THREE

Arguments Good, Bad, and Weird

THE CENTRAL FOCUS of critical thinking is the formulation and evaluation of arguments—and this is true whether the subject matter is ordinary or as weird as can be. Usually when we are doing critical thinking, we are trying either to devise arguments or to assess them. We are trying either (1) to *demonstrate* that a claim, or proposition, is true or (2) to *determine* whether in fact a claim is true. In either case, if we are successful, we are likely to increase our knowledge and expand our understanding—which is, after all, the main reason we use critical thinking in the first place.

So in this chapter, we discuss the skills you need to make sense of arguments—to identify arguments in different contexts, to distinguish arguments from nonarguments, to evaluate the worth of arguments, and to avoid the entanglements of bad arguments.

CLAIMS AND ARGUMENTS

Logical consequences are the scarecrows of fools and the beacons of wise men.

—THOMAS HENRY HUXLEY

As noted earlier, we are entitled to believe a claim when we have good reasons to believe it. The reasons for accepting a claim are themselves stated as claims. This combination of claims—a claim (or claims) supposedly giving reasons for accepting another claim—is known as an *argument.* Or to put it another way, when claims (reasons) provide support for another claim, we have an argument.

People sometimes use the word *argument* to refer to a quarrel or verbal fight. But this meaning has little to do with critical thinking. In critical thinking, an argument is as defined above—reasons supporting a claim.

To be more precise, claims (or reasons) intended to support another claim are known as *premises.* The claim that the premises are intended to support is known as the *conclusion.* Take a look at these simple arguments:

1. *My instructor says that ghosts are real. Therefore, ghosts are real.*
2. *Because the former tenants ran out of the house screaming, and they begged a priest to perform an exorcism on the property, the house is obviously possessed.*
3. *When Julio reads about weird things, he always gets the shakes. Since he's reading about weird things now, he will get the shakes.*
4. *All men are mortal. Socrates is a man. Therefore, Socrates is mortal.*
5. *Fifty percent of the students in this class are Republicans. Therefore, 50 percent of all students at this college are Republicans.*

In each of these five arguments, can you distinguish the premises from the conclusion? Try picking out the conclusions of each one, then look for the premises. Here are the arguments again with their parts labeled:

1. [Premise] *My instructor says that ghosts are real.* [Conclusion] *Therefore, ghosts are real.*
2. [Premise] *Because the former tenants ran out of the house screaming, and* [Premise] *they begged a priest to perform an exorcism on the property,* [Conclusion] *the house is obviously possessed.*
3. [Premise] *When Julio reads about weird things, he always gets the shakes.* [Premise] *Since he's reading about weird things now,* [Conclusion] *he will get the shakes.*
4. [Premise] *All men are mortal.* [Premise] *Socrates is a man.* [Conclusion] *Therefore, Socrates is mortal.*
5. [Premise] *Fifty percent of the students in this class are Republicans.* [Conclusion] *Therefore, 50 percent of all students at this college are Republicans.*

Now consider this passage:

> *The house has been there for a hundred years, and it's pretty spooky. Some people claim that they've seen someone or something moving about inside the house at night. John said that he would never go in there.*

Can you find an argument in this passage? We hope not because there is no argument there. The passage consists of three descriptive claims, but they are not supporting a conclusion. With a little tinkering, though, we can turn this passage into an argument. For example:

> *There is no doubt that the house is haunted because it has been there for a hundred years, it's really spooky, and even John—who is normally very brave—refuses to go anywhere near the house.*

Logic is logic. That's all I say.

—Oliver Wendell Holmes

Now we have an argument. The conclusion is "There is no doubt that the house is haunted," and there are three premises: (1) "[the house] has been there for a hundred years," (2) "it's really spooky," and (3) "John—who is normally very brave—refuses to go anywhere near the house."

Some people think that if they simply state their views on an issue, they have presented an argument. But a string of statements asserting or clarifying their views does not an argument make. Consider this passage:

> *I think that abortion is wrong. I have always believed that and always will. Those who favor abortion on demand are just plain wrong. In fact, those who favor any kind of abortion for any reason are wrong. They may be sincere in their beliefs, and they may have the Supreme Court on their side, but they're still advocating an immoral act.*

This is not an argument. It is merely a collection of unsupported claims. It offers no reasons for believing that abortion is wrong. It is, however, typical of the expression of views that shows up in what many people call "arguments," which often consist of verbal sparring and pointless cycles of claim and counterclaim. Such exchanges may reveal something about the participants, but they say nothing about the grounds for believing something.

You should also keep in mind the distinction between argument and persuasion: They are not the same thing. Through various persuasive ploys—fancy rhetoric, emotional appeals, deception, coercion, and more—you may be able to influence people to accept a conclusion. But if you do, you will not have shown that the conclusion is worthy of acceptance, that there are good reasons for believing it. Of course, a good argument, in addition to presenting solid grounds for accepting a claim, can also be psychologically forceful. But these two approaches to claims should not be confused.

Unfortunately, there is no 100-percent-reliable formula for distinguishing arguments from nonarguments. There are, however, some ways to make the job easier. One technique is to look for *indicator words*—terms that often accompany arguments and signal that a conclusion or premise is nearby. For example, in the haunted house argument above, notice that the word *because* alerts us to the presence of the premises that follow. In arguments 1, 4, and 5 above, the word *therefore* indicates that a conclusion follows.

Here are some common conclusion indicator words:

thus	hence
so	therefore
consequently	as a result
it follows that	we can conclude that
which means that	which implies that

And here are some common premise indicator words:

since	because
the reason being	in view of the fact
assuming that	given that
for the reason that	as indicated by
for	due to the fact that

Keep in mind that indicator words do not *invariably* point to conclusions or premises. Sometimes indicator words are used when no argument is present. For example: "Julio has been working *since* nine o'clock." Or, "Naomi works here *because* she wants to." Also, occasionally arguments can be stated without the use of any indicator words:

> *Look, there is no doubt that the house is haunted. It has been there for a hundred years, it's really spooky, and even John—who is normally very brave—refuses to go anywhere near the house.*

If the world were a logical place, men would ride side saddle.

—RITA MAE BROWN

The minimum requirement for an argument is at least one premise and a conclusion. This simple structure, though, can have many configurations. First, an argument can have one premise or many. The haunted house argument has three premises, but it could have four, or seven, or more. Second, the conclusion of an argument can appear after the premises (as in arguments 1 through 5) or before the premises (as in the haunted house argument). Third, an argument can be buried in a cluster of other statements that are not part of the argument. These other statements may be questions, exclamations, descriptions, explanations, background information, or something else. The trick is to find the argument that's embedded in the extraneous material.

The easiest way to identify an argument is to *find the conclusion first.* If you first find the conclusion, locating the premises becomes much easier. To find the conclusion, ask yourself, "What claim is the writer or speaker trying to get me to accept?" or "For what claim is the writer or speaker providing reasons?"

An argument can be either good or bad. A good argument demonstrates that the conclusion is worthy of acceptance. A bad argument fails to demonstrate that a conclusion is worthy of acceptance.

There are also different kinds of arguments. Arguments can be either *deductive* or *inductive.* Deductive arguments are intended to provide conclusive support for their conclusions. Inductive arguments are intended to provide probable support for their conclusions. A deductive argument that succeeds in providing conclusive support is said to be *valid.* A deductive argument that fails to provide such support is said to be *invalid.* A valid deductive argument has this characteristic: If its premises are true, its conclusion *must* be true. In other words, it is impossible for a deductively valid argument to have true premises and a false conclusion. Notice that the term *valid* as used here is not a synonym for *true. Valid* refers to a deductive argument's logical structure—it refers to an argument structure that *guarantees* the truth of the conclusion *if* the premises are true. If an argument is valid, we say that the *conclusion follows from the premises.* Because a deductively valid argument guarantees the truth of the conclusion if the premises are true, it is said to be *truth-preserving.*

What danger can ever come from ingenious reasoning and inquiry? The worst speculative skeptic ever I knew was a much better man than the best superstitious devotee and bigot.

—DAVID HUME

Here's a classic deductively valid argument:

All men are mortal.
Socrates is a man.
Therefore, Socrates is mortal.

And here's another one:

If you have scars on your body, then you have been abducted by space aliens. You obviously do have scars on your body. Therefore, you have been abducted by space aliens.

Notice that in each of these, if the premises are true, the conclusion *must* be true. If the premises are true, the conclusion cannot possibly be false. This would be the case regardless of the order of the premises and regardless of whether the conclusion came first or last.

Now here are deductively invalid versions of these arguments:

If Socrates is a dog, he is mortal.
Socrates is not a dog.
Therefore, Socrates is not mortal.

If you have scars on your body, then you have been abducted by space aliens. You have been abducted by space aliens. Therefore, you have scars on your body.

These arguments are invalid. In each, the conclusion does not follow from the premises.

An inductive argument that succeeds in giving probable support to its conclusion is said to be *strong*. An inductive argument that fails to do this is said to be *weak*. In an inductively strong argument, if the premises are true, the conclusion is probably or likely to be true. The logical structure of an inductively strong argument can only render the conclusion probably true if the premises are true. Unlike a deductively valid argument, an inductively strong argument cannot guarantee the truth of the conclusion if the premises are true. The best that an inductively strong argument can do is show that the conclusion is very likely to be true. So inductive arguments are not truth-preserving.

Here are two inductively strong arguments:

All humans have lived less than 200 years.
Socrates is a human.
Therefore, Socrates will probably live less than 200 years.

Mysterious scars on one's body almost always indicate an alien abduction.
You have mysterious scars on your body.
So you have probably been the victim of an alien abduction.

Look at the first inductive argument. Notice that it's possible for the premises to be true and the conclusion false. After all, the first premise says that there is no guarantee that Socrates is mortal just because he's a man. He's only *likely* to be mortal. Also in the second argument, there is no guarantee that you have been abducted by space aliens if you have mysterious scars on your body. If you have mysterious scars on your body, there's still a chance that you have *not* been abducted.

Good arguments must be valid or strong—but they also must have true premises. A good argument is one that has the proper logical structure *and* true premises. Consider this argument:

All dogs can lay eggs.
The prime minister is a dog.
Therefore, the prime minister can lay eggs.

This is a valid argument, but the premises are false. The conclusion follows logically from the premises—even though the premises are false. So the argument is not a good one. A deductively valid argument with true premises is said to be *sound*. A sound argument is a

good argument. A good argument gives you good reasons for accepting the conclusion. Likewise, a good inductive argument must be logically strong and have true premises. An inductively strong argument with true premises is said to be *cogent.* A cogent argument is a good argument, which provides good reasons for accepting the conclusion.

DEDUCTIVE ARGUMENTS

Our reason must be considered as a kind of cause, of which truth is the natural effect.

—DAVID HUME

Whether a deductive argument is valid depends on its form or structure. We can see the form most easily if we represent it by using letters to substitute for the argument's statements. Consider this deductive argument:

1. If the soul is immortal, then thinking doesn't depend on brain activity.
2. The soul is immortal.
3. Therefore, thinking doesn't depend on brain activity.

By using letters to represent each statement, we can symbolize the argument like this:

If p then q.
p.
Therefore, q.

The first line is a compound statement consisting of two constituent statements, each of which is assigned a letter: *p* or q. Such a compound statement is known as a *conditional,* or if-then, *statement.* The statement following the *if* is called the *antecedent,* and the statement after *then* is called the *consequent.* The whole argument is referred to as a conditional argument because it contains at least one conditional statement (If *p* then *q.*).

Conditional arguments are common. In fact, many conditional argument patterns are so common that they have been given names. These prevalent forms are worth getting to know because they can help you quickly judge the validity of arguments you encounter. Since the validity of an argument depends on its form, if you know that a particular common form is always valid (or invalid), then you know that any argument having that same form must also be valid (or invalid).

For example, the argument we just examined is cast in the common form known as *affirming the antecedent,* or *modus ponens.* Any argument in this form is always valid. We may drop whatever statements we please into this form, and the argument will remain unshakably valid—whether or not the premises are true. Now consider this *modus ponens* argument:

1. If one human is made of tin, then every human is made of tin.
2. One human is made of tin.
3. Therefore, every human is made of tin.

The premises and conclusion of this argument are false. Nevertheless, this argument is valid because if the premises were true, then the conclusion would have to be true. A valid argument can have false premises and a false conclusion, false premises and a true conclusion, or true premises and a true conclusion. The one thing it cannot have is true premises and a false conclusion.

Here is another frequently occurring, conditional form:

If p then q.
Not q.
Therefore, not p.

For example:

1. If the soul is immortal, then thinking doesn't depend on brain activity.
2. Thinking does depend on brain activity.
3. Therefore, the soul is not immortal.

This form is known as *denying the consequent,* or *modus tollens.* Any argument patterned in this way—regardless of the topic or truth of the premises—is valid.

A valid, hypothetical form that people often employ to think critically about a series of events is known as *hypothetical syllogism.* (*Hypothetical* is a synonym for *conditional;* a syllogism is simply a deductive argument consisting of two premises and a conclusion.) In this form, every statement is conditional. See:

If p then q.
If q then r.
Therefore, if p then r.

For example:

1. If the floor creaks, someone is standing in the hallway.
2. If someone is standing in the hallway, there's a burglar in the house.
3. Therefore, if the floor creaks, there's a burglar in the house.

As you might expect, some very common argument forms are invalid. This one is known as *denying the antecedent:*

If p then q.
Not p.
Therefore, not q.

1. If Joe is a bachelor, then Joe is a male.
2. Joe is not a bachelor.
3. Therefore, Joe is not a male.

The invalidity of this argument seems obvious. But consider this specimen in the same form:

1. If scientists can prove the existence of ghosts, then ghosts are real.
2. But scientists cannot prove the existence of ghosts.
3. Therefore, ghosts are not real.

The dead giveaway of invalidity here is that it's possible for both premises to be true and the conclusion false. Even if scientists cannot prove the existence of ghosts, that doesn't show that ghosts are not real. Perhaps ghosts exist despite the failure of science to prove it.

Another popular invalid form is *affirming the consequent:*

If p then q.
q.
Therefore, p.

1. If Chicago is the capital of Illinois, then Chicago is in Illinois.
2. Chicago is in Illinois.
3. Therefore, Chicago is the capital of Illinois.

We can see immediately that this argument is invalid because, you will recall, it's impossible for a valid argument to have true premises and a false conclusion—and this argument clearly does have true premises and a false conclusion.

Logic is the armory of reason, furnished with all offensive and defensive weapons.
—THOMAS FULLER

Of course, not all common deductive arguments are conditional. Here's a nonconditional valid form known as *disjunctive syllogism:*

Either p or q.
Not p.
Therefore, q.

1. Either Jill faked the UFO landing or Jack did.
2. Jill did not fake the UFO landing.
3. Therefore, Jack faked the UFO landing.

A statement in the *p*-or-*q* format of premise 1 is called a *disjunction*, and each statement in a disjunction (*p* or *q*) is called a disjunct. In a disjunctive syllogism, either one of the disjuncts can be denied, and the conclusion is that the undenied disjunct must be true.

Being familiar with these six argument forms can come in handy when you're trying to quickly determine the validity of an argument.

If you come across an argument whose structure matches one of the valid forms just discussed, then you know the argument is valid. If the argument has a structure matching one of the invalid forms, then you know it's invalid. Memorizing these common forms can help make your comparison of argument patterns more efficient.

Another technique for assessing the validity of deductive arguments is known as the *counterexample method*. This approach is based on the aforementioned impossibility of a valid argument having true premises and a false conclusion. So to determine the validity of an argument (called the test argument), you try to construct a corresponding argument having *the same form as the test argument* but with unquestionably *true premises and a false conclusion*. Successfully constructing such an argument shows that the test argument is not valid.

Suppose this is your test argument:

1. If Ester could bend spoons with her mind, then she would be an extraordinary person.
2. Ester cannot bend spoons with her mind.
3. Therefore, Ester is not an extraordinary person.

To check for validity, you invent this corresponding argument:

1. If dogs could lay eggs, then they would be useful to humans.
2. Dogs cannot lay eggs.
3. Therefore, dogs are not useful to humans.

This argument and the test argument have exactly the same form (which you probably already see is denying the antecedent). This one, however, has true premises and a false conclusion. So it's invalid, and so is the test argument.

INDUCTIVE ARGUMENTS

Even though inductive arguments are not valid, they can still give us good reasons for believing their conclusions provided that certain conditions are met. To get a better idea of what constitutes a strong inductive argument, let's examine some common forms of induction.

Enumerative Induction

Enumerative induction is the sort of reasoning we use when we arrive at a generalization about a group of things after observing only some members of that group. The premise of a typical enumerative induction is a statement reporting what percentage of the observed members of a group have a particular property. The conclusion is a statement

claiming that a certain percentage of the members of the whole group have that property.

In enumerative induction, we might reason that

> Most of the meals you've had down at Joe's Diner have been terrible. So all the meals served at Joe's are probably terrible.
>
> Sixty percent of the apples from the barrel have been tasty. Therefore, 60 percent of all the apples in the barrel are tasty.
>
> Half of the people you've met at the convention are Lutherans, so probably half of all the people at the convention are Lutherans.

Thus, enumerative induction has the following form:

> *X percent of the observed members of group A have property P.*
> *Therefore, X percent of all the members of group A have property P.*

Some technical terms will help here. The group under study—the entire class of individuals we're interested in—is known as the *target group*. The observed members of the target group are the *sample,* and the characteristic we're studying is the *relevant property*. In enumerative induction, then, we draw a conclusion about the relevant property (or properties) in the target group from observations of the relevant property in the sample. In the example about apples, the target group is the apples in the barrel, the sample is the observed apples, and the relevant property is tastiness.

As with any kind of induction, an enumerative inductive argument is good only if it is strong and its premises are true. To be strong, it must score well on two counts: (1) sample size and (2) sample representativeness. Consider this example:

> *Three of the four students Julio encountered in the quad were Democrats.*
> *Therefore, three-fourths of the students at this college are probably Democrats.*

This argument is, of course, weak. We cannot draw a reliable conclusion about the political affiliation of all the students at the college (which we may assume has hundreds or thousands of students) based solely on a fact about four of them. With a sample of four students, we may reasonably conclude that *some* students at the college are Democrats, but that's as far as we can go.

Using an inadequate sample size to draw a conclusion about a target group is a common mistake, a fallacy called *hasty generalization* (discussed later in the chapter). You would commit this error if you claimed that Chevrolets are rotten cars because you used to own one that was a lemon, or if you decided that all biology majors are boring because the last three you met were, or if you concluded that members

of a race different from your own were dishonest because you saw two of them cheat on a test.

But how large a sample is large enough? Generally, the larger the sample, the more reliably it signifies the nature of the target group. But sometimes even small samples can be telling. One guiding principle is that the more homogeneous a target group is in characteristics relevant to the property being studied, the smaller the sample needs to be. We would require, for example, a very small sample of mallard ducks to determine whether they all have bills, because the physical properties of mallard ducks vary little throughout the species. But if we want to know the buying habits of Canadians, we would need to survey a much larger sample—hundreds or thousands of Canadians. People differ dramatically in their social or psychological properties, so surveying a handful of them to generalize about thousands or millions is usually pointless.

Samples must not only be the right size, but also representative—that is, they must be like the target group in all the relevant ways. A sample that is not properly representative of the target group is known as a *biased sample.* Biased samples make weak arguments. To reliably generalize about the paranormal beliefs of New Yorkers, we should not have our sample consist entirely of members of the local occult club. The members' views on the paranormal are not likely to be representative of those of New Yorkers generally. To draw a trustworthy conclusion about water pollution in Lake X, we should not draw all the water samples from the part of the lake polluted by the factory. That area is not representative of the lake as a whole.

A sample is properly representative of the target group if it possesses the same relevant characteristics in the same proportions exhibited by the target group. A characteristic is relevant if it can affect the relevant property. Suppose you want to conduct a survey to find out whether adult Hispanics believe in ghosts. Characteristics that might affect adult Hispanics' belief in ghosts include religion, income, occupation, and education level. These relevant characteristics therefore should be included in your sample, and they should be present in the same proportions found in the target group, adult Hispanics. This means, for example, that if 60 percent of Hispanics are college graduates, then your sample should reflect that—60 percent of the sample should be college graduates.

As you may have guessed, enumerative inductions are the basis for opinion polls, those ubiquitous surveys that describe public attitudes about elections, political issues, moral debates, and consumer preferences. Like any enumerative induction, opinion polls reckon from samples to general conclusions about target groups. To be credible,

they must use properly sized samples representative of the target group in all relevant respects. Good opinion polls must also be well conducted so they generate accurate data—numbers that truthfully describe what they claim to describe. They can fail to generate accurate data because of mathematical errors, poorly phrased questions, faulty survey design, sampling errors, and other problems. All of which means that an opinion poll can work from a properly sized, representative sample and still be a weak inductive argument.

National polling organizations have perfected techniques for generating representative samples of large target groups—all American adults, for example. Because of modern sampling procedures, these samples can contain fewer than 2,000 individuals (representing about 200 million people). Such small representative samples are possible through *random sampling*. This technique is based on the fact that the best way to devise a genuinely representative sample is to select the sample from the target group randomly. Random selection is assured if every member of the target group has an equal chance of being chosen for the sample. Selecting sample members nonrandomly produces a biased sample.

We are frequently exposed to polls created through nonrandom sampling. Many are nonrandom because they use *self-selecting samples*. Suppose a Web site or TV show asks people to respond to a simple question—for example, "Do you believe that concealed weapons should be banned from college campuses?" In this case, pollsters would not randomly select the respondents; respondents would nonrandomly select themselves for all sorts of irrelevant reasons. The sample would be biased in favor of, say, people who have political views encouraged by the Web site or program, who like expressing their opinions on particular issues (or any issue), or who just happen to be online or watching TV when the question is posed. These organizations will often admit that their self-selecting surveys are unreliable, declaring (sometimes in small print) that the polls are "unscientific."

Even the best of opinion polls cannot guarantee 100 percent reliability—that their random, properly sized sample will precisely reflect the views of the larger target group. No matter how careful pollsters are, their sampling can only approach the values they would get if they surveyed every member of the target group. This discrepancy between the poll results and the ideal results is known as the *margin of error*. An honest poll is explicit about its margin of error—stating, for example, that the proportion of adult Americans who favor gun control is 77 percent, plus or minus 4 points (typically expressed as 77 percent $\pm$ 4). This translates as "the percentage of adult Americans who favor gun control is between 73 and 81 percent." Because of the

margin of error, small differences between two poll numbers (for example, percentages of people who intend to vote for a particular presidential candidate) mean little. So if the margin of error is ± 3 points, there is no notable difference between candidate A with 43 percent of the vote and candidate B with 45 percent—though political commentators may want us to believe that candidate B is winning.

Opinion polls can be unreliable and misleading because of how the polling questions are phrased, who asks them, or how they are asked. Question phrasing is especially important. Think how easy it would be to get a large percentage of people in a sample to answer no to a question like "Are you in favor of negating the constitutional right of citizens to bear arms by passing gun-control laws?" Or "Are you in favor of destroying innocent human life by funding stem-cell research?" Such questions are not designed to objectively gauge opinions on an issue—they're meant to prod the respondent to give a particular answer. Good pollsters try to use more neutral wording that will accurately and fairly measure attitudes. Pollsters bent on advocacy will ask their questions accordingly. Sometimes pollsters create biased questions accidentally, but probably more often the slanting is deliberate.

Analogical Induction

When we show how one thing is similar to another, we draw an analogy between them. When we claim that two things that are similar in some respects are similar in some further respect, we make an analogical induction. For example, before the various missions to Mars, NASA scientists may have argued as follows: The Earth has air, water, and life. Mars is like the Earth in that it has air and water. Therefore, it's probable that Mars has life. The form of such analogical inductions can be represented as follows:

Object A has properties F, G, H, etc., as well as the property Z.
Object B has properties F, G, H, etc.
Therefore, object B probably has property Z.

Like all inductive arguments, analogical inductions can only establish their conclusions with a certain degree of probability. The more similarities between the two objects, the more probable the conclusion. The fewer similarities, the less probable the conclusion.

The dissimilarities between the Earth and Mars are significant. The Martian atmosphere is very thin and contains very little oxygen, and the water on Mars is trapped in ice caps at the poles. So the probability of finding life on Mars is not very high. Mars was more like the Earth in the past, however. So the probability of finding evidence of past life on Mars is greater.

Scientists are not the only ones who make analogical inductions. This kind of reasoning is used in many other fields, including medical research and law. Whenever medical researchers test a new drug on laboratory animals, they are making an analogical induction. Essentially they are arguing that if this drug has a certain effect on the animals, then it's probable that the drug will have the same sort of effect on human beings. The strength of such arguments depends on the biological similarities between the animals and humans. Rats, rabbits, and guinea pigs are often used in these kinds of experiments. Although they are all mammals, their biology is by no means identical to ours. So we cannot be certain that any particular drug will affect us in the same way that it affects them.

Logic is the art of convincing us of some truth.

—Jean de La Bruyère

The American legal system is based on precedents. A precedent is a case that has already been decided. Lawyers often try to convince judges of the merits of their case by citing precedents. They argue that the case before the court is similar to one that has been decided in the past, and since the court decided one way in that case, it should decide the same way in this case. The opposing attorney will try to undermine that reasoning by highlighting the differences between the case cited and the current case. Who wins such court cases is often determined by the strength of the analogical arguments presented.

Hypothetical Induction (Abduction, or Inference to the Best Explanation)

We attempt to understand the world by constructing explanations of it. Not all explanations are equally good, however. So even though we may have arrived at an explanation of something, it doesn't mean that we're justified in believing it. If other explanations are better, then we're not justified in believing it.

Science when well digested is nothing more than good sense and reason.

—Stanislas I of Poland

Inference to the best explanation has the following form:

Phenomena p.
Hypothesis h explains p.
No other hypothesis explains p as well as h.
Therefore, it's probable that h is true.

The great American philosopher Charles Sanders Peirce was the first to codify this kind of inference, and he dubbed it *abduction* to distinguish it from other forms of induction.

Inference to the best explanation may be the most widely used form of inference. Doctors, auto mechanics, and detectives—as well as the rest of us—use it almost daily. Anyone who tries to figure out why something happened uses inference to the best explanation.

Sherlock Holmes was a master of inference to the best explanation. Here's Holmes at work in *A Study in Scarlet:*

> I knew you came from Afghanistan. From long habit the train of thoughts ran so swiftly through my mind that I arrived at the conclusion without being conscious of intermediate steps. There were such steps, however. The train of reasoning ran, "Here is a gentleman of a medical type, but with the air of a military man. Clearly an army doctor, then. He has just come from the tropics, for his face is dark, and that is not the natural tint of his skin, for his wrists are fair. He has undergone hardship and sickness, as his haggard face says clearly. His left arm has been injured. He holds it in a stiff and unnatural manner. Where in the tropics would an English army doctor have seen much hardship and got his arm wounded? Clearly in Afghanistan." The whole train of thought did not occupy a second. I then remarked that you came from Afghanistan, and you were astonished.[1]

Although this passage appears in a chapter entitled "The Science of Deduction," Holmes is not using deduction here because the truth of the premises does not guarantee the truth of the conclusion. From the fact that Watson has a deep tan and a wounded arm, it doesn't necessarily follow that he has been in Afghanistan. He could have been in California and cut himself surfing. Properly speaking, Holmes is using abduction, or inference to the best explanation, because he arrives at his conclusion by citing a number of facts and coming up with the hypothesis that best explains them.

Often what makes inference to the best explanation difficult is not that no explanation can be found, but that too many explanations can be found. The trick is to identify which among all the possible explanations is the best. The goodness of an explanation is determined by the amount of understanding it produces, and the amount of understanding produced by an explanation is determined by how well it systematizes and unifies our knowledge. We begin to understand something when we see it as part of a pattern, and the more that pattern encompasses, the more understanding it produces. The extent to which a hypothesis systematizes and unifies our knowledge can be measured by various criteria of adequacy, such as simplicity, the number of assumptions made by a hypothesis; scope, the amount of diverse phenomena explained by the hypothesis; conservatism, how well the hypothesis fits with what we already know; and fruitfulness, the ability of a hypothesis to successfully predict novel phenomena. In Chapter 6 we will see how these criteria are used to distinguish reasonable explanations from unreasonable ones.

INFORMAL FALLACIES

We can easily forgive a child who is afraid of the dark; the real tragedy of life is when men are afraid of the light.

—PLATO

A fallacious argument is a bogus one, for it fails to do what it purports to do, namely, provide a good reason for accepting a claim. Unfortunately, logically fallacious arguments can be psychologically compelling. Since most people have never learned the difference between a good argument and a fallacious one, they are often persuaded to believe things for no good reason. To avoid holding irrational beliefs, then, it is important to understand the many ways in which an argument can fail.

An argument is fallacious if it contains (1) unacceptable premises, (2) irrelevant premises, or (3) insufficient premises.[2] Premises are *unacceptable* if they are at least as dubious as the claim they are supposed to support. In a good argument, you see, the premises provide a firm basis for accepting the conclusion. If the premises are shaky, the argument is inconclusive. Premises are *irrelevant* if they have no bearing on the truth of the conclusion. In a good argument, the conclusion follows from the premises. If the premises are logically unrelated to the conclusion, they provide no reason to accept it. Premises are *insufficient* if they do not establish the conclusion beyond a reasonable doubt. In a good argument, the premises eliminate reasonable grounds for doubt. If they fail to do this, they don't justify the conclusion.

So when someone gives you an argument, you should ask yourself: Are the premises acceptable? Are they relevant? Are they sufficient? If the answer to any of these questions is no, then the argument is not logically compelling.

Unacceptable Premises

Begging the Question An argument begs the question—or argues in a circle—when its conclusion is used as one of its premises. For example, some people claim that one should believe that God exists because the Bible says so. But when asked why we should believe the Bible, they answer that we should believe it because God wrote it. Such people are begging the question, for they are assuming what they are trying to prove, namely that God exists. Here's another example: "Jane has telepathy," says Susan. "How do you know?" asks Ami. "Because she can read my mind," replies Susan. Since telepathy is, by definition, the ability to read someone's mind, all Susan has told us is that she believes that Jane can read her mind because she believes that Jane can read her mind. Her reason merely reiterates her claim in different words. Consequently, her reason provides no additional justification for her claim.

False Dilemma An argument proposes a false dilemma when it presumes that only two alternatives exist when in actuality there are more

than two. For example: "Either science can explain how she was cured or it was a miracle. Science can't explain how she was cured. So it must be a miracle." These two alternatives do not exhaust all the possibilities. It's possible, for example, that she was cured by some natural cause that scientists don't yet understand. Because the argument doesn't take this possibility into account, it's fallacious. Again: "Either have your horoscope charted by an astrologer or continue to stumble through life without knowing where you're going. You certainly don't want to continue your wayward ways. So you should have your horoscope charted by an astrologer." If someone is concerned about the direction his or her life is taking, there are other things he or she can do about it than consult an astrologer. Since there are other options, the argument is fallacious.

Irrelevant Premises

The cure for a fallacious argument is a better argument, not the suppression of ideas.

—CARL SAGAN AND ANN DRUYAN

Equivocation Equivocation occurs when a word is used in two different senses in an argument. For example, consider this argument: "(i) Only man is rational. (ii) No woman is a man. (iii) Therefore no woman is rational." The word *man* is used in two different senses here: In the first premise it means human being while in the second it means male. As a result, the conclusion doesn't follow from the premises. Here's another example: "It's the duty of the press to publish news that's in the public interest. There is great public interest in UFOs. Therefore the press fails in its duty if it does not publish articles on UFOs." In the first premise, the phrase *the public interest* means the public welfare, but in the second, it means what the public is interested in. The switch in meaning invalidates the argument.

Composition An argument may claim that what is true of the parts is also true of the whole; this is the fallacy of composition. For example, consider this argument: "Subatomic particles are lifeless. Therefore anything made out of them is lifeless." This argument is fallacious because a whole may be greater than the sum of its parts; that is, it may have properties not possessed by its parts. A property had by a whole but not by its parts is called an *emergent* property. Wetness, for example, is an emergent property. No individual water molecule is wet, but get enough of them together and wetness emerges.

Just as what's true of a part may not be true of the whole, what's true of a member of a group may not be true of the group itself. For example: "Belief in the supernatural makes Joe happy. Therefore, universal belief in the supernatural would make the nation happy." This argument doesn't follow because everybody's believing in the supernatural could have effects quite different from one person's believing

in it. Not all arguments from part to whole are fallacious, for there are some properties that parts and wholes share. The fallacy lies in *assuming* that what's true of the parts is true of the whole.

Division The fallacy of division is the converse of the fallacy of composition. It occurs when one assumes that what is true of a whole is also true of its parts. For example: "We are alive and we are made out of subatomic particles. So they must be alive too." To argue in this way is to ignore the very real difference between parts and wholes. Here's another example: "Society's interest in the occult is growing. Therefore Joe's interest in the occult is growing." Since groups can have properties that their members do not have, such an argument is fallacious.

Appeal to the Person When someone tries to rebut an argument by criticizing or denigrating its presenter rather than by dealing with the argument itself, that person is guilty of the fallacy of appeal to the person. This fallacy is referred to as *ad hominem,* or "to the man." For example: "This theory has been proposed by a believer in the occult. Why should we take it seriously?" Or: "You can't believe Dr. Jones' claim that there is no evidence for life after death. After all, he's an atheist." The flaw in these arguments is obvious: An argument stands or falls on its own merits; who proposes it is irrelevant to its soundness. Crazy people can come up with perfectly sound arguments, and sane people can talk nonsense.

Genetic Fallacy To argue that a claim is true or false on the basis of its origin is to commit the genetic fallacy. For example: "Juan's idea is the result of a mystical experience, so it must be false (or true)." Or: "Jane got that message from a Ouija board, so it must be false (or true)." These arguments are fallacious because the origin of a claim is irrelevant to its truth or falsity. Some of our greatest advances have originated in unusual ways. For example, the chemist August Kekulé discovered the benzene ring while staring at a fire and seeing the image of a serpent biting its tail. The theory of evolution came to British naturalist Alfred Russell Wallace while in a delirium. Archimedes supposedly arrived at the principle of displacement while taking a bath, from which he leapt shouting, "Eureka!" The truth or falsity of an idea is determined not by where it came from, but by the evidence supporting it.

Appeal to Authority We often try to support our views by citing experts. This sort of appeal to authority is perfectly legitimate—provided that the person cited really is an expert in the field in question. If not,

it is fallacious. Celebrity endorsements, for example, often involve fallacious appeals to authority, because being famous doesn't necessarily give you any special expertise. The fact that Dionne Warwick is a great singer, for example, doesn't make her an expert on the efficacy of psychic hotlines. Similarly, the fact that Linus Pauling is a Nobel Prize winner doesn't make him an expert on the efficacy of vitamin C. Pauling claimed that taking massive doses of vitamin C would help prevent colds and increase the life expectancy of people suffering from cancer. That may be the case, but the fact that he said it doesn't justify our believing it. Only rigorous clinical studies confirming these claims can do that.

In questions of science, the authority of a thousand is not worth the humble reasoning of a single individual.

—GALILEO GALILEI

Appeal to the Masses A remarkably common but fallacious form of reasoning is, "It must be true (or good) because everybody believes it (or does it)." Mothers understand that this argument is a fallacy; they often counter it by asking, "If everyone else jumped off a cliff, would you do it, too?" Of course you wouldn't. What this response shows is that just because a lot of people believe something or like something doesn't mean that it's true or good. A lot of people used to believe that the Earth was flat, but that certainly didn't make it so. Similarly, a lot of people used to believe that women should not have the right to vote. Popularity is not a reliable indication of either reality or value.

Appeal to Tradition We appeal to tradition when we argue that something must be true (or good) because it is part of an established tradition. For example: "Astrology has been around for ages, so there must be something to it." Or: "Mothers have always used chicken soup to fight colds, so it must be good for you." These arguments are fallacious because traditions can be wrong. This error becomes obvious when you consider that slavery was once an established tradition. The fact that people have always done or believed something is no reason for thinking that we should continue to do or believe something.

Appeal to Ignorance The appeal to ignorance comes in two varieties: Using an opponent's inability to disprove a conclusion as proof of the conclusion's correctness, and using an opponent's inability to prove a conclusion as proof of its incorrectness. In the first case, the claim is that since there is no proof that something is true, it must be false. For example: "There is no proof that the parapsychology experiments were fraudulent, so I'm sure they weren't." In the second case, the claim is that since there is no proof that something is false, it must be

true. For example: "Bigfoot must exist because no one has been able to prove that he doesn't." The problem with these arguments is that they take a lack of evidence for one thing to be good evidence for another. A lack of evidence, however, proves nothing. In logic, as in life, you can't get something for nothing.

Appeal to Fear To use the threat of harm to advance one's position is to commit the fallacy of the appeal to fear. It is also known as swinging the big stick. For example: "If you do not convict this criminal, one of you may be her next victim." This argument is fallacious because what a defendant might do in the future is irrelevant to determining whether she is responsible for a crime committed in the past. Or: "You should believe in God because if you don't you'll go to hell." Such an argument is fallacious because it gives us no reason for believing that God exists. Threats extort; they do not help us arrive at the truth.

Straw Man You indulge in the straw man fallacy when you misrepresent someone's claim to make it easier to dismiss or reject. Instead of addressing the actual claim presented, you concoct a weak one to assault—a fake, or straw, man that can be easily struck down. Suppose Senator Brown asserts that she favors strong gun control measures, and against her view you argue this way: "Senator Brown says she wants to outlaw guns, an extreme position that flies in the face of the Second Amendment right to bear arms. But we should absolutely oppose any move to gut the Constitution." Your argument, however, would distort the senator's view. She says she wants the possession of firearms to be controlled, not outlawed altogether. You could, of course, use the straw man fallacy just as easily on the other side of this issue, arguing that someone opposed to strict gun control wants to put guns in the hands of every citizen. Another distortion. Either way, your argument would be fallacious—and irrelevant to the real issue.

Insufficient Premises

Hasty Generalization You are guilty of hasty generalization, or jumping to conclusions, when you draw a general conclusion about all things of a certain type on the basis of evidence concerning only a few things of that type. For example: "Every medium that's been investigated has turned out to be a fraud. You can't trust any of them." Or: "I know one of those psychics. They're all a bunch of phonies." You can't make a valid generalization about an entire class of things from observing only one—or even a number of them. An inference from a sample of a group

to the whole group is legitimate only if the sample is representative—that is, only if the sample is sufficiently large and every member of the group has an equal chance to be part of the sample.

Faulty Analogy An argument from analogy claims that things that resemble one another in certain respects resemble one another in further respects. Recall our previous example: "The Earth has air, water, and living organisms. Mars has air and water. Therefore Mars has living organisms." The success of such arguments depends on the nature and extent of the similarities between the two objects. The greater their dissimilarities, the less convincing the argument will be. For example, consider this argument: "Astronauts wear helmets and fly in spaceships. The figure in this Mayan carving seems to be wearing a helmet and flying in a spaceship. Therefore it is a carving of an ancient astronaut." Although features of the carving may bear a resemblance to a helmet and spaceship, they may bear a greater resemblance to a ceremonial mask and fire. The problem is that any two things have some features in common. Consequently an argument from analogy can be successful only if the dissimilarities between the things being compared are insignificant.

False Cause The fallacy of false cause consists of supposing that two events are causally connected when they are not. People often claim, for example, that because something occurred after something else it was caused by it. Latin scholars dubbed this argument the fallacy of *post hoc, ergo propter hoc,* which means "After this, therefore because of this." Such reasoning is fallacious, because from the fact that two events are constantly conjoined, it doesn't follow that they are causally related. Night follows day, but that doesn't mean that day causes night. Suppose that ever since you wore crystals around your neck you haven't caught a cold. From this action you can't conclude that the crystals caused you to stay healthy, because any number of other factors could be involved. Only if it has been established beyond a reasonable doubt that other factors were not involved—through a controlled study, for example—can you justifiably claim that there is a causal connection between the two events.

Slippery Slope Sometimes people argue that performing a specific action will inexorably lead to an additional bad action (or actions), so you should not perform that first action. An initial wrong step starts an inevitable slide toward an unpleasant result that could have been avoided if only the first step had never been taken. This way of

arguing is legitimate if there is good reason to believe that the chain of actions must happen as alleged. If not, it is an example of the fallacy of slippery slope. For example: "Teaching evolution in schools leads to loss of faith in God, and loss of faith leads to the weakening of moral values, which causes increases in crime and social disorder. Therefore, evolution should not be taught in schools." This argument is fallacious because there are no good reasons to believe that the sequence of calamities would happen as described. If there were good reasons, then the argument—though molded in the slippery-slope pattern—would not be fallacious.

STATISTICAL FALLACIES

Statistical fallacies are misleading statements or arguments expressed with numbers. Statistics can present us with good evidence for a claim or be part of a plausible chain of reasoning. But they are frequently used to deceive us, to get us to accept a conclusion that we should reject or question. Here are a few examples:

Misleading Averages

In statistics, there are three kinds of averages—mean, median, and mode. A *mean* is what most people refer to as an average. The mean of the five numbers 2, 3, 5, 8, and 12 is 6 (2 + 3 + 5 + 8 + 12 = 30 divided by 5 = 6). The *median* is the middle value in a sequence of numbers (the median of our five numbers is 5). The *mode* is the most frequently appearing value in a series.

Trouble comes when people don't specify which kind of average they are using, or they employ the kind that will make their weak case look strong. Imagine that the president promises a huge tax cut for the whole country, amounting to a mean tax savings of $10,000. But the mean has been driven upward by a few very rich people whose tax savings will be $1,000,000 or more. Ninety-five percent of taxpayers (who make less than $20,000 a year) will see a tax savings of less than $400. The president's boast of a mean tax savings of $10,000 is technically accurate—but deceiving. More truth can be told to the taxpayers by the median, which is $300, or even the mode of $250.

Missing Values

Much mischief can occur when people fail to distinguish between relative and absolute statistical values. Suppose you read that in the last year there has been a 75 percent increase in the number of muggings in your town. This sounds serious. But the 75 percent is the *relative*

increase over the number of muggings last year. What you need to know to make sense of this statistic is the *absolute* number that the percentage is based on. Were there 400 muggings last year—or just 4? If 400, the increase brings us to a shocking 700 incidents. If 4, we are now facing only 7 muggings per year.

Sorting out relative and absolute numbers is critical in statistics on disease risk. Suppose researchers report that daily coffee consumption doubles the risk of pancreatitis in men 25 to 45 years old. Should men in this age group worry about this? Should they stop drinking coffee? You can't tell until you know the absolute risk involved. Let's say the absolute risk of pancreatitis for these men is extremely low—1 chance in 100,000. If daily coffee drinking doubles the risk, we get 2 chances in 100,000—still a miniscule chance of being affected and a very poor reason to give up coffee.

Hazy Comparisons

People use statistics legitimately to make comparisons, but they also use them deceptively or recklessly when the comparisons are vague or incomplete. Consider these advertising claims:

1. Super Pain Eraser reduces headaches 50 percent faster.
2. Fast-Energy Protein drinks can boost your performance by 30 percent.
3. Get twice the mileage with Exxon Hi-Grade gasoline.

In Claim 1, we need more information. What does "50% faster" mean? Fifty percent faster than the drug used to work? Fifty percent faster than other pain relievers? If the comparison is with other medicines, which ones? The least effective one? The best-selling one? If the assertion is 50 percent faster than the medicine used to work, how fast is that? After taking the drug, does your headache go away in 20 minutes or 20 hours? Claim 2 is equally vague. What does "performance" refer to? Speed? Stamina? Strength? And how are such things measured? The notion of performance is so fuzzy, and it can be defined in so many ways, that an advertiser can contrive almost any statistic to sell the product. Claim 3 has the same problems that Claim 1 does, with the additional concern that the claim of doubling gas mileage is not credible.

Good reasoning requires good evidence. Even if your logic is impeccable, your conclusions can be mistaken if your evidence is weak. In the next chapter, we examine the difference between good evidence and bad evidence in an attempt to distinguish real knowledge from false knowledge.

SUMMARY

The combination of a claim (or claims) supposedly giving reasons for accepting another claim is known as an argument. Arguments can be either deductive or inductive. Deductive arguments are intended to provide conclusive support for their conclusions. An inductive argument is intended to provide probable support for its conclusion. A deductive argument that succeeds in providing conclusive support is said to be valid; one that fails to do this is said to be invalid. An inductive argument that succeeds in giving probable support to its conclusion is said to be strong; one that fails in this is said to be weak. A valid argument with true premises is sound; a strong argument with true premises is cogent.

There are several common deductive argument forms. Some are valid: *modus ponens, modus tollens,* hypothetical syllogism, and disjunctive syllogism. Some are invalid: denying the antecedent and affirming the consequent. Being familiar with these forms can help you quickly determine the validity of an argument. The counterexample method can also help.

Some common inductive argument forms are enumerative induction, analogical induction, and hypothetical induction (inference to the best explanation). Enumerative induction is the kind of reasoning we use when we arrive at a generalization about a group of things after observing only some of them. The group of things—the entire class of individuals we're interested in—is known as the target group. The observed members of the target group are the sample, and the characteristic we're studying is the relevant property. An enumerative induction is strong only if the sample is large enough and properly representative. Using an inadequate sample size to draw a conclusion about a target group is a common mistake, a fallacy called hasty generalization.

A fallacious argument, or fallacy, fails to provide a good reason for accepting a claim. An argument is fallacious if it contains (1) unacceptable premises, (2) irrelevant premises, or (3) insufficient premises. Fallacies with unacceptable premises: begging the question and false dilemma. Fallacies with irrelevant premises: equivocation, composition, division, appeal to the person, genetic fallacy, appeal to authority, appeal to the masses, appeal to tradition, appeal to ignorance, appeal to fear, and straw man. Fallacies with insufficient premises: hasty generalization, faulty analogy, false cause, and slippery slope.

STUDY QUESTIONS

1. What is an argument?
2. What are three common conclusion indicator words? What are three common premise indicator words?
3. What is the difference between a deductive argument and an inductive argument?
4. What is a valid deductive argument? A sound deductive argument?

5. What is a strong inductive argument? A cogent inductive argument?
6. What is the logical form of affirming the antecedent (*modus ponens*)?
7. What is the logical form of denying the consequent (*modus tollens*)?
8. What is enumerative induction?
9. What is analogical induction?
10. What is the logical form of inference to the best explanation?
11. What is the argument form known as *modus ponens*? *modus tollens*?
12. How is the counterexample method used to check for validity?
13. In enumerative induction, what is the target group? the sample? the relevant property?
14. Why is a self-selecting sample a biased sample?
15. What is the fallacy of false dilemma? appeal to ignorance? straw man?

EVALUATE THESE CLAIMS. ARE THEY REASONABLE? WHY OR WHY NOT?

1. Objects were moving in the house. Either someone was moving them by psychokinesis or it was ghosts. It wasn't psychokinesis. So it must have been ghosts.
2. A psychic healer cheated my sister. I'm never going to a psychic. They are all con artists.
3. Jones began taking powdered rhinoceros horn and in no time was enjoying great sex. It must be an effective aphrodisiac.
4. Is the following argument strong? Every day that you've lived has been followed by another day that you've been alive. Therefore, every day you ever will live will be followed by another day that you will be alive.
5. Is the following argument strong? Every day that you've lived has been a day before tomorrow. Therefore, every day you ever will live will be a day before tomorrow.
6. Is the following argument valid? If the alien spaceship landed, there should be a large circular depression in the field. There is a large circular depression in the field. So the alien spaceship must have landed.
7. Is the following argument valid? If God created the universe, we should live in the best of all possible worlds. But we do not live in the best of all possible worlds. So God must not have created the universe.
8. Is the following conclusion a cogent inference to the best explanation? All over the country have been found mutilated cows whose body parts were removed by means of smooth cauterized incisions. Aliens must be using the cows for some sort of experiments.
9. Is the following conclusion a cogent inference to the best explanation? Cases of spontaneous human combustion have been reported from around the world. People burst into flame, and most of their body and clothing is reduced to ash, but often a limb or appendage is not burned, and the fire does not affect objects near the victim. No natural fire could burn in such a way, so it must be a form of divine punishment.

10. Is the following conclusion a cogent analogical argument? The ancient Greek philosopher Plato described the lost continent of Atlantis in two of his dialogues: *Timaeus* and *Critias*. The Atlanteans were very advanced, both horticulturally and mechanically, and their civilization was destroyed when Atlantis sank under the ocean. Plato must have been talking about the Minoan island of Thera because the civilization of Thera was very advanced, and a volcanic explosion destroyed the civilization very quickly.

DISCUSSION QUESTIONS

1. Read the following passage and answer these questions: (1) Does the passage contain an argument? (2) If so, is the argument deductive or inductive? (3) If it is deductive, does it have a familiar logical form? If yes, what form? (4) If it is an argument, is it a good one?

   Is there archaeological evidence for the [Biblical] Flood? If a universal Flood occurred between five and six thousand years ago, killing all humans except the eight on board the Ark, it would be abundantly clear in the archaeological record. Human history would be marked by an absolute break. We would see the devastation wrought by the catastrophe in terms of the destroyed physical remains of pre-Flood human settlements. . . . Unfortunately for the Flood enthusiasts, the destruction of all but eight of the world's people left no mark on the archaeology of human cultural evolution.

   —KENNETH L. FEDER, *Frauds, Myths, and Mysteries*

2. In the following argument, each statement is numbered. Read the argument and indicate the role that each statement plays—for example, premise, conclusion, question, example or illustration, background information, or reiteration of a premise or the conclusion.

   [1] Is global warming a real threat? [2] Or is it hype propagated by tree-hugging, daft environmentalists? [3] President George W. Bush apparently thinks that the idea of global climate change is bunk. [4] But recently his own administration gave the lie to his bunk theory. [5] His own administration issued a report on global warming called the *U.S. Climate Action Report* 2002. [6] It gave no support to the idea that global warming doesn't happen and we should all go back to sleep. [7] Instead, it asserted that global warming was definitely real and that it could have catastrophic consequences if ignored. [8] For example, global climate change could cause heat waves, extreme weather, and water shortages right here in the United States. [9] The report is also backed by many other reports, including a very influential one from the United Nations. [10] Yes, George, global warming is real. [11] It is as real as typhoons and ice storms.

3. Consider the following two analogical arguments. Which one is stronger? Why? (1) The universe is like a watch with its purposeful arrangement of parts and curious adaptation of means to ends. Every watch has a designer. So the universe must have a designer. (2) The

universe is like a living thing because there is a constant circulation of matter and each part operates to preserve itself as well as the whole. Living things originate through natural reproduction. So the universe must have arisen through natural reproduction.

FIELD PROBLEM

From the "letters to the editor" section of your college newspaper or literary magazine, select a letter that contains at least one argument. Locate the conclusion and each premise. Next go through the letters again to find one that contains no argument at all. Rewrite the letter so that it contains at least one argument. Try to preserve as much of the original letter as possible. Stay on the same topic.

CRITICAL READING AND WRITING

I. Read the passage below and answer the following questions:
   1. What is the claim (conclusion) being argued for in this passage?
   2. What premise or premises are used to support the conclusion?
   3. Is the argument inductive or deductive?
   4. Assuming that the premise or premises are true, is the argument a good one?
   5. Do you believe that reverse speech exists? Why or why not?

II. In a 200-word paper, answer this question: What evidence would persuade you to accept the proposition that reverse speech is a real phenomenon and that it can be useful as a lie detector in courts of law? Explain in detail why the evidence would justify your acceptance of the proposition.

Passage 2

In the past several years, a researcher named David Oates has been advocating his discovery of a most interesting phenomenon. Oates claims that backward messages are hidden unintentionally in all human speech. The messages can be understood by recording normal speech and playing it in reverse. This phenomena, reverse speech, has been discussed by Oates in a number of books (Oates 1996), magazines, newspapers, and radio programs, and even on television with Larry King and Geraldo Rivera. His company, Reverse Speech Enterprises, is dedicated to profiting from his discovery. . . .

We argue that there is no scientific evidence for the phenomena of reverse speech; and that the use of reverse speech as lie detection in courts of law or any other forum, as advocated by Oates, is entirely invalid and unjust. . . .

The burden of proof for any phenomenon lies upon the shoulders of those claiming its existence. To our knowledge there is not one empirical investigation of reverse speech in any peer-reviewed journal. If reverse speech did exist it would be, at the very least, a noteworthy scientific discovery.

However, there are no data to support the existence of reverse speech or Oates's theories about its implications. Although descriptions of "research papers" are available on the Reverse Speech Web site, there is no good indication that Oates has conducted any scholarly or empirical investigation. (Tom Byrne and Matthew Normand, "The Demon-Haunted Sentence: A Skeptical Analysis of Reverse Speech," *Skeptical Inquirer,* March/April 2000.)

NOTES

1. Arthur Conan Doyle, *A Study in Scarlet* (New York: P. F. Collier and Son, 1906), pp. 29–30.
2. Ludwig F. Schlecht, "Classifying Fallacies Logically," Teaching Philosophy 14, no. 1 (1991): 53–64.