

## SCENARIO

You and Ms. Cranshaw, your college career placement counselor, are discussing how to write an application letter.

“What’s the point of the letter?” Ms. Cranshaw asks.

“To let them know, I’d like to work for them,” you say.

“That’s obvious, but what’s the real point of your letter?”

“I guess that they should hire me.”

“You’re getting close.” Ms. Cranshaw says. “But why should they hire you?”

“Well, because I would fit into the company well. I can do the kinds of things they do.”

“Is that a fact or an opinion?” Ms. Cranshaw asks.

“I guess it’s an opinion,” you say.

“Right, and what do you need to support opinions?” Ms. Cranshaw asks.

“Facts, in this case, facts about what I have studied and what I have done and can do,” you say.

“Now, we’re on target,” Ms. Cranshaw says. “A letter of application is like any argument. You have to have a clear idea of what your purpose is, gather the facts you need to support that purpose, present those facts in a logical format, and make sure your conclusion is obvious—inescapable, if you can manage that.”

Arguments are everywhere in technical writing, from letters of application to proposals to the analysis sections of research reports. This chapter lays the groundwork for organizing those arguments logically and presenting them well.

## ***chapter 10***

### **Analyzing Information**

- ▶ Classical Argument
  - Major Proposition
  - Minor Propositions and Evidence
  - Organization

- ▶ Pro and Con
  
- ▶ Induction and Deduction
  - Induction
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- ▶ Comparison
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- ▶ Toulmin Logic
  - Applying Toulmin Logic
  - Arranging Your Arguments for Readers

Analytical reports are common in technical writing. We describe four types in Part III, Applications: proposals, progress reports, recommendation reports, and empirical research reports. Other types are evaluation reports, environmental impact statements, and economic justification reports. No matter what label is given to an analytical report, and no matter what its format, it has one thing in common with all other analytical reports: It goes beyond the facts to reach a conclusion or conclusions. You may, further, base recommendations, decisions, and actions on your conclusions.

A fact is by definition something known with certainty, something that can be objectively verified. Conclusions, by contrast, are opinions. We have more confidence in some opinions than others, but, again by definition, we can never know an opinion with the absolute certainty of a fact. Because they are opinions, conclusions based on insufficient or ill-organized facts are not convincing.

What you have learned in Chapter 9, Presenting Information, will help you organize the information you use in your analyses. In the following excerpt, the authors use exemplification (see pages 178–179) to support their opinion that Southeast wetlands play an integral role in the region’s quality of life.

Southeast wetlands play an integral role in the region’s quality of life—maintaining water quality and quantity, supporting diverse and plentiful fish and wildlife habitat, and providing economic livelihood and recreation for millions of people.

A few specific examples of the contribution of wetlands to the region are noted here.

A single 2,300-acre Georgia floodplain wetland naturally provides pollution control benefits worth an estimated \$1 million each year

(Wharton 1970). The 552,000-acre Green Swamp complex northeast of Tampa, Florida, stores water for eventual aquifer recharge with an estimated value of \$25 million annually (Brown 1984). The value of standing timber in southern wetland forests has been estimated at \$8 billion (Tiner 1984).

The wetlands of the Gulf Coast from Alabama to Louisiana provide winter habitat for more than 400,000 geese and three million ducks (Mississippi Flyway Council 1991). Louisiana is second only to Alaska in volume of commercial fishery landings with a harvest of over 1.2 billion pounds, with a value of \$264 million in 1989 (National Marine Fisheries Service 1991). Louisiana's catch is made up primarily of wetland-dependent species such as brown shrimp, white shrimp, blue crab, seatrout and spot (Gosselink 1984).

Freshwater fishes of the region also depend on wetlands. For example, 53 species of fish are known to use flooded bottomland hardwood wetlands during their life cycles (Wharton et al. 1981).

Wetlands provide the region with a variety of recreational opportunities as well. In 1985 alone, more than two million people fished Florida's fresh waters. Nearly one million people each year visit Everglades National Park, America's largest wetland park and a designated Wetland of International Importance (Ramsar Convention Bureau).<sup>1</sup>

This chapter is designed to aid you in reaching sound opinions and in presenting them convincingly. To meet these goals, we introduce five methods of analysis: classical argument, pro and con argument, induction and deduction, comparison, and Toulmin logic.

## **CLASSICAL ARGUMENT**

In argument, you deal with opinions that lie somewhere on a continuum between verifiable fact and pure subjectivity. Verifiable fact does not require argument. If someone says a room is thirty-five feet long and you disagree, you don't need an argument, you need a tape measure. Pure subjectivity cannot be argued. If someone hates the taste of spinach, you will not convince him or her otherwise with argument. The opinions dealt with in argument may be called propositions, premises, claims, conclusions, theses, or hypotheses, but under any name they remain opinions. Your purpose in argument is to convince your audience of the probability that the opinions you are advancing are correct.

Typically, an argument supports one major opinion, often called the major proposition. In turn, the major proposition is supported by a series of minor propositions. Minor propositions, like major propositions, are opinions, but

generally they are nearer on the continuum to verifiable fact. Finally, the minor propositions are supported by verifiable facts and frequently also by statements from recognized authorities.

To understand how you might construct an argument, imagine for the moment that you are the waste management expert in an environmental consulting firm. Land developers constructing a new housing subdivision called Hawk Estates have turned to your firm for advice. Hawk Estates, like many such new subdivisions, is being built close to, but not in, a city called Colorful Springs. The problem at issue is whether Hawk Estates should build its own sewage disposal plant or tap into the sewage system of Colorful Springs. (The developers have already ruled out individual septic tanks because Hawk Estates is built on nonabsorbent clay soil.) Colorful Springs will allow the tap-in. You have investigated the situation and thought about it a good deal, and you have decided that the tap-in is the most desirable alternative. The land developers are not convinced. It's their money, so you must write a report to convince them.

### **Major Proposition**

In developing your argument, it helps to use a chart like the one in Figure 10-1. The chart is a way of clearly separating and organizing your major proposition, minor propositions, and evidence. First, you must state your major proposition: Hawk Estates should tap into the sewage system of the city of Colorful Springs.

### **Minor Propositions and Evidence**

Now you must support your major proposition. Clearly, your most relevant minor proposition is that Colorful Springs' sewage system can handle Hawk Estates' waste. Questions of cost, convenience, and so forth would be irrelevant if Colorful Springs could not furnish adequate support, so you lead off with this proposition. To support it, you give the estimated amount of waste that will be produced by Hawk Estates, followed by a statement from the Colorful Springs city engineer that the city system can handle this amount of waste.

The minor proposition that the overall cost to Hawk Estates taxpayers will be only slightly more if they are tapped into the city rather than having their own plant is a difficult one. It's actually a rebuttal of your argument, but you must deal with it for several reasons. First and foremost, you must be ethical and honest with the developers. Second, it would be poor strategy not to be. Should they find that you have withheld information from them, it would cast doubt on your credibility. You decide to put this proposition second in your argument. In that way you can begin and end with your strongest propositions, a wise strategy. To support this proposition, you list the initial cost of the plant versus the cost of the tap-in. You also state the yearly fee charged by the city versus the yearly cost of running the plant. You might anticipate the opposing argument that the plant will save the homeowners money. You could break down the cost per individual

homeowner, perhaps showing that the tap-in would cost an average homeowner only an additional ten dollars a year—a fairly nominal amount.

Your final minor proposition is that the proposed plant, a sewage lagoon will represent a nuisance to the homeowners of Hawk Estates. Because the cost for the tap-in is admittedly higher, your argument will probably swing on this minor proposition. You state freely that well-maintained sewage lagoons are not particularly smelly. But then you point out that authorities state that sewage lagoons are difficult to maintain, and if not maintained to the highest standards, they emit an unpleasant odor. To clinch your argument, you show that the only piece of land in Hawk Estates large enough to handle a sewage lagoon is upwind of the majority of houses, during prevailing winds. With the tap-in, of course, all wastes are carried away from Hawk Estates and represent no problem of odor or unsightliness whatsoever.

## **Organization**

When you draft your argument, you can follow the organization shown on the chart, adding details as needed to make a persuasive case. Although your major proposition is actually the recommendation that your argument leads to, you present it first, so that your audience will know where you are heading. In executive reports such as this, major conclusions and recommendations are often presented first.

In summing up your argument, you draw attention once again to your key points. You acknowledge that in cost and the ability to handle the produced wastes, the proposed plant and the tap-in are essentially equal. But, you point out, the plant will probably become an undesirable nuisance to Hawk Estates. Therefore, you recommend that the builder choose the tap-in over the plant.

The following argument presents background information that supports a later conclusion that advanced automotive technology is needed to lower pollution and to conserve gasoline. The major premise of the argument is first supported by statistical examples and second by the chronology (see pages 176–178) of several trends (We have omitted fourteen footnotes documenting the argument and the superscripts that designate them in the source.)

The automobile is also associated with many of the ills of a modern industrial society. Automotive emissions of hydrocarbons and nitrogen oxides are responsible for as much as 50 percent of ozone in urban areas; despite improvements in air quality forced by government regulations, 50 million Americans still live in counties with unsafe ozone levels. Automobiles are also responsible for 37 percent of U.S. oil consumption, in an era when U.S. dependence on imported oil is more than 50 percent and still increasing. A concern related to automotive gasoline consumption

is the emission of greenhouse gases, principally carbon dioxide, which may be linked to global climate change.

The automobile fleet, which accounts for 15 percent of the U.S. annual total, is one of this country's single largest emitters of carbon dioxide.

Recent technological improvements to engines and vehicle designs have begun to address these problems, at least at the level of the individual vehicle. Driven by government regulation and the gasoline price increases of the 1970s, new car fuel economy has doubled between 1972 and today, and individual *vehicle* emissions have been reduced substantially. Several trends have undercut a portion of these gains, however, with the result that the negative impacts of automobiles are expected to continue.

An important trend has been a 40 percent drop in the real price of gasoline since its peak in 1981. This decline has reduced the attractiveness of fuel-efficient automobiles for consumers and encouraged more driving; vehicle-miles traveled (VMT) have been increasing at 3 percent per year. Expanding personal income has meant that more new vehicles (especially less fuel-efficient light trucks and vans) are being added to the fleet; there were approximately 15.1 million new light-duty vehicles purchased in 1994. With more drivers and expected increases in individual travel demand, automotive oil consumption and carbon dioxide emissions are expected to increase by 18 percent from 1993 to 2010, when U.S. oil imports are expected to reach 64 percent. Although highway vehicle emissions have been dropping and air quality improving, the rates of improvement have been slowed greatly by the increase in travel. Similar trends in automobile purchasing and use are occurring in other industrialized countries, even with motor fuel prices far higher than those in the United States, and the problems will be compounded as developing countries such as China continue to industrialize and expand their use of automobiles.

With these trends as background, it is clear that a major advance in automotive technology that could dramatically reduce gasoline consumption and emissions would have great national and international benefits.<sup>2</sup>

Throughout any argument, you appeal to reason. In most technical writing situations, an appeal to emotion will make your case immediately suspect. Never use sarcasm in an argument. You never know whose toes you are stepping on or how you will be understood. Support your case with simply stated, verifiable facts and statements from recognized authorities.

## **PRO AND CON**

The pro and con form of analysis looks at one side of a question and then looks at the other side before reaching a conclusion. The analysis excerpted here is typical.

### **Advantages**

There are many advantages to earth-sheltered construction. An earth-sheltered home is less susceptible to the impact of extreme outdoor air temperatures, so you won't feel the effects of adverse weather as much as in a conventional house. Temperatures inside the house are more stable than in conventional homes, and with less temperature variability, interior rooms seem more comfortable.

Because earth covers part or all of their exterior, earth-sheltered houses require less outside maintenance, such as painting and cleaning gutters. Constructing a house that is dug into the earth or surrounded by earth builds in some natural soundproofing. Plans for most earth-sheltered houses "blend" the building into the landscape more harmoniously than a conventional home. Finally, earth-sheltered houses can cost less to insure because their design offers extra protection against high winds, hailstorms, and natural disasters such as tornados and hurricanes.

### **Disadvantages**

As with any type of unusual construction, there are some disadvantages associated with earth-sheltered housing. Principal downsides are the initial cost of construction, which may be up to 20% higher, and the level of care required to avoid moisture problems, during both the construction and the life of the house. It can take more diligence to resell an earth-sheltered home, and buyers may have a few more hurdles to clear in the mortgage application process...

### **A Home for the Future**

If you are looking for a home with many energy efficient features that will provide a comfortable, tranquil, weather-resistant atmosphere, an earth-sheltered home could be right for you.<sup>3</sup>

## **INDUCTION AND DEDUCTION**

Much of your thought, whether you are casually chatting with friends or are on your most logical and formal behavior, consists of induction and deduction. In this

section we cover both induction and deduction and discuss some of the fallacies you'll want to avoid in using them.

## Induction

Induction is a movement from particular facts to general conclusions. It's a method of discovering and testing the inferences that you can draw from your information. The inductive process consists of (1) looking at the evidence, (2) making an educated guess to explain the evidence, and (3) investigating to see whether the guess fits the evidence. The educated guess is called a hypothesis. No matter how well constructed your hypothesis is, remember, it's still only a guess. Be ready to discard it in an instant if it doesn't fit your facts.

The whole process of gathering evidence, making hypotheses, and testing hypotheses against the evidence is, of course, the scientific method at work.

The following description of the beginnings of the theory of continental drift illustrates well how induction works in forming and supporting scientific thought:

The belief that continents have not always been fixed in their present positions was suspected long before the 20th century; this notion was first suggested as early as 1596 by the Dutch map maker Abraham Ortelius in his work *Thesaurus Geographicus*. Ortelius suggested that the Americas were "torn away from Europe and Africa... by earthquakes and floods" and went on to say: "The vestiges of the rupture reveal themselves, if someone brings forward a map of the world and considers carefully the coasts of the three [continents]." Ortelius' idea surfaced again in the 19th century. However, it was not until 1912 that the idea of moving continents was seriously considered as a full-blown scientific theory—called *Continental Drift*—introduced in two articles published by a 32-year-old German meteorologist named Alfred Lothar Wegener. He contended that, around 200 million years ago, the supercontinent Pangaea began to split apart. Alexander Du Toit, Professor of Geology at Johannesburg University and one of Wegener's staunchest supporters, proposed that Pangaea first broke into two large continental land-masses, *Laurasia* in the northern hemisphere and *Gondwanaland* in the southern hemisphere. Laurasia and Gondwanaland then continued to break apart into the various smaller continents that exist today.

Wegener's theory was based in part on what appeared to him to be the remarkable fit of the South American and African continents, first noted by Abraham Ortelius three centuries earlier. Wegener was also intrigued by the occurrences of unusual geologic structures and of plant and animal fossils found on the matching coastlines of South America and Africa, which are now widely separated by the Atlantic Ocean. He reasoned that it was physically impossible for most of these organisms to



have swum or have been transported across the vast oceans. To him, the presence of identical fossil species along the coastal parts of Africa and South America was the most compelling evidence that the two continents were once joined.

In Wegener's mind, the drifting of continents after the break-up of Pangaea explained not only the matching fossil occurrences but also the evidence of dramatic climate changes on some continents. For example, the discovery of fossils of tropical plants (in the form of coal deposits) in Antarctica led to the conclusion that this frozen land previously must have been situated closer to the equator, in a more temperate climate where lush, swampy vegetation could grow. Other mismatches of geology and climate included distinctive fossil ferns (*Glossopteris*) discovered in now-polar regions, and the occurrence of glacial deposits in present-day arid Africa, such as the Vaal River valley of South Africa.

The *theory of continental drift* would become the spark that ignited a new way of viewing the Earth.<sup>4</sup>

Continental drift was the forerunner of the modern theory of plate tectonics—the theory that the surface of the earth is composed of plates upon which the continents ride.

Looking for similarities and differences as Wegener did is a major tool in testing hypotheses. Examining similarities and differences in the population has led medical authorities, including the Surgeon General of the United States, to declare that cigarette smoking is hazardous to your health. Researchers began this examination by looking at the population, and they saw a difference. There are those who smoke and those who don't. Within each of these two groups, medical authorities looked for similarities. Smokers had in common a high incidence of respiratory problems, including emphysema and lung cancer. Nonsmokers had in common a low incidence of such problems. The higher incidence of such problems in the smoking group when compared to the nonsmoking group was a significant difference.

Induction is the chief way we have of establishing casualty—that A caused B. In the following example, the author uses induction to support the proposition that pollution and overfishing are stressing the oceans of the world. The proposition is then supported by evidence of the pollution and overfishing.

*The oceans, ravaged by pollution and overfishing, are in trouble.* World fisheries are under unprecedented stress as competition for these finite resources increases. Pollution caused by the deliberate dumping of debris, chemical contaminants, agricultural and industrial runoffs, sewage, and vessel discharge has endangered marine life and habitats. Coral mining, blast fishing, the dumping of contaminated dredge material, and

other human activities have destroyed or dramatically damaged ocean and coastal habitats and the wildlife they sustain. The Food and Agriculture Organization of the United Nations estimates that 70 percent of the world's commercially important fish stocks are fully or over-exploited. Chronic overfishing has depleted Atlantic cod and halibut stocks and resulted in the loss of thousands of American jobs. Stocks of some large ocean fish—tunas, sharks, swordfish, and marlin—have declined 60–90 percent in the last two decades. Every year, 27 million tons of fish, marine mammals, sharks, sea turtles, and seabirds, one third of the world's catch, are caught unintentionally and thrown back dead or dying into the ocean.

The United States, with one of the longest coastlines in the world and as a major maritime power and seafood consumer, has vested economic and environmental interests in protecting the oceans. In addition to providing a major food source, the oceans are maritime highways for efficient commerce and national security. They also serve as a source for oil, for medicine, and for recreation. The health and economic well-being of the world's coastal populations and communities are intimately linked to the quality of the marine environment.<sup>5</sup>

Remember that despite the terminology used—conclusion, proposition, thesis—generalizations based on particulars are opinions, nothing more and nothing less. Therefore, the better you support general statements with facts, the more likely they are to be strong and convincing.

## **Deduction**

Deductive reasoning is another way to deal with evidence. Whereas in inductive reasoning you move from the particular to the general, in deductive reasoning you move from the general to the particular. You start with some general principle, apply it to a fact, and draw a conclusion concerning the fact. Although you will seldom use the form of a syllogism in writing, we can best illustrate deductive reasoning with it:

1. All professional golfers are good athletes.
2. Judy is a professional golfer.
3. Therefore, Judy is a good athlete.

In expressing deductive reasoning, we commonly present the syllogism in abbreviated form. You might say, for instance, "Because Judy was a professional golfer, I knew she was a good athlete."

Although induction is the more common organizing technique in argument, deduction is sometimes used, as in this example:

Layered rocks form when particles settle from water or air. Steno's *Law of Original Horizontality* states that most sediments, when originally formed, were laid down horizontally. However, many layered rocks are no longer horizontal. Because of the *Law of Original Horizontality*, we know that sedimentary rocks that are not horizontal either were formed in special ways or, more often, were moved from their horizontal position by later events, such as tilting during episodes of mountain building.<sup>6</sup>

Presented formally, the syllogism in this paragraph would go something like this:

1. Steno's *Law of Original Horizontality* states that most sediments when originally formed were laid down horizontally.
2. However, some sedimentary rocks are not horizontal.
3. Therefore, these sedimentary rocks either were formed in special ways or were moved from their horizontal orientation by later events such as mountain building.

### **Logical Fallacies**

Many traps exist in induction and deduction for the unwary writer. When you fall into one of these traps, you have committed what logicians call a fallacy. Avoid a rush to either conclusion or judgment. Take your time. Don't draw inferences from insufficient evidence. Don't assume that just because one event follows another, the first caused the second—a fallacy that logicians call *post hoc, ergo propter hoc* ("after this, therefore, because of this"). You need other evidence in addition to the time factor to establish a causal relationship.

For example, tobacco smoking was introduced into Europe in the sixteenth century. Since that time, the average European's life span has increased severalfold. It would be a fine example of the *post hoc* fallacy to infer that smoking has caused the increased life span, which in fact probably stems from improvements in housing, sanitation, nutrition, and medical care.

Another common error is applying a syllogism backwards. The following syllogism is valid:

1. All dogs are mammals.
2. Jock is a dog.
3. Therefore, Jock is a mammal.

But if you reverse statements (2) and (3) you have an invalid syllogism:

1. All dogs are mammals.
2. Jock is a mammal.
3. Therefore, Jock is a dog.

Jock, of course, could be a cat, a whale, a Scotsman, or any other member of the mammal family. You can often find flaws in your own reasoning or that of others if you break the thought process down into the three parts of a syllogism.

## **COMPARISON**

In business and technical situations, you frequently have to choose between two or more alternatives. When such is the case, the method of investigating the alternatives will usually involve comparing the alternatives one to another. (Contrast is implied in comparison.) To be meaningful, the comparisons should be made by using standards, or criteria. Perhaps you have bought a car recently. When you did, you had to choose among many alternatives. In reaching your decision, you undoubtedly compared cars using criteria such as price, comfort, performance, appearance, gas mileage, and so forth. Perhaps you even went so far as to rank the criteria in order of importance, for example, giving price the highest priority and appearance the lowest. The more consciously you applied your criteria, the more successful your final choice may have been.

After you bought your car, no one asked you to make a report to justify your decision. However, in business it's common practice for someone to be given the task of choosing among alternatives. The completion of the task involves a report that states the decisions or recommendations made and justifies them. When such is the case, a comparison arrangement is a good choice. You can arrange comparison arguments by alternatives or by criteria.

### **Alternatives**

Assume you work for a health organization and that you are comparing two alternative contact lenses: daily wear and extended wear. Your criteria are cost, ease of use, and risk of infection. After the necessary explanations of the lenses and the criteria, you might organize your material this way:

- Daily wear
  - Cost
  - Ease of use
  - Risk of infection
- Extended wear
  - Cost
  - Ease of use
  - Risk of infection

In this arrangement, you take one alternative at a time and run it through the criteria. This arrangement has the advantage of giving the whole picture for each alternative as you discuss it. The emphasis is on the alternatives.

## Criteria

In another possible arrangement, you discuss each alternative, criterion by criterion:

- Cost
  - Daily wear
  - Extended wear
- Ease of use
  - Daily wear
  - Extended wear
- Risk of infection
  - Daily wear
  - Extended wear

The arrangement by criteria has the advantage of allowing sharper comparison. It also is advantageous for readers who read selectively. Not every reader will have equal interest in all parts of a report. For example, an executive reading this report might be most interested in cost; a consumer, in ease of use; an ophthalmologist, in risk of infection.

## TOULMIN LOGIC

When you construct an argument by yourself, it's difficult at times to see the flaws in it. When you expose the same argument to your friends, even in casual conversation, they, being more objective about it, can often spot the flaws you have overlooked. Toulmin logic provides a way of checking your own arguments for those overlooked flaws. It can also help you arrange your argument.<sup>7</sup>

### Applying Toulmin Logic

Because using Toulmin logic is a way of raising those questions readers may ask, its use will make your arguments more reader oriented. Toulmin logic comprises five components:

1. Claim: the major proposition or conclusion of the argument
2. Grounds: the evidence upon which the claim rests—facts, experimental research data, statements from authorities, and so forth
3. Warrant: justification for the grounds and what makes them relevant to the claim
4. Backing: further evidence for accepting the warrant
5. Rebuttal: counterarguments; exceptions to the claim, warrant, or backing; or reasons for not accepting them

Arguments are rather complex chains of reasoning in which you have to make the case not only for your claim but also for the grounds upon which the

claim is based. Toulmin logic helps you construct the chain. For an example, let's consider the greenhouse effect hypothesis.

### **Claim**

The accumulation of gases, particularly carbon dioxide (CO<sub>2</sub>), emitted from the burning of fossil fuels will trap heat in the atmosphere, which will cause global warming, resulting in droughts, severe storms, floods, and food shortages.

### **Grounds**

In past 100 years, CO<sub>2</sub> concentration in the atmosphere has risen from 270 parts per million (ppm) to 350 ppm. That this rise has been caused by the increased burning of fossil fuels seems indisputable. Various computer models predict global temperatures rising by as much as 4°C in the next 50 years.

### **Warrant**

The United Nations sponsored Intergovernmental Panel on Climate Change has reached the conclusion that "the balance of evidence suggests that there is a discernible human influence on climate."<sup>8</sup>

### **Backing**

The CEO of American Electrical Power has said that "It's clear to me that there is an increase in CO<sub>2</sub> that is probably not for the good, and we ought to do something about it."<sup>9</sup> In June 1992 the nations of the world at the Earth Summit conference in Rio de Janeiro signed a treaty that states a dangerous global warming has already started. In 1997 Europe, the United States, and Japan at an environmental conference in Kyoto, Japan, agreed to "reduce greenhouse emissions" beginning in 2008.<sup>10</sup>

Up to this point, the argument for the greenhouse hypothesis and its effects seems to be going well. But, if you dig further, you will find rebuttals.

### **Rebuttal**

Satellite and balloon measurements show no significant warming over the last 18 years. Harvard climatologist Brian Farrell says, "There really isn't a persuasive case being made" for the detection of greenhouse warming.<sup>11</sup> Climate modeler Max Suarez of the NASA Goddard Space Flight Center says that it is "iffy" to say if greenhouse warming has begun, "especially if you're trying to explain the very small [temperature] change we've already seen. I certainly wouldn't trust the [computer] models at that level of detail

yet.”<sup>12</sup> NASA records indicate that despite some recent violent hurricanes, the frequency and intensity of hurricanes are decreasing overall.<sup>13</sup>

And so on. Digging for evidence on the greenhouse effect shows a sharp division with reputable scientists coming down on both sides of the question. The claim has to be qualified, perhaps something like this: “Some scientific studies show a correlation between the rise of CO<sub>2</sub> in the atmosphere and global warming, but the evidence and methodology of such studies have not convinced all scientists that the results claimed are valid.” Applying Toulmin logic has resulted in a weaker claim, but it is a claim that can be supported with the existing evidence.

The following release from the U.S. Department of Energy shows the effect of the rebuttals. It deals with the rebuttal by acknowledging the possibility that influences other than human activity may be causing the earth’s temperature to vary. But its conclusion, favoring the theory that greenhouse warming is occurring, is qualified by the phrase “appears to be.”

Perhaps no single environmental issue is as complex or holds such potentially profound implications for the world’s inhabitants than the issue of global climate change.

There is little question that human activity is changing the make-up of the atmosphere that surrounds our planet. As world economies have become more industrialized over the last century, we have begun emitting more greenhouse gases into the air than natural processes can remove. Deforestation and clearing land for agriculture have accelerated the buildup of greenhouse gases in the atmosphere, both by releasing significant quantities of these gases and by reducing the capacity of green plants to absorb carbon dioxide, one of the chief greenhouse gases.

In 1995, a panel of more than 2,000 of the world’s top climate scientists concluded that the Earth was indeed warming and that the “balance of evidence suggests a discernible human influence” on climate. Yet, there are still large gaps in the scientific data. The warming in the last century—about 1 degree Fahrenheit—is still small enough to fall within the range of normal climatic changes for a planet that has fluctuated in and out of ice ages for at least the last 200,000 years. A small part of that single degree of warming may have come from variations in the sun’s intensity, which can raise or lower the Earth’s temperatures in ways not yet fully understood.

Nonetheless, the bulk of recent evidence—from rising sea levels and retreating glaciers to freak storms and floods—appears to be falling within the boundaries of scientists’ predictions of greenhouse warming.<sup>14</sup>

## Arranging Your Argument for Readers

You can use Toulmin logic to arrange your argument as well as to discover it. Though you would not want to follow Toulmin logic in a mechanical way, thinking in terms of claim, grounds, warrant, backing, and rebuttal can help you to be sure you have covered everything that needs to be covered.

Obviously, claim and grounds must always be presented. In most business situations, as we have pointed out, the claim is likely to be presented first, particularly in executive reports. However, in a situation in which the readers might be hostile to the claim, it may be preferable to reverse the order. If the grounds are strong enough, readers may be swayed to your side before they even see the claim. On the other hand, if a hostile audience sees the claim first, they may not pay enough attention to the grounds to be convinced.

Rebuttals should always be considered, and, if serious, they should be included in your presentation. You have an ethical responsibility to be honest with your readers. Furthermore, if your readers think of rebuttals you haven't responded to, it will damage your credibility. If you can counter the rebuttals successfully, perhaps by attacking their warrant or backing, your claim can stand. If you cannot counter them, you will have to qualify your claim.

How deeply you go into warrants and backing depends on your readers. If your readers are not likely to realize what your warrant is (for example, that respected scientists agree with this hypothesis), then you had better include the warrant. If your readers are likely to disagree with your warrant or discount its validity, then you had better include the backing.

All in all, Toulmin logic can be a considerable help in discovering and arranging an argument. It is also extremely useful in analyzing the soundness of other people's arguments.

## PLANNING AND REVISION CHECKLISTS

*You will find the planning and revision checklists that follow Chapter 2, Composing, and Chapter 4, Writing for Your Readers, valuable in planning and revising any presentation of technical information. The following checklists specifically apply to organizational strategies. As well as aiding in planning and revision, they summarize the key points in this chapter.*

### Planning

- What is your claim, that is, the major proposition or conclusion of your argument?
- What are your grounds? What is the evidence upon which your claim rests—facts, experimental research data, statements from authorities, and so forth?



- Do you need a warrant that justifies your grounds and makes them relevant?
- Do you need further backing for your grounds and warrant?
- Are there rebuttals—counterarguments; exceptions to the claim, warrant, or backing; or reasons for not accepting them? Can you rebut the rebuttals? If not, should you qualify your claim? Will you present your argument unethically if you do not state the rebuttals and deal with them honestly?
- Are you choosing among alternatives? If so, what are they?
- What are the criteria for evaluating the alternatives?
- Is your audience likely to be neutral, friendly, or hostile to your claim? If your audience is hostile, should you consider putting your claim last rather than first?

## **Revision**

- Is your claim clearly stated?
- Do you have sufficient grounds to support your claim?
- If needed, have you provided a warrant and backing for your grounds?
- Does any of your evidence cast doubt on your claim? Have you considered all serious rebuttals?
- Have you dealt responsibly and ethically with any rebuttals?
- Have you remained fair and objective in your argument?
- Have you presented evidence for causality beyond the fact that one event follows another?
- If you have used deductive reasoning, can you state your argument in a syllogism? Does the syllogism demonstrate that you have reasoned in a valid way?
- Is your argument arranged so that it can be read selectively by readers with different interests?

## **EXERCISES**

1. Write a memo to an executive that recommends the purchase of some product or service the executive needs for the conduct of his or her business. Your memo should establish criteria and justify choosing the product or service you recommend over other alternatives. See Letter and Memorandum Format in Appendix B. for information on memo format.
2. Your new boss on your first job knows how important it is for the organization to stay aware of trends that may affect the organization. He or she asks you to explore such a trend. The possibilities are limitless, but you may be happier exploring some trend in your own field. For example, are you in computer science? Then you might be interested in the latest trends in artificial intelligence. Are you in forestry? Trends in the use and the kinds of wood products might interest you. Develop a claim about the trend, for example:

- If trend A continues, surely B will result.
- Trend A will have great significance for X industry.

Support your claim with a well-developed argument that demonstrates your ability to use induction, deduction, and Toulmin logic. Write your argument as a memorandum to your boss. See Letter and Memorandum Format in Appendix B. for information on memo format.

3. You are a member of a consulting firm. Your firm has been called in to help a professional organization deal with a question of major importance to the members of the organization. For example, nurses have an interest in whether nurses should be allowed to prescribe medication and therapy. You will probably be most successful in this exercise if you deal with organizations and questions relevant to your major. Investigate the question and prepare a short report for the executive board of the organization. Your report should support some claim—for example, nurses should be allowed to prescribe medication and therapy. Use Toulmin logic in discovering and presenting your argument. That is, be aware of the need to provide grounds, warrants, backings, and qualifiers. Anticipate rebuttals and deal with them ethically and responsibly. Use Appendix B for help with format and documentation.
4. You are the scientific adviser for a newly elected congressman from your home district. He has a college degree in history and is a self-avowed scientific illiterate (which is why he has hired you).

He says to you, “I need to have a position on global warming. Is it or isn’t it happening? If it is happening, how serious is it? Write a position paper on the subject for me. Take a strong stand and defend it, but do it ethically and in language I can understand.”

Write the position paper the congressman has requested. Use both Internet and print sources. Document your paper. See Appendix B for help with format and documentation.

### **FIGURE 10-1 • Argument Arrangement Chart**