

Clinton has the proper temperament to lead the country, while Trump does not.

/ One should prefer Clinton to Trump in the presidential election.

In that example, the conclusion of the argument was tacit. Sometimes, premises are unstated and we should make them explicit in our explication of the argument. Now consider this passage:

The sad fact is that wages for middle-class workers have stagnated over the past several decades. We need a resurgence of the union movement in this country.

This person is arguing in favor of labor unions; the second sentence is the conclusion of the argument. The first sentence gives the only explicit premise: the stagnation of middle-class wages. But notice what the passage doesn't say: what connection there might be between the two things. What do unions have to do with middle-class wages?

There's an implicit premise lurking in the background here—something that hasn't been said, but which needs to be true for the argument to go through. We need a claim that connects the premise to the conclusion—that bridges the gap between them. Something like this: A resurgence of unions would lead to wage growth for middle-class workers. The first sentence identifies a problem; the second sentence purports to give a solution to the problem. But it's only a solution if the tacit premise we've uncovered is true. If unions don't help raise middle-class wages, then the argument falls apart.

This is the mark of the kinds of tacit premises we want to uncover: if they're false, they undermine the argument. Often, premises like this are unstated for a reason: they're controversial claims on their own, requiring a lot of evidence to support them; so the arguer leaves them out, preferring not to get bogged down. When we draw them out, however, we can force a more robust dialectical exchange, focusing the argument on the heart of the matter. In this case, a discussion about the connection between unions and middle-class wages would be in order. There's a lot to be said on that topic.

Arguments v Explanations

One final item on the topic of "Recognizing and Explicating Arguments." We've been focusing on explication; this is a remark about the recognition side. Some passages may superficially resemble arguments—they may, for example, contain words like 'therefore' and 'because', which normally indicate conclusions and premises in argumentative passages—but which are nevertheless not argumentative. Instead, they are explanations.

Consider this passage:

Because female authors of her time were often stereotyped as writing light-hearted romances, and because her real name was well-known for other (sometimes scandalous) reasons, Mary Ann Evans was reluctant to use her own name for her novels. She wanted her work to be taken seriously and judged on its own merits. Therefore, she adopted the pen name ‘George Eliot’.

This passage has the words ‘because’ (twice), and ‘therefore’, which typically indicate the presence of premises and a conclusion, respectively. But it is not an argument. It’s not an argument because it does not have the rhetorical purpose of an argument: the aim of the passage is not to convince you of something. If it were an argument, the conclusion would be the claim following ‘therefore’, namely, the proposition that Mary Ann Evans adopted the pen name ‘George Eliot’. But this claim is not the conclusion of an argument; the passage is not trying to persuade us to believe that Evans adopted a pen name. That she did so is not a controversial claim. Rather, that’s a fact that’s assumed to be known already. The aim of the passage is to explain to us why Evans made that choice. The rhetorical purpose is not to convince; it is to inform, to edify. The passage is an explanation, not an argument.

So, to determine whether a given passage is an argument or an explanation, we need to figure out its rhetorical purpose. Why is the author saying these things to me? Is she trying to convince me of something, or is she merely trying to inform me—to give me an explanation for something I already knew? Sometimes this is easy, as with the George Eliot passage; it’s hard to imagine someone saying those things with persuasive intent. Other times, however, it’s not so easy. Consider the following:

Many of the celebratory rituals (of Christmas), as well as the timing of the holiday, have their origins outside of, and may predate, the Christian commemoration of the birth of Jesus. Those traditions, at their best, have much to do with celebrating human relationships and the enjoyment that this life has to offer. As an atheist, I have no hesitation in embracing the holiday and joining with believers and nonbelievers alike to celebrate what we have in common.⁵

Unless we understand a little bit more about the context of this passage, it’s difficult to determine the speaker’s intentions. It may appear to be an argument. That atheists should embrace a religious holiday like Christmas is, among many, a controversial claim. Controversial claims are the kinds of claims that we often try to convince skeptical people to believe. If the speaker’s audience for this passage is a bunch of hard-line atheists, who

⁵John Teehan, 12/24/2006, “A Holiday Season for Atheists, Too,” The New York Times. Excerpted in Copi and Cohen, 2009, Introduction to Logic 13e, p. 25.

vehemently reject anything with a whiff of religiosity, who consider Christmas a humbug, then it's pretty clear that the speaker is trying to offer reasons for them to reconsider their stance; he's trying to convince them to embrace Christmas; he's making an argument. If we explicated the argument, we would paraphrase the last sentence to represent the controversial conclusion: 'Atheists should have no hesitation embracing and celebrating Christmas'.

But in a different context, with a different audience, this may not be an argument. If we leave the claim in the final sentence as-is—'As an atheist, I have no hesitation in embracing the holiday and joining with believers and nonbelievers alike to celebrate what we have in common'—we have a claim about the speaker's personal beliefs and inclinations. Typically, as we saw above, such claims are not suitable as the conclusions of arguments; we don't usually spend time trying to convince people that we believe such-and-such. But what is more typical is providing people with explanations for why we believe things. If the author of our passage is an atheist, and he's saying these things to friends of his, say, who know he's an atheist, we might have just such an explanation. His friends know he's not religious, but they know he loves Christmas. That's kind of weird. Don't atheists hate religious holidays? Not so, says our speaker. Let me explain to you why I have no problems with Christmas, despite my atheism. Again, the difference between arguments and explanations comes down to rhetorical purpose: arguments try to convince people; explanations try to inform them. Determining whether a given passage is one or the other involves figuring out the author's intentions. To do this, we must carefully consider the context of the passage.

EXERCISES

1. Identify the conclusions in the following arguments.

(a) Every citizen has a right—nay, a duty—to defend himself and his family. This is all the more important in these increasingly dangerous times. The framers of the Constitution, in their wisdom, enshrined the right to bear arms in that very document. We should all oppose efforts to restrict access to guns.

(b) Totino's pizza rolls are the perfect food. They have all the great flavor of pizza, with the added benefit of portability!

(c) Because they go overboard making things user-friendly, Apple phones are inferior to those with Android operating systems. If you want to change the default settings on an Apple phone to customize it to your personal preferences, it's practically impossible to figure out how. The interface is so dumbed down to appeal to the "average consumer" that it's super hard to find where the controls for advanced settings even are. On Android phones, though, everything's right there in the open.

(d) The U.S. incarcerates more people per capita than any other country on Earth, many for non-violent drug offenses. Militarized policing of our inner cities has led to scores of unnecessary deaths and a breakdown of trust between law enforcement and the communities they are supposed to serve and protect. We need to end the “War on Drugs” now. Our criminal justice system is broken. The War on Drugs broke it.

(e) The point of a watch is to tell you what time it is. Period. Rolexes are a complete waste of money. They don’t do any better at telling the time, and they cost a ton!

2. Explicate the following arguments, paraphrasing as necessary.

(a) You think that if the victims of the mass shooting had been armed that would’ve made things better? Are you nuts? The shooting took place in a bar; not even the NRA thinks it’s a good idea to allow people to carry guns in a drinking establishment. And don’t be fooled by the fantasy that “good guys with guns” would prevent mass murder. More likely, the situation would’ve been even bloodier, with panicked people shooting randomly all over the place.

(b) The heat will escape the house through the open door, which means the heater will keep running, which will make our power bill go through the roof. Then we’ll be broke. So stop leaving the door open when you come into the house.

(c) Do you like delicious food? How about fun games? And I know you like cool prizes. Well then, Chuck E. Cheese’s is the place for you.

3. Write down the tacit premises that the following arguments depend on for their success.

(a) Cockfighting is an exciting pastime enjoyed by many people. It should therefore be legal.

(b) The president doesn’t understand the threat we face. He won’t even use the phrase “Radical Islamic Terror.”

4. Write down the tacit conclusion that follows most immediately from the following.

(a) If there really were an all-loving God looking down on us, then there wouldn’t be so much death and destruction visited upon innocent people.

(b) The death penalty is immoral. Numerous studies have shown that there is racial bias in its application. The rise of DNA testing has exonerated scores of inmates on death row; who knows how many innocent people have been killed in the past? The death penalty is also impractical. Revenge is counterproductive: “An eye for an eye leaves the whole world blind,” as Gandhi said. Moreover, the costs of litigating death penalty cases, with their endless appeals, are enormous. The correct decision for policymakers is clear.

5. Decide whether the following are arguments or explanations, given their context. If the passage is an argument, write down its conclusion; if it is an explanation, write down the fact that is being explained.

(a) Michael Jordan is the best of all time. I don't care if Kareem scored more points; I don't care if Russell won more championships. The simple fact is that no other player in history displayed the stunning combination of athleticism, competitive drive, work ethic, and sheer jaw-dropping artistry of Michael Jordan. (Context: Sports talk radio host going on a "rant")

(b) Because different wavelengths of light travel at different velocities when they pass through water droplets, they are refracted at different angles. Because these different wavelengths correspond to different colors, we see the colors separated. Therefore, if the conditions are right, rainbows appear when the sun shines through the rain. (Context: grade school science textbook)

(c) The primary motivation for the Confederate States in the Civil War was not so much the preservation of the institution of slavery, but the preservation of the sovereignty of individual states guaranteed by the 10th Amendment to the U.S. Constitution. Southerners of the time were not the simple-minded racists they were often depicted to be. Leaders in the southern states were disturbed by the over-reach of the Federal government into issues of policy more properly decided by the states. That slavery was one of those issues is incidental. (Context: excerpt from *Rebels with a Cause: An Alternative History of the Civil War*)

(d) This is how natural selection works: those species with traits that promote reproduction tend to have an advantage over competitors and survive; those without such traits tend to die off. The way that humans reproduce is by having sex. Since the human species has survived, it must have traits that encourage reproduction—that encourage having sex. This is why sex feels good. Sex feels good because if it didn't, the species would not have survived. (Context: excerpt from *Evolutionary Biology for Dummies*)

2.1.4 Deductive and Inductive Arguments

As we noted earlier, there are different logics—different approaches to distinguishing good arguments from bad ones. One of the reasons we need different logics is that there are different kinds of arguments. In this section, we distinguish two types: deductive and inductive arguments.

Sally Johansson does all her grocery shopping at an organic food co-op. She's a

huge fan of tofu. She's really into those week-long juice cleanse thingies. And she's an active member of PETA. I conclude that she's a vegetarian.

- (a) Make up a new piece of information about Sally that weakens the argument.
- (b) Make up a new piece of information about Sally that strengthens the argument.

2.1.5 Diagramming Arguments

Before we get down to the business of evaluating arguments—of judging them valid or invalid, strong or weak—we still need to do some preliminary work. We need to develop our analytical skills to gain a deeper understanding of how arguments are constructed, how they hang together. So far, we've said that the premises are there to support the conclusion. But we've done very little in the way of analyzing the structure of arguments: we've just separated the premises from the conclusion. We know that the premises are supposed to support the conclusion. What we haven't explored is the question of just how the premises in a given argument do that job—how they work together to support the conclusion, what kinds of relationships they have with one another. This is a deeper level of analysis than merely distinguishing the premises from the conclusion; it will require a mode of presentation more elaborate than a list of propositions with the bottom one separated from the others by a horizontal line. To display our understanding of the relationships among premises supporting the conclusion, we are going to depict them: we are going to draw diagrams of arguments.

Here's how the diagrams will work. They will consist of three elements: (1) circles with numbers inside them—each of the propositions in the argument we're diagramming will be assigned a number, so these circled numbers in the diagram will represent the propositions; (2) arrows pointed at circled numbers—these will represent relationships of support, where one or more propositions provide a reason for believing the one pointed to; and (3) horizontal brackets—propositions connected by these will be interdependent (in a sense to be specified below).

Our diagrams will always feature the circled number corresponding to the conclusion at the bottom. The premises will be above, with brackets and arrows indicating how they collectively support the conclusion and how they're related to one another. There are a number of different relationships that premises can have to one another. We will learn how to draw diagrams of arguments by considering them in turn.

Independent Premises

Often, different premises will support a conclusion—or another premise—individually, without help from any others. When this is the case, we draw an arrow from the circled number representing that premise to the circled number representing the proposition it supports.

Consider this simple argument:

(1) Marijuana is less addictive than alcohol. In addition, (2) it can be used as a medicine to treat a variety of conditions. Therefore, (3) marijuana should be legal.

The last proposition is clearly the conclusion (the word ‘therefore’ is a big clue), and the first two propositions are the premises supporting it. They support the conclusion independently. The mark of independence is this: each of the premises would still provide support for the conclusion even if the other weren’t true; each, on its own, gives you a reason for believing the conclusion. In this case, then, we diagram the argument as follows:

Intermediate Premises

Some premises support their conclusions more directly than others. Premises provide more indirect support for a conclusion by providing a reason to believe another premise that supports the conclusion more directly. That is, some premises are intermediate between the conclusion and other premises.

Consider this simple argument:

(1) Automatic weapons should be illegal. (2) They can be used to kill large numbers of people in a short amount of time. This is because (3) all you have to do is hold down the trigger and bullets come flying out in rapid succession.

The conclusion of this argument is the first proposition, so the premises are propositions 2 and 3. Notice, though, that there’s a relationship between those two claims. The third sentence starts with the phrase ‘This is because’, indicating that it provides a reason for another claim. The other claim is proposition 2; ‘This’ refers to the claim that automatic weapons can kill large numbers of people quickly. Why should I believe that they can do that? Because all one has to do is hold down the trigger to release lots of bullets really fast. Proposition 2 provides immediate support for the conclusion (automatic weapons can kill lots of people really quickly, so we should make them illegal); proposition 3 supports the conclusion more indirectly, by giving support to proposition 2. Here is how we diagram in this case:

Joint Premises

Sometimes premises need each other: the job of supporting another proposition can't be done by each on its own; they can only provide support together, jointly. Far from being independent, such premises are interdependent. In this situation, on our diagrams, we join together the interdependent premises with a bracket underneath their circled numbers.

There are a number of different ways in which premises can provide joint support. Sometimes, premises just fit together like a hand in a glove; or, switching metaphors, one premise is like the key that fits into the other to unlock the proposition they jointly support. An example can make this clear:

- (1) The chef has decided that either salmon or chicken will be tonight's special.
- (2) Salmon won't be the special. Therefore, (3) the special will be chicken.

Neither premise 1 nor premise 2 can support the conclusion on its own. A useful rule of thumb for checking whether one proposition can support another is this: read the first proposition, then say the word 'therefore', then read the second proposition; if it doesn't make any sense, then you can't draw an arrow from the one to the other. Let's try it here: "The chef has decided that either salmon or chicken will be tonight's special; therefore, the special will be chicken." That doesn't make any sense. What happened to salmon? Proposition 1 can't support the conclusion on its own. Neither can the second: "Salmon won't be the special; therefore, the special will be chicken." Again, that makes no sense. Why chicken? What about steak, or lobster? The second proposition can't support the conclusion on its own, either; it needs help from the first proposition, which tells us that if it's not salmon, it's chicken. Propositions 1 and 2 need each other; they support the conclusion jointly. This is how we diagram the argument:

The same diagram would depict the following argument:

- (1) John Le Carre gives us realistic, three-dimensional characters and complex, interesting plots. (2) Ian Fleming, on the other hand, presents an unrealistically glamorous picture of international espionage, and his plotting isn't what you'd call immersive. (3) Le Carre is a better author of spy novels than Fleming.

In this example, the premises work jointly in a different way than in the previous example. Rather than fitting together hand-in-glove, these premises each give us half of what we need to arrive at the conclusion. The conclusion is a comparison between two authors. Each of the premises makes claims about one of the two authors. Neither one, on its own, can support

the comparison, because the comparison is a claim about both of them. The premises can only support the conclusion together. We would diagram this argument the same way as the last one.

Another common pattern for joint premises is when general propositions need help to provide support for particular propositions. Consider the following argument:

(1) People shouldn't vote for racist, incompetent candidates for president. (2) Donald Trump seems to make a new racist remark at least twice a week. And (3) he lacks the competence to run even his own (failed) businesses, let alone the whole country. (4) You shouldn't vote for Trump to be the president.

The conclusion of the argument, the thing it's trying to convince us of, is the last proposition— you shouldn't vote for Trump. This is a particular claim: it's a claim about an individual person, Trump. The first proposition in the argument, on the other hand, is a general claim: it asserts that, generally speaking, people shouldn't vote for incompetent racists; it makes no mention of an individual candidate. It cannot, therefore, support the particular conclusion—about Trump—on its own. It needs help from other particular claims—propositions 2 and 3—that tell us that the individual in the conclusion, Trump, meets the conditions laid out in the general proposition 1: racism and incompetence. This is how we diagram the argument:

Occasionally, an argumentative passage will only explicitly state one of a set of joint premises because the others “go without saying”—they are part of the body of background information about which both speaker and audience agree. In the last example, that Trump was an incompetent racist was not uncontroversial background information. But consider this argument:

(1) It would be good for the country to have a woman with lots of experience in public office as president. (2) People should vote for Hillary Clinton.

Diagramming this argument seems straightforward: an arrow pointing from (1) to (2) But we've got the same relationship between the premise and conclusion as in the last example: the premise is a general claim, mentioning no individual at all, while the conclusion is a particular claim about Hillary Clinton. Doesn't the general premise “need help” from particular claims to the effect that the individual in question, Hillary Clinton, meets the conditions set forth in the premise—i.e., that she's a woman and that she has lots of experience in public office? No, not really. Everybody knows those things about her already; they go without saying, and can therefore be left unstated (implicit, tacit).

But suppose we had included those obvious truths about Clinton in our presentation of the argument; suppose we had made the tacit premises explicit:

- (1) It would be good for the country to have a woman with lots of experience in public office as president.
- (2) Hillary Clinton is a woman.
- And (3) she has deep experience with public offices—as a First Lady, U.S. Senator, and Secretary of State.
- (4) People should vote for Hillary Clinton.

How do we diagram this? Earlier, we talked about a rule of thumb for determining whether or not it's a good idea to draw an arrow from one number to another in a diagram: read the sentence corresponding to the first number, say the word 'therefore', then read the sentence corresponding to the second number; if it doesn't make sense, then the arrow is a bad idea. But if it does make sense, does that mean you should draw the arrow? Not necessarily. Consider the first and last sentences in this passage. Read the first, then 'therefore', then the last. Makes pretty good sense! That's just the original formulation of the argument with the tacit propositions remaining implicit. And in that case we said it would be OK to draw an arrow from the general premise's number straight to the conclusion's. But when we add the tacit premises—the second and third sentences in this passage—we can't draw an arrow directly from (1) to (4). To do so would obscure the relationship among the first three propositions and misrepresent how the argument works. If we drew an arrow from (1) to (4) what would we do with (2) to (3) in our diagram? Do they get their own arrows, too? No, that won't do. Such a diagram would be telling us that the first three propositions each independently provide a reason for the conclusion. But they're clearly not independent; there's a relationship among them that our diagram must capture, and it's the same relationship we saw in the parallel argument about Trump, with the particular claims in the second and third propositions working together with the general claim in the first:

EXERCISES

Diagram the following arguments.

1. (1) Hillary Clinton would make a better president than Donald Trump. (2) Clinton is a toughminded pragmatist who gets things done. (3) Trump is a thin-skinned maniac who will be totally ineffective in dealing with Congress.
2. (1) Donald Trump is a jerk who's always offending people. Furthermore, (2) he has no experience whatsoever in government. (3) Nobody should vote for him to be president.

3. (1) Human beings evolved to eat meat, so (2) eating meat is not immoral. (3) It's never immoral for a creature to act according to its evolutionary instincts.
4. (1) We need new campaign finance laws in this country. (2) The influence of Wall Street money on elections is causing a breakdown in our democracy with bad consequences for social justice. (3) Politicians who have taken those donations are effectively bought and paid for, consistently favoring policies that benefit the rich at the expense of the vast majority of citizens.
5. (1) Voters shouldn't trust any politician who took money from Wall Street bankers. (2) Hillary Clinton accepted hundreds of thousands of dollars in speaking fee from Goldman Sachs, a big Wall Street firm. (3) You shouldn't trust her.
6. (1) There are only three possible explanations for the presence of the gun at the crime scene: either the defendant just happened to hide from the police right next to where the gun was found, or the police planted the gun there after the fact, or it was really the defendant's gun like the prosecution says. (2) The first option is too crazy a coincidence to be at all believable, and (3) we've been given no evidence at all that the officers on the scene had any means or motivation to plant the weapon. Therefore, (4) it has to be the defendant's gun.
7. (1) Golden State has to be considered the clear favorite to win the NBA Championship. (2) No team has ever lost in the Finals after taking a 3-games-to-1 lead, and (3) Golden State now leads Cleveland 3-to-1. In addition, (4) Golden State has the MVP of the league, Stephen Curry.
8. (1) We should increase funding to public colleges and universities. First of all, (2) as funding has decreased, students have had to shoulder a larger share of the financial burden of attending college, amassing huge amounts of debt. (3) A recent report shows that the average college student graduates with almost \$ 30,000 in debt. Second, (4) funding public universities is a good investment. (5) Every economist agrees that spending on public colleges is a good investment for states, where the economic benefits far outweigh the amount spent.
9. (1) LED lightbulbs last for a really long time and (2) they cost very little to keep lit. (3) They are, therefore, a great way to save money. (4) Old-fashioned incandescent bulbs, on the other hand, are wasteful. (5) You should buy LEDs instead of incandescent bulbs.

10. (1) There's a hole in my left shoe, which means (2) my feet will get wet when I wear them in the rain, and so (3) I'll probably catch a cold or something if I don't get a new pair of shoes. Furthermore, (4) having new shoes would make me look cool. (5) I should buy new shoes.
11. Look, it's just simple economics: (1) if people stop buying a product, then companies will stop producing it. And (2) people just aren't buying tablets as much anymore. (3) The CEO of Best Buy recently said that sales of tablets are "crashing" at his stores. (4) Samsung's sales of tablets were down 14% this year alone. (5) Apple's not going to continue to make your beloved iPad for much longer.
12. (1) We should increase infrastructure spending as soon as possible. Why? First, (2) the longer we delay needed repairs to things like roads and bridges, the more they will cost in the future. Second, (3) it would cause a drop in unemployment, as workers would be hired to do the work. Third, (4) with interest rates at all-time lows, financing the spending would cost relatively little. A fourth reason? (5) Economic growth. (6) Most economists agree that government spending in the current climate would boost GDP.
13. (1) Smoking causes cancer and (2) cigarettes are really expensive. (3) You should quit smoking. (4) If you don't, you'll never get a girlfriend. (5) Smoking makes you less attractive to girls: (6) it stains your teeth and (7) it gives you bad breath.

Chapter 3

Chapter 3

3.1 Deductive and Inductive Arguments

As we noted earlier, there are different logics—different approaches to distinguishing good arguments from bad ones. One of the reasons we need different logics is that there are different kinds of arguments. In this section, we distinguish two types: deductive and inductive arguments.

3.1.1 Deductive Arguments

First, deductive arguments. These are distinguished by their aim: a deductive argument attempts to provide premises that guarantee, necessitate its conclusion. Success for a deductive argument, then, does not come in degrees: either the premises do in fact guarantee the conclusion, in which case the argument is a good, successful one, or they don't, in which case it fails. Evaluation of deductive arguments is a black-and-white, yes-or-no affair; there is no middle ground. We have a special term for a successful deductive argument: we call it valid. Validity is a central concept in the study of logic. It's so important, we're going to define it three times. Each of these three definitions is equivalent to the others; they are just three different ways of saying the same thing:

An argument is valid just in case . . .

- (i) its premises guarantee its conclusion; i.e.,
- (ii) if its premises are true, then its conclusion must also be true; i.e.,
- (iii) it is impossible for its premises to be true and its conclusion false.

Here's an example of a valid deductive argument:

All humans are mortal.

Socrates is a human.

Socrates is mortal.

This argument is valid because the premises do in fact guarantee the conclusion: if they're true (as a matter of fact, they are), then the conclusion must be true; it's impossible for the premises to be true and the conclusion false.

Here's a surprising fact about validity: what makes a deductive argument valid has nothing to do with its content; rather, validity is determined by the argument's form. That

is to say, what makes our Socrates argument valid is not that it says a bunch of accurate things about Socrates, humanity, and mortality. The content doesn't make a difference. Instead, it's the form that matters—the pattern that the argument exhibits.

Later, when undertake a more detailed study of deductive logic, we will give a precise definition of logical form.¹ For now, we'll use this rough gloss: the form of an argument is what's left over when you strip away all the non-logical terms and replace them with blanks.²

Here's what that looks like for our Socrates argument:

All A are B.

x is A.

x is B.

The letter are the blanks: they're placeholders, variables. As a matter of convention, we're using capital letters to stand for groups of things (humans, mortals) and lower case letters to stand for individual things (Socrates).

The Socrates argument is a good, valid argument because it exhibits this good, valid form. Our third way of wording the definition of validity helps us see why this is a valid form: it's impossible for the premises to be true and the conclusion false, in that it's impossible to plug in terms for A, B, and x in such a way that the premises come out true and the conclusion comes out false. A consequence of the fact that validity is determined entirely by an argument's form is that, given a valid form, every single argument that has that form will be valid. So any argument that has the same form as our Socrates argument will be valid; that is, we can pick things at random to stick in for A, B, and x, and we're guaranteed to get a valid argument. Here's a silly example:

All apples are bananas.

Donald Trump is an apple.

Donald Trump is a banana.

This argument has the same form as the Socrates argument: we simply replaced A with 'apples', B with 'bananas', and x with 'Donald Trump'. That means it's a valid argument.

¹Definitions, actually. We'll study two different deductive logics, each with its own definition of form.

²What counts as a "logical term," you're wondering? Unhelpful answer: it depends on the logic; different logics count different terms as logical. Again, this is just a rough gloss. We don't need precision just yet, but we'll get it eventually.

That's a strange thing to say, since the argument is just silly—but it's the form that matters, not the content. Our second way of wording the definition of validity can help us here. The standard for validity is this: IF the premises are true, then the conclusion must be. That's a big 'IF'. In this case, as a matter of fact, the premises are not true (they're silly, plainly false). However, IF they were true—if in fact apples were a type of banana and Donald Trump were an apple—then the conclusion would be unavoidable: Trump would have to be a banana. The premises aren't true, but if they were, the conclusion would have to be—that's validity.

So it turns out that the actual truth or falsehood of the propositions in a valid argument are completely irrelevant to its validity. The Socrates argument has all true propositions and it's valid; the Donald Trump argument has all false propositions, but it's valid, too. They're both valid because they have a valid form; the truth/falsity of their propositions don't make any difference. This means that a valid argument can have propositions with almost any combination of truth-values: some true premises, some false ones, a true or false conclusion. One can fiddle around with the Socrates' argument's form, plugging different things in for A, B, and x, and see that this is so. For example, plug in 'ants' for A, 'bugs' for B, and Beyoncé for x: you get one true premise (All ants are bugs), one false one (Beyoncé is an ant), and a false conclusion (Beyoncé is a bug). Plug in other things and you can get any other combination of truth-values.

Any combination, that is, but one: you'll never get true premises and a false conclusion. That's because the Socrates' argument's form is a valid one; by definition, it's impossible to generate true premises and a false conclusion in that case.

This irrelevance of truth-value to judgments about validity means that those judgments are immune to revision. That is, once we decide whether an argument is valid or not, that decision cannot be changed by the discovery of new information. New information might change our judgment about whether a particular proposition in our argument is true or false, but that can't change our judgment about validity. Validity is determined by the argument's form, and new information can't change the form of an argument. The Socrates argument is valid because it has a valid form. Suppose we discovered, say, that as a matter of fact Socrates wasn't a human being at all, but rather an alien from outer space who got a kick out of harassing random people on the streets of ancient Athens. That information would change the argument's second premise—Socrates is human—from a truth to a falsehood. But it wouldn't make the argument invalid. The form is still the same, and it's a valid one.

It's time to face up to an awkward consequence of our definition of validity. Remember, logic is about evaluating arguments—saying whether they're good or bad. We've said that for

deductive arguments, the standard for goodness is validity: the good deductive arguments are the valid ones. Here's where the awkwardness comes in: because validity is determined by form, it's possible to generate valid arguments that are nevertheless completely ridiculous-sounding on their face. Remember, the Donald Trump argument—where we concluded that he's a banana—is valid. In other words, we're saying that the Trump argument is good; it's valid, so it gets the logical thumbsup. But that's nuts! The Trump argument is obviously bad, in some sense of 'bad', right? It's a collection of silly, nonsensical claims.

We need a new concept to specify what's wrong with the Trump argument. That concept is soundness. This is a higher standard of argument-goodness than validity; in order to meet it, an argument must satisfy two conditions.

An argument is sound just in case (i) it's valid, AND (ii) its premises are in fact true.³

The Trump argument, while valid, is not sound, because it fails to satisfy the second condition: its premises are both false. The Socrates argument, however, which is valid and contains nothing but truths (Socrates was not in fact an alien), is sound.

The question now naturally arises: if soundness is a higher standard of argument-goodness than validity, why didn't we say that in the first place? Why so much emphasis on validity? The answer is this: we're doing logic here, and as logicians, we have no special insight into the soundness of arguments. Or rather, we should say that as logicians, we have only partial expertise on the question of soundness. Logic can tell us whether or not an argument is valid, but it cannot tell us whether or not it is sound. Logic has no special insight into the second condition for soundness, the actual truth-values of premises. To take an example from the silly Trump argument, suppose you weren't sure about the truth of the first premise, which claims that all apples are bananas (you have very little experience with fruit, apparently). How would you go about determining whether that claim was true or false? Whom would you ask? Well, this is a pretty easy one, so you could ask pretty much anybody, but the point is this: if you weren't sure about the relationship between apples and bananas, you wouldn't think to yourself, "I better go find a logician to help me figure this out." Propositions make claims about how things are in the world. To figure out whether they're true or false, you need to consult experts in the relevant subject-matter. Most claims aren't about logic, so logic is very little help in determining truth-values. Since logic can only provide insight into

³What about the conclusion? Does it have to be true? Yes: remember, for valid arguments, if the premises are true, the conclusion has to be. Sound arguments are valid, so it goes without saying that the conclusion is true, provided that the premises are.

the validity half of the soundness question, we focus on validity and leave soundness to one side.

Returning to validity, then, we're now in a position to do some actual logic. Given what we know, we can demonstrate invalidity; that is, we can prove that an invalid argument is invalid, and therefore bad (it can't be sound, either; the first condition for soundness is validity, so if the argument's invalid, the question of actual truth-values doesn't even come up). Here's how:

To demonstrate the invalidity of an argument, one must write a down a new argument with the same form as the original, whose premises are in fact true and whose conclusion is in fact false. This new argument is called a counterexample.

Let's look at an example. The following argument is invalid:

Some mammals are swimmers.

All whales are swimmers.

All whales are mammals.

Now, it's not really obvious that the argument is invalid. It does have one thing going for it: all the claims it makes are true. But we know that doesn't make any difference, since validity is determined by the argument's form, not its content. If this argument is invalid, it's invalid because it has a bad, invalid form. This is the form:

Some A are B.

All C are B.

All C are A.

To prove that the original whale argument is invalid, we have to show that this form is invalid. For a valid form, we learned, it's impossible to plug things into the blanks and get true premises and a false conclusion; so for an invalid form, it's possible to plug things into the blanks and get that result. That's how we generate our counterexample: we plug things in for A, B, and C so that the premises turn out true and the conclusion turns out false. There's no real method here; you just use your imagination to come up with an A, B, and C that give the desired result.⁴

⁴Possibly helpful hint: universal generalizations (All ... are ...) are rarely true, so if you have to make one true, as in this example, it might be good to start there; likewise, particular claims (Some ... are ...) are rarely false, so if you have to make one false—you don't in this particular example, but if you had one as a conclusion, you would— that would be a good place to start.

Here's a counterexample:

Some lawyers are American citizens.

All members of Congress are American citizens.

All members of Congress are lawyers.

For A, we inserted 'lawyers', for B we chose 'American citizens', and for C, 'members of Congress'. The first premise is clearly true. The second premise is true: non-citizens aren't eligible to be in Congress. And the conclusion is false: there are lots of people in Congress who are nonlawyers—doctors, businesspeople, etc. That's all we need to do to prove that the original whale-argument is invalid: come up with one counterexample, one way of filling in the blanks in its form to get true premises and a false conclusion. We only have to prove that it's possible to get true premises and a false conclusion, and for that, you only need one example.

What's far more difficult is to prove that a particular argument is valid. To do that, we'd have to show that its form is such that it's impossible to generate a counterexample, to fill in the blanks to get true premises and a false conclusion. Proving that it's possible is easy; you only need one counterexample. Proving that it's impossible is hard; in fact, at first glance, it looks impossibly hard! What do you do? Check all the possible ways of plugging things into the blanks, and make sure that none of them turn out to have true premises and a false conclusion? That's nuts! There are, literally, infinitely many ways to fill in the blanks in an argument's form. Nobody has the time to check infinitely many potential counterexamples.

Well, take heart; it's still early. For now, we're able to do a little bit of deductive logic: given an invalid argument, we can demonstrate that it is in fact invalid. We're not yet in the position we'd like to be in, namely of being able to determine, for any argument whatsoever, whether it's valid or not. Proving validity looks too hard based on what we know so far. But we'll know more later: in chapters 3 and 4 we will study two deductive logics, and each one will give us a method of deciding whether or not any given argument is valid. But that'll have to wait. Baby steps.

Inductive Arguments

That's all we'll say for now about deductive arguments. On to the other type of argument we're introducing in this section: inductive arguments. These are distinguished from their deductive cousins by their relative lack of ambition. Whereas deductive arguments aim

to give premises that guarantee/necessitate the conclusion, inductive arguments are more modest: they aim merely to provide premises that make the conclusion more probable than it otherwise would be; they aim to support the conclusion, but without making it unavoidable. Here is an example of an inductive argument:

I'm telling you, you're not going to die taking a plane to visit us. Airplane crashes happen far less frequently than car crashes, for example; so you're taking a bigger risk if you drive. In fact, plane crashes are so rare, you're far more likely to die from slipping in the bathtub. You're not going to stop taking showers, are you?

The speaker is trying to convince her visitor that he won't die in a plane crash on the way to visit her. That's the conclusion: you won't die. This claim is supported by the others—which emphasize how rare plane crashes are—but it is not guaranteed by them. After all, plane crashes sometimes do happen. Instead, the premises give reasons to believe that the conclusion—you won't die—is very probable.

Since inductive arguments have a different, more modest goal than their deductive cousins, it would be unreasonable for us to apply the same evaluative standards to both kinds of argument. That is, we can't use the terms 'valid' and 'invalid' to apply to inductive arguments. Remember, for an argument to be valid, its premises must guarantee its conclusion. But inductive arguments don't even try to provide a guarantee of the conclusion; technically, then, they're all invalid. But that won't do. We need a different evaluative vocabulary to apply to inductive arguments. We will say of inductive arguments that they are (relatively) strong or weak, depending on how probable their conclusions are in light of their premises. One inductive argument is stronger than another when its conclusion is more probable than the other, given their respective premises.

One consequence of this difference in evaluative standards for inductive and deductive arguments is that for the former, unlike the latter, our evaluations are subject to revision in light of new evidence. Recall that since the validity or invalidity of a deductive argument is determined entirely by its form, as opposed to its content, the discovery of new information could not affect our evaluation of those arguments. The Socrates argument remained valid, even if we discovered that Socrates was in fact an alien. Our evaluations of inductive arguments, though, are not immune to revision in this way. New information might make the conclusion of an inductive argument more or less probable, and so we would have to revise our judgment accordingly, saying that the argument is stronger or weaker. Returning to the example above about plane crashes, suppose we were to discover that the FBI in the visitor's

hometown had recently been hearing lots of “chatter” from terrorist groups active in the area, with strong indications that they were planning to blow up a passenger plane. Yikes! This would affect our estimation of the probability of the conclusion of the argument—that the visitor wasn’t going to die in a crash. The probability of not dying goes down (as the probability of dying goes up). This new information would trigger a re-evaluation of the argument, and we would say it’s now weaker. If, on the other hand, we were to learn that the airline that flies between the visitor’s and the speaker’s towns had recently upgraded its entire fleet, getting rid of all of its older planes, replacing them with newer, more reliable model, while in addition instituting a new, more thorough and rigorous program of pre- and post-flight safety and maintenance inspections—well, then we might revise our judgment in the other direction.

Given this information, we might judge that things are even safer for the visitor as it regards plane travel; that is, the proposition that the visitor won’t die is now even more probable than it was before. This new information would strengthen the argument to that conclusion.

Reasonable follow-up question: how much is the argument strengthened or weakened by the new information imagined in these scenarios? Answer: how should I know? Sorry, that’s not very helpful. But here’s the point: we’re talking about probabilities here; sometimes it’s hard to know what the probability of something happening really is. Sometimes it’s not: if I flip a coin, I know that the probability of it coming up tails is 0.5. But how probable is it that a particular plane from Airline X will crash with our hypothetical visitor on board? I don’t know. And how much more probable is a disaster on the assumption of increased terrorist chatter? Again, I have no idea. All I know is that the probability of dying on the plane goes up in that case. And in the scenario in which Airline X has lots of new planes and security measures, the probability of a crash goes down.

Sometimes, with inductive arguments, all we can do is make relative judgments about strength and weakness: in light of these new facts, the conclusion is more or less probable than it was before we learned of the new facts. Sometimes, however, we can be precise about probabilities and make absolute judgments about strength and weakness: we can say precisely how probable a conclusion is in light of the premises supporting it. But this is a more advanced topic. We will discuss inductive logic in chapters 5 and 6, and will go into more depth then. Until then, patience. Baby steps.

EXERCISES

1. Determine whether the following statements are true or false.

1. Not all valid arguments are sound.
 2. An argument with a false conclusion cannot be sound.
 3. An argument with true premises and a true conclusion is valid.
 4. An argument with a false conclusion cannot be valid.
2. Demonstrate that the following argument is invalid.

Some politicians are Democrats.
Hillary Clinton is a politician.
 Hillary Clinton is a Democrat.

The argument's form is:

Some A are B.
x is A.
 x is B.

(where 'A' and 'B' stand for groups of things and 'x' stands for an individual)

3. Consider the following inductive argument (about a made-up person):
- Sally Johansson does all her grocery shopping at an organic food co-op. She's a huge fan of tofu. She's really into those week-long juice cleanse thingies. And she's an active member of PETA. I conclude that she's a vegetarian.
1. Make up a new piece of information about Sally that weakens the argument.
 2. Make up a new piece of information about Sally that strengthens the argument.

3.1.2 Arguments with missing premises

Quite often, an argument will not explicitly state a premise that we can see is needed in order for the argument to be valid. In such a case, we can supply the premise(s) needed in order so make the argument valid. Making missing premises explicit is a central part of reconstructing arguments in standard form. We have already dealt in part with this in the section on paraphrasing, but now that we have introduced the concept of validity, we have a useful tool for knowing when to supply missing premises in our reconstruction of an argument. In some cases, the missing premise will be fairly obvious, as in the following:

Gary is a convicted sex-offender, so Gary is not allowed to work with children.

The premise and conclusion of this argument are straightforward:

Gary is a convicted sex-offender

Therefore, Gary is not allowed to work with children (from premise 1)

However, as stated, the argument is invalid. (Before reading on, see if you can provide a counterexample for this argument. That is, come up with an imaginary scenario in which the premise is true and yet the conclusion is false.) Here is just one counterexample (there could be many): Gary is a convicted sex-offender but the country in which he lives does not restrict convicted sex-offenders from working with children. I don't know whether there are any such countries, although I suspect there are (and it doesn't matter for the purpose of validity whether there are or aren't). In any case, it seems clear that this argument is relying upon a premise that isn't explicitly stated. We can and should state that premise explicitly in our reconstruction of the standard form argument. But what is the argument's missing premise? The obvious one is that no sexoffenders are allowed to work with children, but we could also use a more carefully statement like this one:

Where Gary lives, no convicted sex-offenders are allowed to work with children.

It should be obvious why this is a more "careful" statement. It is more careful because it is not so universal in scope, which means that it is easier for the statement to be made true. By relativizing the statement that sex-offenders are not allowed to work with children to the place where Gary lives, we leave open the possibility that other places in the world don't have this same restriction. So even if there are other places in the world where convicted sex-offenders are allowed to work with children, our statements could still be true since in this

place (the place where Gary lives) they aren't. (For more on strong and weak statements, see section 1.10). So here is the argument in standard form:

Gary is a convicted sex-offender.

Where Gary lives, no convicted sex-offenders are allowed to work with children.

Therefore, Gary is not allowed to work with children. (from premises 1-2)

This argument is now valid: there is no way for the conclusion to be false, assuming the truth of the premises. This was a fairly simple example where the missing premise needed to make the argument valid was relatively easy to see. As we can see from this example, a missing premise is a premise that the argument needs in order to be as strong as possible. Typically, this means supplying the statement(s) that are needed to make the argument valid. But in addition to making the argument valid, we want to make the argument plausible. This is called "the principle of charity." The principle of charity states that when reconstructing an argument, you should try to make that argument (whether inductive or deductive) as strong as possible. When it comes to supplying missing premises, this means supplying the most plausible premises needed in order to make the argument either valid (for deductive arguments) or inductively strong (for inductive arguments).

Although in the last example figuring out the missing premise was relatively easy to do, it is not always so easy. Here is an argument whose missing premises are not as easy to determine:

Since children who are raised by gay couples often have psychological and emotional problems, the state should discourage gay couples from raising children.

The conclusion of this argument, that the state should not allow gay marriage, is apparently supported by a single premise, which should be recognizable from the occurrence of the premise indicator, "since." Thus, our initial reconstruction of the standard form argument looks like this:

Children who are raised by gay couples often have psychological and emotional problems.

Therefore, the state should discourage gay couples from raising children.

However, as it stands, this argument is invalid because it depends on certain missing premises. The conclusion of this argument is a normative statement a statement about whether something ought to be true, relative to some standard of evaluation.

Normative statements can be contrasted with descriptive statements, which are simply factual claims about what is true. For example, “Russia does not allow gay couples to raise children” is a descriptive statement. That is, it is simply a claim about what is in fact the case in Russia today. In contrast, “Russia should not allow gay couples to raise children” is a normative statement since it is not a claim about what is true, but what ought to be true, relative to some standard of evaluation (for example, a moral or legal standard). An important idea within philosophy, which is often traced back to the Scottish philosopher David Hume (1711-1776), is that statements about what ought to be the case (i.e., normative statements) can never be derived from statements about what is the case (i.e., descriptive statements). This is known within philosophy as the is-ought gap. The problem with the above argument is that it attempts to infer a normative statement from a purely descriptive statement, violating the is-ought gap. We can see the problem by constructing a counterexample. Suppose that in society x it is true that children raised by gay couples have psychological problems. However, suppose that in that society people do not accept that the state should do what it can to decrease harm to children. In this case, the conclusion, that the state should discourage gay couples from raising children, does not follow. Thus, we can see that the argument depends on a missing or assumed premise that is not explicitly stated. That missing premise must be a normative statement, in order that we can infer the conclusion, which is also a normative statement. There is an important general lesson here: Many times an argument with a normative conclusion will depend on a normative premise which is not explicitly stated. The missing normative premise of this particular argument seems to be something like this:

The state should always do what it can to decrease harm to children.

Notice that this is a normative statement, which is indicated by the use of the word “should.” There are many other words that can be used to capture normative statements such as: good, bad, and ought. Thus, we can reconstruct the argument, filling in the missing normative premise like this:

Children who are raised by gay couples often have psychological and emotional problems.

The state should always do what it can to decrease harm to children.

Therefore, the state should discourage gay couples from raising children. (from premises 1-2)

However, although the argument is now in better shape, it is still invalid because it is still possible for the premises to be true and yet the conclusion false. In order to show this, we just have to imagine a scenario in which both the premises are true and yet the conclusion is false. Here is one counterexample to the argument (there are many). Suppose that while it is true that children of gay couples often have psychological and emotional problems, the rate of psychological problems in children raised by gay couples is actually lower than in children raised by heterosexual couples. In this case, even if it were true that the state should always do what it can to decrease harm to children, it does not follow that the state should discourage gay couples from raising children. In fact, in the scenario I've described, just the opposite would seem to follow: the state should discourage heterosexual couples from raising children.

But even if we suppose that the rate of psychological problems in children of gay couples is higher than in children of heterosexual couples, the conclusion still doesn't seem to follow. For example, it could be that the reason that children of gay couples have higher rates of psychological problems is that in a society that is not yet accepting of gay couples, children of gay couples will face more teasing, bullying and general lack of acceptance than children of heterosexual couples. If this were true, then the harm to these children isn't so much due to the fact that their parents are gay as it is to the fact that their community does not accept them. In that case, the state should not necessarily discourage gay couples from raising children. Here is an analogy: At one point in our country's history (if not still today) it is plausible that the children of black Americans suffered more psychologically and emotionally than the children of white Americans. But for the government to discourage black Americans from raising children would have been unjust, since it is likely that if there was a higher incidence of psychological and emotional problems in black Americans, then it was due to unjust and unequal conditions, not to the black parents, per se. So, to return to our example, the state should only discourage gay couples from raising children if they know that the higher incidence of psychological problems in children of gay couples isn't the result of any kind of injustice, but is due to the simple fact that the parents are gay.

Thus, one way of making the argument (at least closer to) valid would be to add the following two missing premises:

- A. The rate of psychological problems in children of gay couples is higher than in children of heterosexual couples.
- B. The higher incidence of psychological problems in children of gay couples is not due to any kind of injustice in society, but to the fact that the parents are

gay.

So the reconstructed standard form argument would look like this:

Children who are raised by gay couples often have psychological and emotional problems.

The rate of psychological problems in children of gay couples is higher than in children of heterosexual couples.

The higher incidence of psychological problems in children of gay couples is not due to any kind of injustice in society, but to the fact that the parents are gay.

The state should always do what it can to decrease harm to children.

Therefore, the state should discourage gay couples from raising children. (from premises 1-4)

In this argument, premises 2-4 are the missing or assumed premises. Their addition makes the argument much stronger, but making them explicit enables us to clearly see what assumptions the argument relies on in order for the argument to be valid. This is useful since we can now clearly see which premises of the argument we may challenge as false. Arguably, premise 4 is false, since the state shouldn't always do what it can to decrease harm to children. Rather, it should only do so as long as such an action didn't violate other rights that the state has to protect or create larger harms elsewhere.

The important lesson from this example is that supplying the missing premises of an argument is not always a simple matter. In the example above, I have used the principle of charity to supply missing premises. Mastering this skill is truly an art (rather than a science) since there is never just one correct way of doing it (cf. section 1.5) and because it requires a lot of skilled practice.

EXERCISES:

Supply the missing premise or premises needed in order to make the following arguments valid. Try to make the premises as plausible as possible while making the argument valid (which is to apply the principle of charity).

1. Ed rides horses. Therefore, Ed is a cowboy.
2. Tom was driving over the speed limit. Therefore, Tom was doing something wrong.
3. If it is raining then the ground is wet. Therefore, the ground must be wet.
4. All elves drink Guinness, which is why Olaf drinks Guinness.

5. Mark didn't invite me to homecoming. Instead, he invited his friend Alexia. So he must like Alexia more than me.
6. The watch must be broken because every time I have looked at it, the hands have been in the same place.
7. Olaf drank too much Guinness and fell out of his second story apartment window. Therefore, drinking too much Guinness caused Olaf to injure himself.
8. Mark jumped into the air. Therefore, Mark landed back on the ground.
9. In 2009 in the United States, the net worth of the median white household was \$113,149 a year, whereas the net worth of the median black household was \$5,677. Therefore, as of 2009, the United States was still a racist nation.
10. The temperature of the water is 212 degrees Fahrenheit. Therefore, the water is boiling.
11. Capital punishment sometimes takes innocent lives, such as the lives of individuals who were later found to be not guilty. Therefore, we should not allow capital punishment.
12. Allowing immigrants to migrate to the U.S. will take working class jobs away from working class folks. Therefore, we should not allow immigrants to migrate to the U.S.
13. Prostitution is a fair economic exchange between two consenting adults. Therefore, prostitution should be allowed.
14. Colleges are more interested in making money off of their football athletes than in educating them. Therefore, college football ought to be banned.
15. Edward received an F in college Algebra. Therefore, Edward should have studied more.

Chapter 4

Chapter 4

4.1 Induction

4.1.1 Inductive argumentation

Inductive argumentation is a less certain, more realistic, more familiar way of reasoning that we all do, all the time. Inductive argumentation recognizes, for instance, that a premise like “All horses have four legs” comes from our previous experience of horses. If one day we were to encounter a three-legged horse, deductive logic would tell us that “All horses have four legs” is false, at which point the premise becomes rather useless for a deducer. In fact, deductive logic tells us that if the premise “All horses have four legs” is false, even if we know there are many, many four-legged horses in the world, when we go to the track and see hordes of four-legged horses, all we can really be certain of is that “There is at least one four-legged horse.”

Inductive logic allows for the more realistic premise, “The vast majority of horses have four legs”. And inductive logic can use this premise to infer other useful information, like “If I’m going to get Chestnut booties for Christmas, I should probably get four of them.” The trick is to recognize a certain amount of uncertainty in the truth of the conclusion, something for which deductive logic does not allow. In real life, however, inductive logic is used much more frequently and (hopefully) with some success.

Predicting the Future

We constantly use inductive reasoning to predict the future. We do this by compiling evidence based on past observations, and by assuming that the future will resemble the past. For instance, I make the observation that every other time I have gone to sleep at night, I have woken up in the morning. There is actually no certainty that this will happen, but I make the inference because of the fact that this is what has happened every other time. In fact, it is not the case that “All people who go to sleep at night wake up in the morning”. But I’m not going to lose any sleep over that. And we do the same thing when our experience has been less consistent. For instance, I might make the assumption that, if there’s someone at the door, the dog will bark. But it’s not outside the realm of possibility that the dog is asleep, has gone out for a walk, or has been persuaded not to bark by a clever intruder with sedative-laced bacon. I make the assumption that if there’s someone at the door, the dog will bark, because that is what usually happens.

Explaining Common Occurrences

We also use inductive reasoning to explain things that commonly happen. For instance, if I'm about to start an exam and notice that Bill is not here, I might explain this to myself with the reason that Bill is stuck in traffic. I might base this on the reasoning that being stuck in traffic is a common excuse for being late, or because I know that Bill never accounts for traffic when he's estimating how long it will take him to get somewhere. Again, that Bill is actually stuck in traffic is not certain, but I have some good reasons to think it's probable. We use this kind of reasoning to explain past events as well. For instance, if I read somewhere that 1986 was a particularly good year for tomatoes, I assume that 1986 also had some ideal combination of rainfall, sun, and consistently warm temperatures. Although it's possible that a scientific madman circled the globe planting tomatoes wherever he could in 1986, inductive reasoning would tell me that the former, environmental explanation is more likely. (But I could be wrong.)

Generalizing

Often we would like to make general claims, but in fact it would be very difficult to prove any general claim with any certainty. The only way to do so would be to observe every single case of something about which we wanted to make an observation. This would be, in fact, the only way to prove such assertions as, "All swans are white". Without being able to observe every single swan in the universe, I can never make that claim with certainty. Inductive logic, on the other hand, allows us to make the claim, with a certain amount of modesty.

4.1.2 Inductive Generalization

Inductive generalization allows us to make general claims, despite being unable to actually observe every single member of a class in order to make a certainly true general statement. We see this in scientific studies, population surveys, and in our own everyday reasoning. Take for example a drug study. Some doctor or other wants to know how many people will go blind if they take a certain amount of some drug for so many years. If they determine that 5% of people in the study go blind, they then assume that 5% of all people who take the drug for that many years will go blind. Likewise, if I survey a random group of people and ask them what their favourite color is, and 75% of them say "purple", then I assume that purple is the favourite colour of 75% of people. But we have to be careful when we

make an inductive generalization. When you tell me that 75% of people really like purple, I'm going to want to know whether you took that survey outside a Justin Bieber concert.

Let's take an example. Let's say I asked a class of 400 students whether or not they think logic is a valuable course, and 90% of them said yes. I can make an inductive argument like this:

90% of 400 students believe that logic is a valuable course.

Therefore 90% of all students believe that logic is a valuable course.

There are certain things I need to take into account in judging the quality of this argument. For instance, did I ask this in a logic course? Did the respondents have to raise their hands so that the professor could see them, or was the survey taken anonymously? Are there enough students in the course to justify using them as a representative group for students in general?

If I did, in fact, make a class of 400 logic students raise their hands in response to the question of whether logic is valuable course, then we can identify a couple of problems with this argument. The first is bias. We can assume that anyone enrolled in a logic course is more likely to see it as valuable than any random student. I have therefore skewed the argument in favour of logic courses. I can also question whether the students were answering the question honestly. Perhaps if they are trying to save the professor's feelings, they are more likely to raise their hands and assure her that the logic course is a valuable one.

Now let's say I've avoided those problems. I have assured that the 400 students I have asked are randomly selected, say, by soliciting email responses from randomly selected students from the university's entire student population. Then the argument looks stronger.

Another problem we might have with the argument is whether I have asked enough students so that the whole population is well-represented. If the student body as a whole consists of 400 students, my argument is very strong. If the student body numbers in the tens of thousands, I might want to ask a few more before assuming that the opinions of a few mirror those of the many. This would be a problem with my sample size.

Let's take another example. Now I'm going to run a scientific study, in which I will pay someone \$50 to take a drug with unknown effects and see if it makes them blind. In order to control for other variables, I open the study only to white males between the ages of 18 and 25.

A bad inductive argument would say:

40% of 1000 people who took the drug went blind.

40% of people who take the drug will go blind.

A better inductive argument would make a more modest claim:

40% of the 1000 people who took the drug went blind.

40% of white males between the ages of 18 and 25 who take the drug will go blind.

The point behind this example is to show how inductive reasoning imposes an important limitation on the possible conclusions a study or a survey can make. In order to make good generalizations, we need to ensure that our sample is representative, non-biased, and sufficiently sized.

4.1.3 Statistical Syllogism

Where in an inductive generalization we saw statement expressing a statistic applied to a more general group, we can also use statistics to go from the general to the particular. For instance, if I know that most computer science majors are male, and that some random individual with the androgynous name “Cameron” is an computer science major, then we can be reasonably certain that Cameron is a male. We tend to represent the uncertainty by qualifying the conclusion with the word “probably”. If, on the other hand, we wanted to say that something is unlikely, like that Cameron were a female, we could use “probably not”. It is also possible to temper our conclusion with other similar qualifying words.

Let’s take an example.

Of the 133 people found guilty of homicide last year in Canada, 79% were jailed.

Socrates was found guilty of homicide last year in Canada.

Therefore, Socrates was probably jailed.

In this case we can be reasonably sure that Socrates is currently rotting in prison. Now the certainty of our conclusion seems to be dependent on the statistics we’re dealing with. There are definitely more certain and more uncertain cases.

In the last election, 50% of voting Americans voted for Obama, while 48% voted for Romney.

Jim is a voting American.

Jim probably voted for Obama.

Clearly, this argument is not as strong as the first. It is only slightly more likely than not that Jim voted for Obama. In this case we might want to revise our conclusion to say:

(C) It is slightly more likely than not that Jim voted for Obama.

In other cases, the likelihood that something is or is not the case approaches certainty. For example:

There is a 0.00000059% chance you will die on any single flight, assuming you use one of the most poorly rated airlines.

I'm flying to Paris next week.

There's more than a million to one chance that I will die on my flight.

Note that in all of these examples, nothing is ever stated with absolute certainty. It is possible to improve the chances that our conclusions will be accurate by being more specific, or finding out more information. We would know more about Jim's voting strategy, for instance, if we knew where he lived, his previous voting habits, or if we simply asked him for whom he voted (in which case, we might also want to know how often Jim lies).

Induction is the process of justifying quantified, categorical generalizations such as “All dogs like hot dogs.” and “92% of Canadian adults are owners of a mobile phone.” based on data about particular cases which we have experienced.

Claims like this are made all the time by people in everyday life. For example, a lot of common knowledge about things and their properties is encoded in generalizations, such as “Birds have wings.” and “Bananas grow on trees.”.

Stereotypes about different nations or ethnicities, such as “All Irish people love a drink.”, are generalizations. So are superstitions such as “I always play well when I wear my lucky socks.”.

As the examples of stereotypes and superstitions show, induction in everyday life is often done hastily. Doing it properly requires collecting a large, unbiased sample, so that the percentage discovered in the sample is likely to be close to that in the population. When a categorical proposition has a quantity that is universal or near-universal it can be used in inferences which classify new objects or events. For example, if you know “Almost all dogs have tails.”, you can infer that Jack’s new dog, Jim, has a tail.

4.1.4 Inductive Generalization (IG)

Induction is the process of justifying quantified, categorical propositions such as “All dogs like hot dogs.” and “92% of Canadian adults are owners of a mobile phone.” based on information about particular cases which we have experienced.

People make claims like this all the time. For example, a lot of common knowledge about things and their properties is encoded in such propositions, such as “Birds have wings.” and “Bananas grow on trees.”. Stereotypes about different nations or ethnicities, such as “All Irish people love a drink.”, are also quantified categorical propositions.

These propositions are categorical in that they are about categories or classes or types of thing, rather than a particular case or instance of that type. For example, “Jim loves chasing squirrels.” is about a specific dog, Jim, while “Most dogs are things that love chasing squirrels.” (or more naturally “Most dogs love chasing squirrels.”) is about dogs in general.

These proposition are quantified in that they specify what proportion or percentage of members of the initial class belong to the class mentioned in the predicate. “Nine out of ten dentists brush with Oral-B toothbrushes.” tells us that the percentage of dentists who use an Oral-B toothbrush is 90%. If the quantity is “All” or 100%, or “None” or 0%, the proposition is universal. Universality is rarely the case; what we more often get is a proposition describing a probabilistic relation—e.g. if F is present, G is present in 90% of

cases. We are happy if the frequency of joint appearance or non-appearance is very high or near-universal.

We turn now to the process of generalization from a sample to a wider population. Consider the following scenario:

Jack shakes a large opaque basket filled with 4,000 black and red cubes, reaches in without looking, and grabs 500. He counts the reds, sees that he has 450, and then on this basis infers that roughly 90% of the cubes in the basket are red.

Jack's inference is an instance of inductive generalization (IG) (or sometimes simply induction), and in standard form (i.e. with the premises above the line and the conclusion below) it looks like this:

Cube1 through Cube500 are all cubes in the basket.

90% of the 500 cubes examined are red.

Roughly 90% of the 4,000 cubes in the basket are red.

(Important Note: This analysis of the inference does not use the literal propositions in the passage. Rather, the relevant information is extracted from the passage. Which information is important is about to be explained.)

This inference concerns a sample of cubes (500 of them) from a wider population (of 4,000). The population is all the cubes in the basket, and this is mentioned in the conclusion. The sample is the cubes Jack looked at, and this is mentioned in premise (1).

Since we are interested in the percentage of the cubes that are red, the cubes can be divided into two types: those that are red, and those that are not red. The color of the cubes is a variable, which means that it can take multiple values, in this case two: red and black. Writing out all of the information in propositions would be a lot of work; there would be 500 premises stating that each cube is a cube in the basket (i.e. (1) Cube 1 is a cube in the basket. (2) Cube 2 is a cube in the basket. . . .) and 500 more stating the color of each cube (i.e. (1) Cube 1 is red. (2) Cube 2 is red. (3) Cube 3 is black. . . .). What we do instead is summarize all of this information in two premises. Premise (1) states that the 500 cases are cubes in the basket, while premise (2) states the proportion that are red. (The remainder are then assumed to be black.)

From the fact that 90% of the cubes in the sample are red, Jack infers that roughly 90% of the population of cubes are red. That is, he generalizes. The conclusion moves beyond the specific cubes which were examined to cubes in the basket generally.

Here is the general form of IG:

Case1 through caseN are all F.

The % of case1 through caseN are also G.

The sample is large.

The sampling method yields an unbiased sample.

Roughly % of cases of F are G.

“F” and “G” stand for any two types of thing; they can refer to either the presence or the absence of any type of thing. The first two premises refer to a limited number of cases of F, while the conclusion refers to all Fs. The sample is numbered from 1 to n. The percentage-sign (%) stands for a proportion, expressed as a percentage (or sometimes a fraction, and in ordinary speech by a quantifying word or phrase such as “All”, “Most”, “A majority of”, “Some”, and so on). The word “roughly” (or some equivalent word) appears in the conclusion because it is improbable that the percentage of Gs in the population is exactly the same as the percentage of Gs in the sample.

IG can be used whether F and G are described positively or negatively. For example, we might be interested in the percentage of cases in which something is absent that are also cases where a second thing is absent (e.g. In 100% of places where water is absent, life is impossible), or one thing is absent and another present (e.g. 72% of buildings without sprinkler systems suffer serious damage in fires) or the first thing is present and the second absent (e.g. 97% of children who have been vaccination do not contract a certain illness).

4.2 Potential Problems with Inductive arguments and statistical generalizations

As we've seen, an inductive argument is an argument whose conclusion is supposed to follow from its premises with a high level of probability, rather than with certainty. This means that although it is possible that the conclusion doesn't follow from its premises, it is unlikely that this is the case. We said that inductive arguments are "defeasible," meaning that we could turn a strong inductive argument into a weak inductive argument simply by adding further premises to the argument. In contrast, deductive arguments that are valid can never be made invalid by adding further premises. Consider our "Tweets" argument:

Tweets is a healthy, normally functioning bird
Most healthy, normally functioning birds fly
Therefore, Tweets probably flies

Without knowing anything else about Tweets, it is a good bet that Tweets flies. However, if we were to add that Tweets is 6 ft. tall and can run 30 mph, then it is no longer a good bet that Tweets can fly (since in this case Tweets is likely an ostrich and therefore can't fly). The second premise, "most healthy, normally functioning birds fly," is a statistical generalization. Statistical generalizations are generalizations arrived at by empirical observations of certain regularities. Statistical generalizations can be either universal or partial. Universal generalizations assert that all members (i.e., 100%) of a certain class have a certain feature, whereas partial generalizations assert that most or some percentage of members of a class have a certain feature. For example, the claim that "67.5% of all prisoners released from prison are rearrested within three years" is a partial generalization that is much more precise than simply saying that "most prisoners released from prison are rearrested within three years." In contrast, the claim that "all prisoners released from prison are rearrested within three years" is a universal generalization. As we can see from these examples, deductive arguments typically use universal statistical generalizations whereas inductive arguments typically use partial statistical generalizations. Since statistical generalizations are often crucial premises in both deductive and inductive arguments, being able to evaluate when a statistical generalization is good or bad is crucial for being able to evaluate arguments. What we are doing in evaluating statistical generalizations is determining whether the premise in

our argument is true (or at least well supported by the evidence). For example, consider the following inductive argument, whose premise is a (partial) statistical generalization:

70% of voters say they will vote for candidate X

Therefore, candidate X will probably win the election

This is an inductive argument because even if the premise is true, the conclusion could still be false (for example, an opponent of candidate X could systematically kill or intimidate those voters who intend to vote for candidate X so that very few of them will actually vote). Furthermore, it is clear that the argument is intended to be inductive because the conclusion contains the word “probably,” which clearly indicates that an inductive, rather than deductive, inference is intended. Remember that in evaluating arguments we want to know about the strength of the inference from the premises to the conclusion, but we also want to know whether the premise is true! We can assess whether or not a statistical generalization is true by considering whether the statistical generalization meets certain conditions. There are two conditions that any statistical generalization must meet in order for the generalization to be deemed “good.”

1. Adequate sample size: the sample size must be large enough to support the generalization.
2. Non-biased sample: the sample must not be biased.

A sample is simply a portion of a population. A population is the totality of members of some specified set of objects or events. For example, if I were determining the relative proportion of cars to trucks that drive down my street on a given day, the population would be the total number of cars and trucks that drive down my street on a given day. If I were to sit on my front porch from 12-2 pm and count all the cars and trucks that drove down my street, that would be a sample. A good statistical generalization is one in which the sample is representative of the population. When a sample is representative, the characteristics of the sample match the characteristics of the population at large. For example, my method of sampling cars and trucks that drive down my street would be a good method as long as the proportion of trucks to cars that drove down my street between 12-2 pm matched the proportion of trucks to cars that drove down my street during the whole day. If for some

reason the number of trucks that drove down my street from 12-2 pm was much higher than the average for the whole day, my sample would not be representative of the population I was trying to generalize about (i.e., the total number of cars and trucks that drove down my street in a day). The “adequate sample size” condition and the “non-biased sample” condition are ways of making sure that a sample is representative. In the rest of this section, we will explain each of these conditions in turn.

It is perhaps easiest to illustrate these two conditions by considering what is wrong with statistical generalizations that fail to meet one or more of these conditions. First, consider a case in which the sample size is too small (and thus the adequate sample size condition is not met). If I were to sit in front of my house for only fifteen minutes from 12:00-12:15 and saw only one car, then my sample would consist of only 1 automobile, which happened to be a car. If I were to try to generalize from that sample, then I would have to say that only cars (and no trucks) drive down my street. But the evidence for this universal statistical generalization (i.e., “every automobile that drives down my street is a car”) is extremely poor since I have sampled only a very small portion of the total population (i.e., the total number of automobiles that drive down my street). Taking this sample to be representative would be like going to Flagstaff, AZ for one day and saying that since it rained there on that day, it must rain every day in Flagstaff. Inferring to such a generalization is an informal fallacy called “hasty generalization.” One commits the fallacy of hasty generalization when one infers a statistical generalization (either universal or partial) about a population from too few instances of that population. Hasty generalization fallacies are very common in everyday discourse, as when a person gives just one example of a phenomenon occurring and implicitly treats that one case as sufficient evidence for a generalization. This works especially well when fear or practical interests are involved. For example, Jones and Smith are talking about the relative quality of Fords versus Chevys and Jones tells Smith about his uncle’s Ford, which broke down numerous times within the first year of owning it. Jones then says that Fords are just unreliable and that that is why he would never buy one. The generalization, which is here ambiguous between a universal generalization (i.e., all Fords are unreliable) and a partial generalization (i.e., most/many Fords are unreliable), is not supported by just one case, however convinced Smith might be after hearing the anecdote about Jones’s uncle’s Ford.

The non-biased sample condition may not be met even when the adequate sample size condition is met. For example, suppose that I count all the cars on my street for a three hour period from 11-2 pm during a weekday. Let’s assume that counting for three hours

straight give us an adequate sample size. However, suppose that during those hours (lunch hours) there is a much higher proportion of trucks to cars, since (let's suppose) many work trucks are coming to and from worksites during those lunch hours. If that were the case, then my sample, although large enough, would not be representative because it would be biased. In particular, the number of trucks to cars in the sample would be higher than in the overall population, which would make the sample unrepresentative of the population (and hence biased).

Another good way of illustrating sampling bias is by considering polls. So consider candidate X who is running for elected office and who strongly supports gun rights and is the candidate of choice of the NRA. Suppose an organization runs a poll to determine how candidate X is faring against candidate Y, who is actively anti gun rights. But suppose that the way the organization administers the poll is by polling subscribers to the magazine, Field and Stream. Suppose the poll returned over 5000 responses, which, let's suppose, is an adequate sample size and out of those responses, 89% favored candidate X. If the organization were to take that sample to support the statistical generalization that "most voters are in favor of candidate X" then they would have made a mistake. If you know anything about the magazine Field and Stream, it should be obvious why. Field and Stream is a magazine whose subscribers who would tend to own guns and support gun rights. Thus we would expect that subscribers to that magazine would have a much higher percentage of gun rights activists than would the general population, to which the poll is attempting to generalize. But in this case, the sample would be unrepresentative and biased and thus the poll would be useless. Although the sample would allow us to generalize to the population, "Field and Stream subscribers," it would not allow us to generalize to the population at large. Let's consider one more example of a sampling bias. Suppose candidate X were running in a district in which there was a high proportion of elderly voters. Suppose that candidate X favored policies that elderly voters were against. For example, suppose candidate X favors slashing Medicare funding to reduce the budget deficit, whereas candidate Y favored maintaining or increasing support to Medicare. Along comes an organization who is interested in polling voters to determine which candidate is favored in the district. Suppose that the organization chooses to administer the poll via text message and that the results of the poll show that 75% of the voters favor candidate X. Can you see what's wrong with the poll—why it is biased? You probably recognize that this polling method will not produce a representative sample because elderly voters are much less likely to use cell phones and text messaging and so the poll will leave out the responses of these elderly voters (who, we've assumed make up

a large segment of the population).

Thus, the sample will be biased and unrepresentative of the target population. As a result, any attempt to generalize to the general population would be extremely ill-advised.

EXERCISES

What kinds of problems, if any, do the following statistical generalizations have? If there is a problem with the generalization, specify which of the two conditions (adequate sample size, non-biased sample) are not met. Some generalizations may have multiple problems. If so, specify all of the problems you see with the generalization.

1. Bob, from Silverton, CO drives a 4x4 pickup truck, so most people from Silverton, CO drive 4x4 pickup trucks.
2. Tom counts and categorizes birds that land in the tree in his backyard every morning from 5:00-5:20 am. He counts mostly morning doves and generalizes, “most birds that land in my tree in the morning are morning doves.”
3. Tom counts and categorizes birds that land in the tree in his backyard every morning from 5:00-6:00 am. He counts mostly morning doves and generalizes, “most birds that land in my tree during the 24-hour day are morning doves.”
4. Tom counts and categorizes birds that land in the tree in his backyard every day from 5:00-6:00 am, from 11:00-12:00 pm, and from 5:00-6:00 pm. He counts mostly morning doves and generalizes, “most birds that land in my tree during the 24-hour day are morning doves.”
5. Tom counts and categorizes birds that land in the tree in his backyard every evening from 10:00-11:00 pm. He counts mostly owls and generalizes, “most birds that land in my tree throughout the 24-hour day are owls.”
6. Tom counts and categorizes birds that land in the tree in his backyard every evening from 10:00-11:00 pm and from 2:00-3:00 am. He counts mostly owls and generalizes, “most birds that land in my tree throughout the night are owls.”
7. A poll administered to 10,000 registered voters who were homeowners showed that 90% supported a policy to slash Medicaid funding and decrease property taxes. Therefore, 90% of voters support a policy to slash Medicaid funding.

8. A telephone poll administered by a computer randomly generating numbers to call, found that 68% of Americans in the sample of 2000 were in favor of legalizing recreational marijuana use. Thus, almost 70% of Americans favor legalizing recreation marijuana use.
9. A randomized telephone poll in the United States asked respondents whether they supported a) a policy that allows killing innocent children in the womb or b) a policy that saves the lives of innocent children in the womb. The results showed that 69% of respondents choose option “b” over option “a.” The generalization was made that “most Americans favor a policy that disallows abortion.”
10. Steve’s first rock and roll concert was an Ani DiFranco concert, in which most of the concert-goers were women with feminist political slogans written on their t-shirts. Steve makes the generalization that “most rock and roll concert-goers are women who are feminists.” He then applies this generalization to the next concert he attends (Tom Petty) and is greatly surprised by what he finds.
11. A high school principal conducts a survey of how satisfied students are with his high school by asking students in detention to fill out a satisfaction survey. Generalizing from that sample, he infers that 79% of students are dissatisfied with their high school experience. He is surprised and saddened by the result.
12. After having attended numerous Pistons home games over 20 years, Alice cannot remember a time when she didn’t see ticket scalpers selling tickets outside the stadium. She generalizes that there are always scalpers at every Pistons home game.
13. After having attended numerous Pistons home games over 20 years, Alice cannot remember a time when she didn’t see ticket scalpers selling tickets outside the stadium. She generalizes that there are ticket scalpers at every NBA game.
14. After having attended numerous Pistons home games over 20 years, Alice cannot remember a time when she didn’t see ticket scalpers selling tickets outside the stadium. She generalizes that there are ticket scalpers at every sporting event.
15. Bob once ordered a hamburger from Burger King and got violently ill shortly after he ate it. From now on, he never eats at Burger King because he fears he will get food poisoning.

Chapter 5

Chapter 5

5.1 Causal reasoning

When I strike a match it will produce a flame. It is natural to take the striking of the match as the cause that produces the effect of a flame. But what if the matchbook is wet? Or what if I happen to be in a vacuum in which there is no oxygen (such as in outer space)? If either of those things is the case, then the striking of the match will not produce a flame. So it isn't simply the striking of the match that produces the flame, but a combination of the striking of the match together with a number of other conditions that must be in place in order for the striking of the match to create a flame. Which of those conditions we call the "cause" depends in part on the context. Suppose that I'm in outer space striking a match (suppose I'm wearing a space suit that supplies me with oxygen but that I'm striking the match in space, where there is no oxygen). I continuously strike it but no flame appears (of course). But then someone (also in a space suit) brings out a can of compressed oxygen that they spray on the match while I strike it. All of a sudden a flame is produced. In this context, it looks like it is the spraying of oxygen that causes flame, not the striking of the match. Just as in the case of the striking of the match, any cause is more complex than just a simple event that produces some other event. Rather, there are always multiple conditions that must be in place for any cause to occur. These conditions are called *background conditions*. That said, we often take for granted the background conditions in normal contexts and just refer to one particular event as the cause. Thus, we call the striking of the match the cause of the flame. We don't go on to specify all the other conditions that conspired to create the flame (such as the presence of oxygen and the absence of water). But this is more for convenience than correctness. For just about any cause, there are a number of conditions that must be in place in order for the effect to occur. These are called necessary conditions (recall the discussion of necessary and sufficient conditions from chapter 2, section 2.7). For example, a necessary condition of the match lighting is that there is oxygen present. A necessary condition of a car running is that there is gas in the tank. We can use necessary conditions to diagnose what has gone wrong in cases of malfunction. That is, we can consider each condition in turn in order to determine what caused the malfunction. For example, if the match doesn't light, we can check to see whether the matches are wet. If we find that the matches are wet then we can explain the lack of the flame by saying something like, "dropping the matches in the water caused the matches not to light." In contrast, a sufficient condition is one which if present will always bring about the effect. For example, a person being fed through an operating wood chipper is sufficient for causing that person's death (as was the fate of Steve Buscemi's character in the movie *Fargo*).

Because the natural world functions in accordance with natural laws (such as the laws of physics), causes can be generalized. For example, any object near the surface of the earth will fall towards the earth at 9.8 m/s^2 unless impeded by some contrary force (such as the propulsion of a rocket). This generalization applies to apples, rocks, people, wood chippers and every other object. Such causal generalizations are often parts of explanations. For example, we can explain why the airplane crashed to the ground by citing the causal generalization that all unsupported objects fall to the ground and by noting that the airplane had lost any method of propelling itself because the engines had died. So we invoke the causal generalization in explaining why the airplane crashed. Causal generalizations have a particular form:

For any x, if x has the feature(s) F, then x has the feature G

For example:

For any human, if that human has been fed through an operating wood chipper, then that human is dead.

For any engine, if that engine has no fuel, then that engine will not operate.

For any object near the surface of the earth, if that object is unsupported and not impeded by some contrary force, then that object will fall towards the earth at 9.8 m/s^2 .

Being able to determine when causal generalizations are true is an important part of becoming a critical thinker. Since in both scientific and every day contexts we rely on causal generalizations in explaining and understanding our world, the ability to assess when a causal generalization is true is an important skill. For example, suppose that we are trying to figure out what causes our dog, Charlie, to have seizures. To simplify, let's suppose that we have a set of potential candidates for what causes his seizures. It could be either:

1. eating human food,
2. the shampoo we use to wash him,
3. his flea treatment,
4. not eating at regular intervals,

or some combination of these things. Suppose we keep a log of when these things occur each day and when his seizures (S) occur. In the table below, I will represent the absence of the feature by a negation. So in the table below, “ $\sim A$ ” represents that Charlie did not eat human food on that day; “ $\sim B$ ” represents that he did not get a bath and shampoo that day; “ $\sim S$ ” represents that he did not have a seizure that day. In contrast, “B” represents that he did have a bath and shampoo, whereas “C” represents that he was given a flea treatment that day. Here is how the log looks:

Day 1	$\sim A$	B	C	D	S
Day 2	A	$\sim B$	C	D	$\sim S$
Day 3	A	B	$\sim C$	D	$\sim S$
Day 4	A	B	C	$\sim D$	S
Day 5	A	B	$\sim C$	D	$\sim S$
Day 6	A	$\sim B$	C	D	$\sim S$

How can we use this information to determine what might be causing Charlie to have seizures? The first thing we’d want to know is what feature is present every time he has a seizure. This would be a necessary (but not sufficient) condition. And that can tell us something important about the cause. The necessary condition test says that any candidate feature (here A, B, C, or D) that is absent when the target feature (S) is present is eliminated as a possible necessary condition of S.¹ In the table above, A is absent when S is present, so A can’t be a necessary condition (i.e., day 1). D is also absent when S is present (day 4) so D can’t be a necessary condition either. In contrast, B is never absent when S is present—that is every time S is present, B is also present. That means B is a necessary condition, based on the data that we have gathered so far. The same applies to C since it is never absent when S is present. Notice that there are times when both B and C are absent, but on those days the target feature (S) is absent as well, so it doesn’t matter.

The next thing we’d want to know is which feature is such that every time it is present, Charlie has a seizure. The test that is relevant to determining this is called the sufficient condition test. The sufficient condition test says that any candidate that is present when the target feature (S) is absent is eliminated as a possible sufficient condition of S. In the table above, we can see that no one candidate feature is a sufficient condition for causing the seizures since for each candidate (A, B, C, D) there is a case (i.e. day) where it is present but that no seizure occurred. Although no one feature is sufficient for causing the seizures

¹This discussion draws heavily on chapter 10, pp. 220-224 of Sinnott-Armstrong and Fogelin’s *Understanding Arguments*, 9th edition (Cengage Learning).

(according to the data we have gathered so far), it is still possible that certain features are jointly sufficient. Two candidate features are jointly sufficient for a target feature if and only if there is no case in which both candidates are present and yet the target is absent. Applying this test, we can see that B and C are jointly sufficient for the target feature since any time both are present, the target feature is always present. Thus, from the data we have gathered so far, we can say that the likely cause of Charlie's seizures are when we both give him a bath and then follow that bath up with a flea treatment. Every time those two things occur, he has a seizure (sufficient condition); and every time he has a seizure, those two things occur (necessary condition). Thus, the data gathered so far supports the following causal conditional:

Any time Charlie is given a shampoo bath and a flea treatment, he has a seizure.

Although in the above case, the necessary and sufficient conditions were the same, this needn't always be the case. Sometimes sufficient conditions are not necessary conditions. For example, being fed through a wood chipper is a sufficient condition for death, but it certainly isn't necessary! (Lots of people die without being fed through a wood chipper, so it can't be a necessary condition of dying.) In any case, determining necessary and sufficient conditions is a key part of determining a cause.

When analyzing data to find a cause it is important that we rigorously test each candidate. Here is an example to illustrate rigorous testing. Suppose that on every day we collected data about Charlie he ate human food but that on none of the days was he given a bath and shampoo, as the table below indicates.

Day 1	A	$\sim B$	C	D	$\sim S$
Day 2	A	$\sim B$	C	D	$\sim S$
Day 3	A	$\sim B$	$\sim C$	D	$\sim S$
Day 4	A	$\sim B$	C	$\sim D$	S
Day 5	A	$\sim B$	$\sim C$	D	$\sim S$
Day 6	A	$\sim B$	C	D	S

Given this data, A trivially passes the necessary condition test since it is always present (thus, there can never be a case where A is absent when S is present). However, in order to rigorously test A as a necessary condition, we have to look for cases in which A is not present and then see if our target condition S is present. We have rigorously tested A as a necessary condition only if we have collected data in which A was not present. Otherwise, we don't really know whether A is a necessary condition. Similarly, B trivially passes the

sufficient condition test since it is never present (thus, there can never be a case where B is present but S is absent). However, in order to rigorously test B as a sufficient condition, we have to look for cases in which B is present and then see if our target condition S is absent. We have rigorously tested B as a sufficient condition only if we have collected data in which B is present. Otherwise, we don't really know whether B is a sufficient condition or not.

In rigorous testing, we are actively looking for (or trying to create) situations in which a candidate feature fails one of the tests. That is why when rigorously testing a candidate for the necessary condition test, we must seek out cases in which the candidate is not present, whereas when rigorously testing a candidate for the sufficient condition test, we must seek out cases in which the candidate is present. In the example above, A is not rigorously tested as a necessary condition and B is not rigorously tested as a sufficient condition. If we are interested in finding a cause, we should always rigorously test each candidate. This means that we should always have a mix of different situations where the candidates and targets are sometimes present and sometimes absent.

EXERCISES

Determine which of the candidates (A, B, C, D) in the following examples pass the necessary condition test or the sufficient condition test relative to the target (G). In addition, note whether there are any candidates that aren't rigorously tested as either necessary or sufficient conditions.

Case 1	A	B	$\sim C$	D	$\sim G$
Case 2	$\sim A$	B	C	D	G
Case 3	A	$\sim B$	C	D	G

Case 1	A	B	C	D	G
Case 2	$\sim A$	B	$\sim C$	D	$\sim G$
Case 3	A	$\sim B$	C	$\sim D$	G

Case 1	A	B	C	D	G
Case 2	$\sim A$	B	C	D	G
Case 3	A	$\sim B$	C	D	G

Case 1	A	B	C	D	$\sim G$
Case 2	$\sim A$	B	C	D	G
Case 3	A	B	C	$\sim D$	G

Case 1	A	B	$\sim C$	D	$\sim G$
Case 2	$\sim A$	B	C	D	G
Case 3	A	$\sim B$	$\sim C$	$\sim D$	$\sim G$

- For each of the following correlations, use your background knowledge to determine whether A causes B, B causes A, a common cause C is the cause of both A and B, or the correlations is accidental.
1. There is a positive correlation between U.S. spending on science, space, and technology (A) and suicides by hanging, strangulation, and suffocation (B).
 2. There is a positive correlation between our dog Charlie's weight (A) and the amount of time we spend away from home (B). That is, the more time we spend away from home, the heavier Charlie gets (and the more we are at home, the lighter Charlie is).
 3. The height of the tree in our front yard (A) positively correlates with the height of the shrub in our backyard (B).
 4. There is a negative correlation between the number of suicide bombings in the U.S. (A) and the number of hairs on a particular U.S President's head (B).
 5. There is a high positive correlation between the number of fire engines in a particular borough of New York Cite (A) and the number of fires that occur there (B).
 6. At one point in history, there was a negative correlation between the number of mules in the state (A) and the salaries paid to professors at the state university (B). That is, the more mules, the lower the professors' salaries.
 7. There is a strong positive correlation between the number of traffic accidents on a particular highway (A) and the number of billboards featuring scantily-clad models (B).
 8. The girth of an adult's waist (A) is negatively correlated with the height of their vertical leap (B).

Case 1	A	B	C	D	$\sim G$
Case 2	$\sim A$	B	C	$\sim D$	$\sim G$
Case 3	A	$\sim B$	$\sim C$	D	G

9. Olympic marathon times (A) are positively correlated with the temperature during the marathon (B). That is, the more time it takes an Olympic marathoner to complete the race, the higher the temperature.
10. The number gray hairs on an individual's head (A) is positively correlated with the number of children or grandchildren they have (B).

5.1.1 Causal Reasoning

Inductive arguments are used to support claims about cause and effect. These arguments come in a number of different forms. The most straightforward is what is called enumerative induction. This is an argument that makes a (non-hasty) generalization, inferring that one event or type of event causes another on the basis of a (large) number of particular observations of the cause immediately preceding the effect. To use a very famous example (from the history of philosophy, due to David Hume, the 18th century Scottish philosopher who had much to say about cause and effect and inductive reasoning), we can infer from observations of a number of billiard-ball collisions that the first ball colliding with the second causes the second ball to move. Or we can infer from a number of observations of drunkenness following the consumption of alcoholic beverages that imbibing alcohol causes one to become drunk.

This is all well and good, so far as it goes.² It just doesn't go very far. If we want to establish a robust knowledge of what causes the natural phenomena we're interested in, we need techniques that are more sophisticated than simple enumerative induction. There are such techniques. These are patterns of reasoning identified and catalogued by the 19th century English philosopher, scientist, logician, and politician John Stuart Mill. The inferential forms Mill enumerated have come to be called "Mill's Methods", because he thought of them as tools to be used in the investigation of nature—methods of discovering the causes of natural phenomena. In this section, we will look at Mill's Methods each in turn (there are five of them), using examples to illustrate each. We will finish with a discussion of the limitations of the methods and the difficulty of isolating causes.

The Meaning(s) of 'Cause'

Before we proceed, however, we must issue something of a disclaimer: when we say the one action or event causes another, we don't really know what the hell we're talking about. OK, maybe that's putting it a bit too strongly. The point is this: the meaning of 'cause' has been the subject of intense philosophical debate since ancient times (in both Greece and India)—debate that continues to this day. Myriad philosophical theories have been put forth over the millennia about the nature of causation, and there is no general agreement about just what it is (or whether causes are even real!).

We're not going to wade into those philosophical waters; they're too deep. Instead, we'll

²Setting aside Hume's philosophical skepticism about our ability to know that one thing causes another and about the conclusiveness of inductive reasoning.

merely dip our toes in, by making a preliminary observation about the word ‘cause’—an observation that gives some hint as to why it’s been the subject of so much philosophical deliberation for so long. The observation is this: there are a number of distinct, but perfectly acceptable ways that we use the word ‘cause’ in everyday language. We attach different incompatible meanings to the term in different contexts.

Consider this scenario: I’m in my backyard vegetable garden with my younger daughter (age 4 at the time). She’s “helping” me in my labors by watering some of the plants.³ She asks, “Daddy, why do we have to water the plants?” I might reply, “We do that because water causes the plants to grow.” This is a perfectly ordinary claim about cause and effect; it is uncontroversial and true. What do I mean by ‘causes’ in this sentence? I mean that water is a necessary condition for the plants to grow. Without water, there will be no growth. It is not a sufficient condition for plantgrowth, though: you also need sunlight, good soil, etc.

Consider another completely ordinary, uncontroversial truth about causation: decapitation causes death. What do I mean by ‘causes’ in this sentence? I mean that decapitation is a sufficient condition for death. If death is the result you’re after, decapitation will do the trick on its own; nothing else is needed. It is not (thank goodness) a necessary condition for death, however. There are lots of other ways to die besides beheading.

Finally, consider this true claim: smoking causes cancer. What do I mean by ‘causes’ in this sentence? Well, I don’t mean that smoking is a sufficient condition for cancer. Lots of people smoke all their lives but are lucky enough not to get cancer. Moreover, I don’t mean that smoking is a necessary condition for cancer. Lots of people get cancer—even lung cancer—despite having never smoked. Rather, what I mean is that smoking tends to produce cancer, that it increases the probability that one will get cancer.

So, we have three totally ordinary uses of the word ‘cause’, with three completely different meanings: cause as necessary condition, sufficient condition, and mere tendency (neither necessary nor sufficient). These are incompatible, but all acceptable in their contexts. We could go on to list even more uses for the term, but the point has been made. Causation is a slippery concept, which is why philosophers have been struggling for so long to capture its precise meaning. In what follows, we will set aside these concerns and speak about cause and effect without hedging or disclaimers, but it’s useful to keep in mind that doing so papers over some deep and difficult philosophical problems.

³Those who have ever employed a 4-year-old to facilitate a labor-intensive project will understand the scare quotes.

Mill's Methods

John Stuart Mill identified five different patterns of reasoning that one could use to discover causes. These are argument forms, the conclusions of which involve a claim to the effect that one thing causes (or is causally related to) another. They can be used alone or in combination, depending on the circumstances. As was the case with analogical reasoning, these are patterns of inference that we already employ unreflectively in everyday life. The benefit in making them explicit and subjecting them to critical scrutiny is that we thereby achieve a metacognitive perspective—a perspective from which we can become more self-aware, effective reasoners. This is especially important in the context of causal reasoning, since, as we shall see, there are many pitfalls in this domain that we are prone to fall into, many common errors that people make when thinking about cause and effect.

Method of Agreement I've been suffering from heartburn recently. Seems like at least two or three days a week, by about dinnertime, I've got that horrible feeling of indigestion in my chest and that yucky taste in my mouth. Acid reflux: ugh. I've got to do something about this. What could be causing my heartburn, I wonder? I know that the things you eat and drink are typical causes of the condition, so I start thinking back, looking at what I've consumed on the days when I felt bad. As I recall, all of the recent days on which I suffered heartburn were different in various ways: my dinners ranged from falafel to spaghetti to spicy burritos; sometimes I had a big lunch, sometimes very little; on some days I drank a lot of coffee at breakfast, but other days not any at all. But now that I think about it, one thing stands out: I've been in a nostalgic mood lately, thinking about the good old days, when I was a carefree college student. I've been listening to lots of music from that time, watching old movies, etc. And as part of that trip down memory lane, I've re-acquired a taste for one of my favorite beverages from that era—Mountain Dew. I've been treating myself to a nice bottle of the stuff with lunch now and again. And sure enough, each of the days that I got heartburn was a day when I drank Mountain Dew at lunch. Huh. I guess the Mountain Dew is causing my heartburn. I better stop drinking it.

This little story is an instance of Mill's Method of Agreement. It's a pattern of reasoning that one can use to figure out the cause of some phenomenon of interest. In this case, the phenomenon I want to discover the cause of is my recent episodes of heartburn. I eventually figure out that the cause is Mountain Dew. We could sum up the reasoning pattern abstractly thus:

We want to find the cause of a phenomenon, call it X. We examine a variety of

circumstances in which X occurs, looking for potential causes. The circumstances differ in various ways, but they each have in common that they feature the same potential cause, call it A. We conclude that A causes X.

Each of the past circumstances agrees with the others in the sense that they all feature the same potential cause—hence, the Method of Agreement. In the story above, the phenomenon X that I wanted to find the cause of was heartburn; the various circumstances were the days on which I had suffered that condition, and they varied with respect to potential causes (foods and beverages consumed); however, they all agreed in featuring Mountain Dew, which is the factor A causing the heartburn, X.

More simply, we can sum up the Method of Agreement as a simple question:

What causal factor is present whenever the phenomenon of interest is present?

In the case of our little story, Mountain Dew was present whenever heartburn was present, so we concluded that it was the cause.

Method of Difference Everybody in my house has a rash! Itchy skin, little red bumps; it's annoying. It's not just the grownups—me and my wife—but the kids, too. Even the dog has been scratching herself constantly! What could possibly be causing our discomfort? My wife and I brainstorm, and she remembers that she recently changed brands of laundry detergent. Maybe that's it. So we re-wash all the laundry (including the pillow that the dog sleeps on in the windowsill) in the old detergent and wait. Sure enough, within a day or two, everybody's rash is gone. Sweet relief!

This story presents an instance of Mill's Method of Difference. Again, we use this pattern of reasoning to discover the cause of some phenomenon that interests us—in this case, the rash we all have. We end up discovering that the cause is the new laundry detergent. We isolated this cause by removing that factor and seeing what happened. We can sum up the pattern of reasoning abstractly thus:

We want to find the cause of a phenomenon, call it X. We examine a variety of circumstances in which X occurs, looking for potential causes. The circumstances differ in various ways, but they each have in common that when we remove from them a potential cause—call it A—the phenomenon disappears. We conclude that A causes X.

If we introduce the same difference in all of the circumstances—removing the causal factor—we see the same effect—disappearance of the phenomenon. Hence, the Method of Difference. In our story, the phenomenon we wanted to explain, X, was the rash. The varying circumstances are the different inhabitants of my house—Mom, Dad, kids, even the dog—and the different factors affecting them. The factor that we removed from each, A, was the new laundry detergent. When we did that, the rash went away, so the detergent was the cause of the rash—A caused X.

More simply, we can sum up the Method of Difference as a simple question:

What causal factor is absent whenever the phenomenon of interest is absent?

In the case of our little story, when the detergent was absent, so too was the rash. We concluded that the detergent caused the rash.

Joint Method of Agreement and Difference This isn't really a new method at all. It's just a combination of the first two. The Methods of Agreement and Difference are complementary; each can serve as a check on the other. Using them in combination is an extremely effective way to isolate causes.

The Joint Method is an important tool in medical research. It's the pattern of reasoning used in what we call controlled studies. In such a study, we split our subjects into two groups, one of which is the "control" group. An example shows how this works. Suppose I've formulated a pill that I think is a miracle cure for baldness. I'm gonna be rich! But first, I need to see if it really works. So I gather a bunch of bald men together for a controlled study. One group gets the actual drug; the other, control group, gets a sugar pill—not the real drug at all, but a mere placebo. Then I wait and see what happens. If my drug is as good as I think it is, two things will happen: first, the group that got the drug will grow new hair; and second, the group that got the placebo won't grow new hair. If either of these things fails to happen, it's back to the drawing board. Obviously, if the group that got the drug didn't get any new hair, my baldness cure is a dud. But in addition, if the group that got the mere placebo grew new hair, then something else besides my drug has to be the cause.

Both the Method of Agreement and the Method of Difference are being used in a controlled study. I'm using the Method of Agreement on the group that got the drug. I'm hoping that whenever the causal factor (my miracle pill) is present, so too will be the phenomenon of interest (hair growth). The control group complements this with the Method of Difference. For them, I'm hoping that whenever the causal factor (the miracle pill) is

absent, so too will be the phenomenon of interest (hair growth). If both things happen, I've got strong confirmation that my drug causes hair growth. (Now all I have to do is figure out how to spend all my money!)

Method of Residues I'm running a business. Let's call it LogiCorp. For a modest fee, the highly trained logicians at LogiCorp will evaluate all of your deductive arguments, issuing Certificates of Validity (or Invalidity) that are legally binding in all fifty states. Satisfaction guaranteed. Anyway, as should be obvious from that brief description of the business model, LogiCorp is a highly profitable enterprise. But last year's results were disappointing. Profits were down 20% from the year before. Some of this was expected. We undertook a renovation of the LogiCorp World Headquarters that year, and the cost had an effect on our bottom line: half of the lost profits, 10%, can be chalked up to the renovation expenses. Also, as healthcare costs continue to rise, we had to spend additional money on our employees' benefits packages; these expenditures account for an additional 3% profit shortfall. Finally, another portion of the drop in profits can be explained by the entry of a competitor into the marketplace. The upstart firm Arguments R Us, with its fast turnaround times and ultra-cheap prices, has been cutting into our market share. Their services are totally inferior to ours (you should see the shoddy shading technique in their Venn Diagrams!) and LogiCorp will crush them eventually, but for now they're hurting our business: competition from Arguments R Us accounts for a 5% drop in our profits.

As CEO, I was of course aware of all these potential problems throughout the year, so when I looked at the numbers at the end, I wasn't surprised. But, when I added up the contributions from the three factors I knew about—10% from the renovation, 3% from the healthcare expenditures, 5% from outside competition—I came up short. Those causes only account for an 18% shortfall in profit, but we were down 20% on the year; there was an extra 2% shortfall that I couldn't explain. I'm a suspicious guy, so I hired an outside security firm to monitor the activities of various highly placed employees at my firm. And I'm glad I did! Turns out my Chief Financial Officer had been taking lavish weekend vacations to Las Vegas and charging his expenses to the company credit card. His thievery surely accounts for the extra 2%. I immediately fired the jerk. (Maybe he can get a job with Arguments R Us.)

This little story presents an instance of Mill's Method of Residues. 'Residue' in this context just means the remainder, that which is left over. The pattern of reasoning, put abstractly, runs something like this:

We observe a series of phenomena, call them X_1 , X_2 , X_3 , ..., X_n . As a matter of

background knowledge, we know that X_1 is caused by A_1 , that X_2 is caused by A_2 , and so on. But when we exhaust our background knowledge of the causes of phenomena, we're left with one, X_n , that is inexplicable in those terms. So we must seek out an additional causal factor, A_n , as the cause of X_n .

The leftover phenomenon, X_n , inexplicable in terms of our background knowledge, is the residue. In our story, that was the additional 2% profit shortfall that couldn't be explained in terms of the causal factors we were already aware of, namely the headquarters renovation (A_1 , which caused X_1 , a 10% shortfall), the healthcare expenses (A_2 , which caused X_2 , a 3% shortfall), and the competition from Arguments R Us (A_3 , which caused X_3 , a 5% shortfall). We had to search for another, previously unknown cause for the final, residual 2%.

Method of Concomitant Variation Fact: if you're a person who currently maintains a fairly steady weight, and you change nothing else about your lifestyle, adding 500 calories per day to your diet will cause you to gain weight. Conversely, if you cut 500 calories per day from your diet, you would lose weight. That is, calorie consumption and weight are causally related: consuming more will cause weight gain; consuming less will cause weight loss.

Another fact: if you're a person who currently maintains a steady weight, and you change nothing else about your lifestyle, adding an hour of vigorous exercise per day to your routine will cause you to lose weight. Conversely, (assuming you already exercise a heck of a lot), cutting that amount of exercise from your routine will cause you to gain weight. That is, exercise and weight are causally related: exercising more will cause weight loss; exercising less will cause weight gain.

(These are revolutionary insights, I know. My next get-rich-quick scheme is to popularize one of those fad diets. Instead of recommending eating nothing but bacon or drinking nothing but smoothies made of kale and yogurt, my fad diet will be the "Eat Less, Move More" plan. I'm gonna be rich!)

I know about the cause-and-effect relationships above because of the Method of Concomitant Variation. Put abstractly, this pattern of reasoning goes something like this:

We observe that, holding other factors constant, an increase or decrease in some causal factor A is always accompanied by a corresponding increase or decrease in some phenomenon X . We conclude that A and X are causally related.

Things that "vary concomitantly" are things, to put it more simply, that change together. As A changes—goes up or down— X changes, too. There are two ways things can vary concomitantly: directly or inversely. If A and X vary directly, that means that an increase in one

will be accompanied by an increase in the other (and a decrease in one will be accompanied by a decrease in the other); if A and X vary inversely, that means an increase in one will be accompanied by a decrease in the other.

In our first example, calorie consumption (A) and weight (X) vary directly. As calorie consumption increases, weight increases; and as calorie consumption decreases, weight decreases. In our second example, exercise (A) and weight (X) vary inversely. As exercise increases, weight decreases; and as exercise decreases, weight increases.

Either way, when things change together in this way, when they vary concomitantly, we conclude that they are causally related.

The Difficulty of Isolating Causes

Mill's Methods are useful in discovering the causes of phenomena in the world, but their usefulness should not be overstated. Unless they are employed thoughtfully, they can lead an investigator astray. A classic example of this is the parable of the drunken logician.⁴ After a long day at work on a Monday, a certain logician heads home wanting to unwind. So he mixes himself a "7 and 7"—Seagram's 7 Crown whiskey and 7-Up. It tastes so good, he makes another—and another, and another. He drinks seven of these cocktails, passes out in his clothes, and wakes up feeling terrible (headache, nausea, etc.). On Tuesday, after dragging himself into work, toughing it through the day, then finally getting home, he decides to take the edge off with a different drink: brandy and 7-Up. He gets carried away again, and ends up drinking seven of these cocktails, with the same result: passing out in his clothes and waking up feeling awful on Wednesday. So, on Wednesday night, our logician decides to mix things up again: scotch and 7-Up. He drinks seven of these; same results. But he perseveres: Thursday night, it's seven vodka and 7-Ups; another blistering hangover on Friday. So on Friday at work, he sits down to figure out what's going on. He's got a phenomenon—hangover symptoms every morning of that week—that he wants to discover the cause of. He's a professional logician, intimately familiar with Mill's Methods, so he figures he ought to be able to discover the cause. He looks back at the week and uses the Method of Agreement, asking, "What factor was present every time the phenomenon was?" He concludes that the cause of his hangovers is 7-Up.

Our drunken logician applied the Method of Agreement correctly: 7-Up was indeed present every time. But it clearly wasn't the cause of his hangovers. The lesson is that Mill's Methods are useful tools for discovering causes, but their results are not always definitive.

⁴Inspired by Copi and Cohen, p. 547.

Uncritical application of the methods can lead one astray. This is especially true of the Method of Concomitant Variation. You may have heard the old saw that “correlation does not imply causation.” It’s useful to keep this corrective in mind when using the Method of Concomitant Variation. That two things vary concomitantly is a hint that they may be causally related, but it is not definitive proof that they are. They may be separate effects of a different, unknown cause; they may be completely causally unrelated. It is true, for example, that among children, shoe size and reading ability vary directly: children with bigger feet are better readers than those with smaller feet. Wow! So large feet cause better reading? Of course not. Larger feet and better reading ability are both effects of the same cause: getting older. Older kids wear bigger shoes than younger kids, and they also do better on reading tests. Duh. It is also true, for example, that hospital quality and death rate vary directly: that is, the higher quality the hospital (prestige of doctors, training of staff, sophistication of equipment, etc.), on average, the higher the death rate at that hospital. That’s counterintuitive! Does that mean that high hospital quality causes high death rates? Of course not. Better hospitals have higher mortality rates because the extremely sick, most badly injured patients are taken to those hospitals, rather than the ones with lower-quality staff and equipment. Alas, these people die more often, but not because they’re at a good hospital; it’s exactly the reverse.

Spurious correlations—those that don’t involve any causal connection at all—are easy to find in the age of “big data.” With publicly available databases archiving large amounts of data, and computers with the processing power to search them and look for correlations, it is possible to find many examples of phenomena that vary concomitantly but are obviously not causally connected. A very clever person named Tyler Vigen set about doing this and created a website where he posted his (often very amusing) discoveries.⁵ For example, he found that between 2000 and 2009, per capita cheese consumption among Americans was very closely correlated with the number of deaths caused by people becoming entangled in their bedsheets:

These two phenomena vary directly, but it’s hard to imagine how they could be causally related. It’s even more difficult to imagine how the following two phenomena could be causally related:

So, Mill’s Methods can’t just be applied willy-nilly; one could end up “discovering” causal connections where none exist. They can provide clues as to potential causal relationships,

⁵<http://tylervigen.com/spurious-correlations>. The site has a tool that allows the user to search for correlations. It’s a really amusing way to kill some time.

but care and critical analysis are required to confirm those results. It's important to keep in mind that the various methods can work in concert, providing a check on each other. If the drunken logician, for example, had applied the Method of Difference—removing the 7-Up but keeping everything else the same—he would have discovered his error (he would've kept getting hangovers). The combination of the Methods of Agreement and Difference—the Joint Method, the controlled study—is an invaluable tool in modern scientific research. A properly conducted controlled study can provide quite convincing evidence of causal connections (or a lack thereof).

Of course, properly conducting a controlled study is not as easy as it sounds. It involves more than just the application of the Joint Method of Agreement and Difference. There are other potentially confounding factors that must be accounted for in order for such a study to yield reliable results. For example, it's important to take great care in separating subjects into the test and control groups: there can be no systematic difference between the two groups other than the factor that we're testing; if there is, we cannot say whether the factor we're testing or the difference between the groups is the cause of any effects observed. Suppose we were conducting a study to determine whether or not vitamin C was effective in treating the common cold.⁶ We gather 100 subjects experiencing the onset of cold symptoms. We want one group of 50 to get vitamin C supplements, and one group of 50—the control group—not to receive them. How do we decide who gets placed into which group? We could ask for volunteers. But doing so might create a systematic difference between the two groups. People who hear “vitamin C” and think, “yeah, that's the group for me” might be people who are more inclined to eat fruits and vegetables, for example, and might therefore be healthier on average than people who are turned off by the idea of receiving vitamin C supplements. This difference between the groups might lead to different results between the how their colds progress. Instead of asking for volunteers, we might just assign the first 50 people who show up to the vitamin C group, and the last 50 to the control group. But this could lead to differences, as well. The people who show up earlier might be early-risers, who might be healthier on average than those who straggle in late.

The best way to avoid systematic differences between test and control groups is to randomly assign subjects to each. We refer to studies conducted this way as randomized controlled studies. And besides randomization, other measures can be taken to improve reliability. The best kinds of controlled studies are “double-blind”. This means that neither the subjects nor the people conducting the study know which group is the control and which

⁶Despite widespread belief that it is, researchers have found very little evidence to support this claim.

group is receiving the actual treatment. (This information is hidden from the researchers only while the study is ongoing; they are told later, of course, so they can interpret the results.) This measure is necessary because of the psychological tendency for people's observations to be biased based on their expectations. For example, if the control group in our vitamin C experiment knew they were not getting any treatment for their colds, they might be more inclined to report that they weren't feeling any better. Conversely, if the members of the group receiving the vitamin supplements knew that they were getting treated, they might be more inclined to report that their symptoms weren't as bad. This is why the usual practice is to keep subjects in the dark about which group they're in, giving a placebo to the members of the control group. It's important to keep the people conducting the study "blind" for the same reasons. If they knew which group was which, they might be more inclined to observe improvement in the test group and a lack of improvement in the control group. In addition, in their interactions with the subjects, they may unknowingly give away information about which group was which via subconscious signals.

Hence, the gold standard for medical research (and other fields) is the double-blind controlled study. It's not always possible to create those conditions—sometimes the best doctors can do is to use the Method of Agreement and merely note commonalities amongst a group of patients suffering from the same condition, for example—but the most reliable results come from such tests. Discovering causes is hard in many contexts. Mill's Methods are a useful starting point, and they accurately model the underlying inference patterns involved in such research, but in practice they must be supplemented with additional measures and analytical rigor in order to yield definitive results. They can give us clues about causes, but they aren't definitive evidence. Remember, these are inductive, not deductive arguments.

EXERCISES

1. What is meant by the word 'cause' in the following—necessary condition, sufficient condition, or mere tendency?
 - (a) (a) Throwing a brick through a window causes it to break.
 - (b) (b) Slavery caused the American Civil War.
 - (c) (c) Exposure to the cold causes frostbite.
 - (d) (d) Running causes knee injuries.
 - (e) (e) Closing your eyes causes you not to be able to see.

2. Consider the following scenario and answer the questions about it:

- Alfonse, Bertram, Claire, Dominic, Ernesto, and Francine all go out to dinner at a local greasy spoon. There are six items on the menu: shrimp cocktail, mushroom/barley soup, burger, fries, steamed carrots, and ice cream. This is what they ate:
- Alfonse: shrimp, soup, fries
- Bertram: burger, fries, carrots, ice cream
- Claire: soup, burger, fries, carrots
- Dominic: shrimp, soup, fries, ice cream
- Ernesto: burger, fries, carrots
- Francine: ice cream
- That night, Alfonse, Claire, and Dominic all came down with a wicked case of food poisoning. The others felt fine.

- (a) (a) Using only the Method of Agreement, how far can we narrow down the list of possible causes for the food poisoning?
- (b) (b) Using only the Method of Difference, how far can we narrow down the list of possible causes for the food poisoning?
- (c) (c) Using the Joint Method, we can identify the cause. What is it?

3. For each of the following, identify which of Mill's Methods is being used to draw the causal conclusion.

- (a) (a) A farmer noticed a marked increase in crop yields for the season. He started using a new and improved fertilizer that year, and the weather was particularly ideal—just enough rain and sunshine. Nevertheless, the increase was greater than could be explained by these factors. So he looked into it and discovered that his fields had been colonized by hedgehogs, who prey on the kinds of insect pests that usually eat crops.
- (b) (b) I've been looking for ways to improve the flavor of my vegan chili. I read on a website that adding soy sauce can help: it has lots of umami flavor, and that can help compensate for the lack of meat. So the other day, I made two batches

of my chili, one using my usual recipe, and the other made exactly the same way, except for the addition of soy sauce. I invited a bunch of friends over for a blind taste test, and sure enough, the chili with the soy sauce was the overwhelming favorite!

- (c) (c) The mere presence of guns in circulation can lead to higher murder rates. The data are clear on this. In countries with higher numbers of guns per capita, the murder rate is higher; and in countries with lower numbers of guns per capita, the murder rate is correspondingly lower.
- (d) (d) There's a simple way to end mass shootings: outlaw semiautomatic weapons. In 1996, Australia suffered the worst mass shooting episode in its history, when a man in Tasmania used two semiautomatic rifles to kill 35 people (and wound an additional 19). The Australian government responded by making such weapons illegal. There hasn't been a mass shooting in Australia since.
- (e) (e) A pediatric oncologist was faced with a number of cases of childhood leukemia over a short period of time. Puzzled, he conducted thorough examinations of all the children, and also compared their living situations. He was surprised to discover that all of the children lived in houses that were located very close to high-voltage power lines. He concluded that exposure to electromagnetic fields causes cancer.
- (f) (f) Many people are touting the benefits of the so-called "Mediterranean" diet because it apparently lowers the risk of heart disease. Residents of countries like Italy and Greece, for example, consume large amounts of vegetables and olive oil and suffer from heart problems at a much lower rate than Americans.
- (g) (g) My daughter came down with what appeared to be a run-of-the-mill case of the flu: fever, chills, congestion, sore throat. But it was a little weird. She was also experiencing really intense headaches and an extreme sensitivity to light. Those symptoms struck me as atypical of mere influenza, so I took her to the doctor. It's a good thing I did! It turns out she had a case of bacterial meningitis, which is so serious that it can cause brain damage if not treated early. Luckily, we caught it in time and she's doing fine.

Chapter 6

Chapter 6

Chapter 7

Chapter 7

Chapter 8

Chapter 8

Chapter 9

Chapter X

Chapter 10

Chapter X

Chapter 11

Chapter X

Chapter 12

Chapter X