Earth's Atmosphere. 16 July 1987. Washington, DC: U.S. Government Printing Office.

WMO (World Meteorological Organization), 1979: *World Climate Conference*. Extended summaries of papers presented at the conference (Geneva, February 1979). Geneva, Switzerland: WMO.

WMO (World Meteorological Organization), 1986: *Report of the International Conference on the Assessment of the Role of Carbon Dioxide and of Other Trace Gases in Climate Variation and Associated Impacts* (Villach, Austria, 9–15 October 1985). WMO Report 661. Geneva, Switzerland: WMO.

WMO (World Meteorological Organization), 1988: *Developing Policies for Responding to Climate Change*. A summary of the discussions and recommendations of the workshops held in Villach (26 September–2 October 1987) and Bellagio (9–13 November 1987). WMO/TD–No. 225. Geneva, Switzerland: WMO.

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Grappling for a Glimpse of the Future

Dale Jamieson

INTRODUCTION

Most of us are interested in knowing the future. We want to know the future in order to control it. We want to control the future in order to benefit from it, or to mitigate or avoid harms that we would otherwise suffer. As Francis Bacon wrote in the sixteenth century, "knowledge itself is power" (Passmore, 1974, 18).

Throughout history, many methods have been employed for trying to glimpse the future. These methods have ranged from reading tea leaves to running computer models. Not all of these methods have been equally honored, however. The ancient Hebrews regarded fortune-telling as a sin against God, while holding that prophecy is one of God's greatest gifts. Our current cultural demarcation between honored and dishonored ways of trying to glimpse the future can be seen in the following news report from St. Augustine, Florida.

> An ordinance that outlaws predicting the future for pay should be rewritten because it might apply to doctors and stock brokers, as well as targeted palmists....

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> "We have made it illegal in the city to predict the future for compensation," said Dobson [the city attorney] ... the ordinance could apply to "the account executive ... who thinks tomorrow Ford (stock) will go up." (Associated Press, 1987)

The methods of doctors and stock brokers are honored ways of trying to glimpse the future, while those of palmists are not.

Among the most honored ways of trying to glimpse the future is scientific forecasting (or "futurology"). Futurologists give us long-term predictions about economic cycles, food production, energy supplies, the likelihood of war, and more. Some even speculate on the very fate of the earth.

Scientific forecasting is supposed to be different from fortune-telling, and from just plain guessing. In some ways it is. Scientific forecasting employs computers, manipulates large data sets, and enjoys the respectability conferred by science. Yet in other ways scientific forecasting, at least in areas which involve human behavior, does not seem much different from fortune-telling. Consider, for example, the fate of macroeconomic forecasts in the first half of the 1980s.

> The final issue of *Business Week* provides some casual, but revealing, information on the predictive performance of the major modelling services over the previous year.... The December 28, 1981, issue offers a brief column entitled "How the Forecasters Went Wrong in 1981," and this should have been taken as a disclaimer for the feature story, "Scanning a Brighter but Hazy Future." The "brighter future" for 1982 turned out to be the most severe recession of the post-World War II period.... At the end of 1982 we had "Why the Forecasters Really Blew It in 1982" and the main fare offered "Slow Motion Recovery..." as a prediction for 1983. Growth in real GNP for 1983 turned out to be a robust 6.5 versus an average prediction from the models of only 3.7 percent (McNown, 1986, 363).

It is not surprising that some see the distinction between futurologists and palm readers as a distinction without a difference. According to Lester Thurow, "futurology is the intellectual's version of going to a palm reader" (Traub, 1979, 24).

This volume is directed toward glimpsing the future. In particular we are concerned to give plausible answers to the following complex question: How are humans likely to respond to environmental changes at the regional level brought about by a carbon dioxide/trace-gases-induced global warming?

In this chapter I will sketch some aspects of an approach to developing plausible answers to this question. This approach, employed by most of the contributions to this volume in varying degrees, is referred to as the *Case Scenario Approach* (CSA). Before sketching the CSA, I will try to explain why I think scientific forecasting may not be a promising approach to developing answers to our question.

SCIENTIFIC FORECASTING

Scientific forecasting in climatology depends on large-scale computer models called General Circulation Models (GCMs). Existing GCMs are inadequate in many ways. One important problem concerns lack of resolution: they cannot support reliable predictions of precipitation and temperature at the regional or seasonal level (Wigley et al., 1986, 287). In addition, existing GCMs focus on mean values. They can tell us how different inputs into the atmospheric system may affect mean temperature and precipitation. Yet for many purposes, information about climate variability may be more important than information about mean values.

There are further problems that must be solved if GCMs are to be significantly more helpful in forecasting climate change (see also Katz, this volume). It is often thought that climatic events that are unprecedented in the historical record are evidence of climate change. Yet such events may instead be testimony to the inadequacy of the historical record. Extreme events can be due to variability that is part of a long-term stable climate regime. Because of the shortness of our time horizon and our failure to pay enough attention to variability, we may sometimes mistake variability for climate change. Moreover, it is conceptually unclear how climate change can be distinguished from variability. Claims about climate change are made relative to some time frame, and there is no widely accepted theory about what time frames should be preferred. Not enough attention has been paid to this problem, yet predictions of climate change and societal and environmental

responses to them rest on our ability to distinguish real change from variability.

Models have their strengths as well as their weaknesses. If they are not used in mindless or derivative ways, they force us to be clear about our assumptions. Rather than remaining tacit and unacknowledged, assumptions must be made explicit if they are to figure in a computer model. In addition, because the computers employed in these modeling efforts are so powerful, they can show us consequences of our assumptions that otherwise might remain hidden. Finally, although GCMs are not advanced enough to support detailed predictions, they do help illuminate interactions between different elements in the climate system. For this reason GCMs can be used to perform a function that is analogous to sensitivity analysis. Models can help us see the range of possible climatic changes. They can also show how sensitive these changes are to shifts in various inputs and relationships.

However helpful computer models may be, it is unlikely that scientific forecasting will be able to produce good answers to our question. Our question—How are humans likely to respond to the regional impacts of a global warming?—is difficult to answer for many reasons. One reason is that good answers will involve data from both the physical sciences and the human sciences. Scientific forecasting is most at home in the physical sciences where causal laws can be framed that support deterministic predictions. There is increasing agreement among philosophers and reflective methodologists that attempts to model the human sciences on this conception of the physical sciences have largely failed (Fiske and Shweder, 1986). Indeed some have argued that such attempts are doomed from the outset (Popper, 1957; Winch, 1958; Roth, 1987).

The question that we are dealing with is even more complex than many other questions that arise in the human sciences. If global warming is now occurring, it is not just something that is happening *to* people: People are implicated in bringing it about. In response to global warming, we can expect various modulations of human behavior. These modulations will in turn affect atmospheric conditions, and this in turn will affect human behavior, and so on. One consequence of this feedback between human behavior and atmospheric conditions is that in order to answer our question, we must gain some insight into the interactions between

climate and behavior. Rather than being an "impacts" study, such projects might better be viewed as a study of the interactions between climate and human behavior.

Although scientific forecasting does not provide a promising approach to answering our question, research with climate models is important. The present-day scientific consensus presupposes that global warming is in fact occurring, and much of the evidence for this involves research with climate models. If we are to understand human responses to global warming, however, we must go beyond what we can learn from the models.

THE CONCEPT OF A SCENARIO

In the previous section I tried to explain why scientific forecasting is not likely to give us plausible answers to the question we are addressing. In this section I will develop one of the fundamental concepts involved in the CSA: the concept of a scenario. The CSA is devoted to constructing scenarios about human responses to global warming, based on analogies with other cases of human responses to recent extreme or prolonged environmental changes. It is important to be clear about what scenarios are.

The notion of a scenario is widely used in the climatological literature. Unfortunately, it is often used in a vague or misleading way. The concept of a scenario is a rich one, and of great utility in a number of different areas of investigation.

The *Oxford English Dictionary* defines "scenario" as "a sketch or outline of the plot of a play, giving particulars of the scenes, situations, etc." The *Random House College Dictionary* supplies a second sense: a scenario is "an outline of a natural or expected course of events." These definitions suggest two characteristics of scenarios that are worth considering.

First, scenarios are sketches or outlines of stories rather than abstract sets of statements or propositions. Scenarios are narratives that typically have beginnings, middles, and ends. They are constructed in order to serve some purpose, and they are told from a point of view. They bring together diverse information, and engage our imagination.

Second, scenarios about the future are stories about a natural or expected course of events. They are not predictions, nor are they fantasies; they are plausible stories. Forward-looking sce-

narios are intended to be useful, and to fulfill this function they must focus on past or present facts, activities, trends, tendencies, or dispositions, and extrapolate them into the future. A scenario need not be true in order to be useful. There may be a number of different ways that the future could go, each of which can reasonably be seen as "natural" or "expected." A single person may imagine several plausible futures, and different people may have different conceptions, all reasonable, of what constitutes a "natural" or "expected" course of events. A multiplicity of plausible yet mutually inconsistent scenarios reflecting these facts may be useful in guiding our thinking about the future.

Like other stories, scenarios can be constructed from a variety of materials. Myths, legends, and anecdotes can all provide the makings of scenarios. So can historical facts, the results of sociological research, and the outputs of computer models.

Climatologists often distinguish two kinds of scenarios: those based on GCMs and those based on historical analogues. Although both GCMs and historical analogues can provide the makings of scenarios, there is nothing about these sources themselves that ensure that what is based upon them are scenarios. GCMs typically are used to produce abstract characterizations of future states of the atmosphere. These are not, strictly speaking, scenarios; and we have already discussed their shortcomings with respect to answering the question that concerns us. The search for historical analogues is in the spirit of the CSA, but it may not yield scenarios, and this approach has some other serious shortcomings that shall be discussed later in the section "Traps and Pitfalls."

The CSA, like the search for historical analogues, relies on analogy. Before considering the advantages and disadvantages of the CSA it is important to get clear about the nature of analogical reasoning, the engine that drives the CSA.

ANALOGY AND SCENARIO CONSTRUCTION

The CSA relies on analogical reasoning in the following way. A speaker claims that some actual case X is analogous to a hypothetical case Y with respect to some set of characteristics. On the basis of these characteristics, a story is told about Y that is projected from the story of X.

This volume reports a number of actual cases. For example, stories are told about human responses to decreasing ground water levels in the Ogallala Aquifer region, and increasing water levels in the Great Lakes, the Great Salt Lake, and in the coastal regions of Louisiana (Wilhite, Cohen, Morrisette, and Meo, respectively, this volume). In each case what is attempted is to identify some important respects in which the cases are analogous to ways that societies might respond to environmental changes in a warmer world.

These analogies work at different levels. In some cases analogies are drawn between physical changes that have occurred, and those that might result from global warming, for example sea-level rise and coastal subsidence in Louisiana (Meo, this volume). In other cases the analogies are on the social side, for example drought in northern Virginia (Sheer, this volume). In these cases people and institutions respond analogously in both the actual and hypothetical cases, although the character of the physical changes to which they are responding is quite different.

Viewed abstractly, this sort of scenario construction may seem very complex. In a way it is. Yet it is easier to construct plausible scenarios based on analogy in particular cases than it is to generalize methods for doing so.

Recently there have been some attempts to formalize analogical reasoning. Skorstad et al. (1987) have developed a computer program that is supposed to sort sound analogies from unsound ones. They assume that sound analogies are those based on common causal or structural elements, and unsound ones are those based on appearance or other superficial properties. A proposed analogy between the solar system and an atom would be sound, while a proposed analogy between a blade of grass and a house would be unsound.

This will not do, however. The proposed analogy between the solar system and an atom would fail if what we were focusing on was an electron's ability to jump orbits, or the fact that planets often have satellites. On the other hand the proposed analogy between a blade of grass and a house might succeed in the context of a discussion about color. A house may have more in common with a tent or a Winnebago with respect to its causal and structural properties, but this is not sufficient for supposing that an anal-

ogy between houses and tents is always sound while an analogy between houses and blades of grass is always unsound. Pragmatic considerations, such as context, are very important.

The proposal of Skorstad et al. (1987) does not take pragmatic considerations into account. Its failures are inherent in any purely structural approach to analogical reasoning. We can begin to see this by comparing analogical reasoning with deductive reasoning.

Consider the following deductive argument: If P then Q, P therefore Q. This argument is valid in a straightforward sense: Any case in which the premises are true is one in which the conclusion is true as well. Instances of this argument are sound when the premises are true.

Consider the following analogical argument: X is analogous to Y, Y has property a, therefore X has property a. This argument is not valid. In some cases true premises lead to a true conclusion, but in some cases they do not. Consider the following example.

> Teaching is analogous to picking fruit.
> Picking fruit involves long hours and low pay.
> Therefore, teaching involves long hours and low pay.

In this case the premises are true, and so is the conclusion. But consider another argument of the same form.

> Teaching is analogous to picking fruit.
> Most of those who pick fruit are undocumented workers.
> Therefore, most of those who teach are undocumented workers.

In this case the premises are true but the conclusion is false. These examples show that analogical arguments are not formally valid. Unlike deductive reasoning, for analogical reasoning to be acceptable other considerations besides formal validity must be involved.

One reason why it is difficult to assess analogical reasoning is that everything is analogous to everything else in some respect or other. Computers and coffee grinders are analogous in that both are machines. Long's Peak and Picasso's *Guernica* are analogous in that both are physical objects.

It might be thought that similarity-counting is a way out of this difficulty. Sound analogies, it might be suggested, are

those drawn between things which share many properties. Unsound analogies are those drawn between things which share few properties. Unfortunately this suggestion will not work. Goodman (1972) has shown that by employing some logical "tricks" it can be demonstrated that any two objects have an indefinite number of similarities.

Good analogical reasoning does not concern the number of similarities two objects share, but rather the significance of the similarities. Good analogical reasoning fixes on important similarities, the contemplation of which supports correct inferences and interesting insights. Identifying important similarities involves pragmatic considerations regarding contexts, interests, and purposes. These considerations cannot be taken up in any purely structural account.

The assessment of analogical reasoning is difficult at best. Perhaps that is why the SCOPE report on the "greenhouse effect" (Bolin et al., 1986) discusses climate analogues but does not directly address analogical reasoning. Perhaps the thought is that identifying analogues is more scientifically respectable than reasoning by analogy.

If we are told that X is an analogue of Y, this suggests that being an analogue of Y is a property that X has. By investigation we can discover that X has this property. Analogical reasoning, on the other hand, is something that people do. Analogues are discovered while analogies are proposed. The surface grammar suggests that analogues are somehow "in the nature of things" while analogies are conjectures put forward by speakers (for the distinction between surface grammar and deep structure see Chomsky, 1965). This is deceptive, however. Analogues are nothing more than reified analogies. Analogues are what speakers claim are analogous to something else. Since the language of analogues suppresses reference to the reasoner, it may appear to be more "scientific" and less "subjective." Grammatical suppression does not alter the substance of the matter, however. Analogues are established by people engaged in analogical reasoning. "Subjectivity" is as present in the discussion of analogues as it is in analogical reasoning.

It is difficult to frame general principles for assessing sound analogical reasoning. For this reason no formal procedure can be given for constructing plausible scenarios based on analogy. Still

in this area, as in so many others, our inability to generalize a method does not impair our ability to find our way with particular cases.

In the next two sections some of the problems and prospects of the case scenario approach will be discussed. Some of these primarily concern analogical reasoning, while others mainly concern scenario construction. Since both are involved in the CSA, I will not try to separate out various concerns. Moreover, since I cannot claim to offer an algorithm for constructing scenarios based on analogy, what I have to say should be construed as (hopefully helpful) advice.

ADVANTAGES OF THE CASE SCENARIO APPROACH

The advantages of the CSA over other approaches have been hinted at, but now it is time to make them explicit. There are four advantages that I will discuss. These concern wealth of detail, integration of a broad range of knowledge, multiplicity of perspectives, and communicability and usability.

Wealth of Detail

Whatever the future is like, it will be just as specific and detailed as the present. When we wake up in the morning, and get ready for work, our thoughts and actions will be affected in various ways, both gross and subtle, by climatic conditions. Our attempts to anticipate the ways in which this will be so will be more successful if we can in some way capture the texture and detail of the life we may lead. The best way of doing this is through stories rather than predictions or speculations that are in the form of abstract sets of sentences. Indeed, it has been claimed by some that "we have no other way of describing 'lived time' save in the form of narrative" (Bruner, 1987, 12; see also Ricoeur, 1984).

A story conjures up a complete world. It presents us with a slice of the life that is led in that world. The teller of the tale may not say everything we want to know, but we can be sure that at least some of our questions have answers. In some cases we may have no idea what they are, while in other cases plausible answers are suggested by what is said. Stories are about worlds, but they do not wholly constitute them. The contours of the story should not be mistaken for the contours of the world.

Consider an example. There are details about James Bond that Ian Fleming does not relate. Yet Fleming's portrait of Bond is sufficiently rich for us to identify plausible answers to some unanswered questions, while rejecting other answers as implausible. Bond is not a devout Catholic nor is he an active member of the communist party. He does not have a disfiguring scar on his face nor is he sickly and sallow in appearance.

The information contained in the stories we construct about human responses to global warming will outrun what can be obtained by mapping analogies between the cases and the stories. The case studies, which are stories of real events, are rich enough to permit us to fill in the missing pieces in our scenarios about the future. Scenario construction involves projection. It is this projection in narrative form which gives scenarios their wealth of detail.

Integration of a Broad Range of Knowledge

The question we are trying to answer is a very broad one. Human responses to global warming may range from modifications of individual behavior, to new developments in international law. Virtually everything which can affect, or be affected by, human behavior bears on this question.

Scenarios are tightly woven and finely textured, at least compared to abstract sets of sentences and arrays of quantitative data. Although a story can be constructed by extrapolation from some single (or few) isolated trend(s), the resources of narrative permit the telling of more complex tales. A scenario can integrate different trends and tendencies and illuminate their interactions (Martino, 1983, 148). For this reason a good scenario can give us a feel for what life in the future might be like, and make vivid for us what effect on everyday life various possible solutions may have. Good scenarios engage our imagination, and help us break through the constraints enmeshed in our methodologies and enshrined in our systems of representation and expression.

One special advantage of stories is that they can incorporate knowledge and belief that we would have a very difficult time making explicit. It is a challenge for any sort of cognitive activity to figure out how to employ knowledge that cannot be made explicit. Since computer models are constituted by and operate on explicit

statements, they have no way of employing inexplicit knowledge. This has been one of the great stumbling blocks in the development of artificial intelligence (Dreyfus, 1985).

Scenarios bring inexplicit background knowledge into play in a number of ways. Our judgments that particular scenarios are implausible, far-fetched, or totally wild, often rest on inexplicit background beliefs. Once these judgments have been made, sometimes the inexplicit beliefs can be made explicit and evaluated accordingly. Aspects of plausible scenarios may also draw on inexplicit beliefs about the future. Thinking about a particular case may move us to a future scenario in a way that might be described as "intuitive." Still there may be nothing mystical or unscientific about this. We may be exploiting relationships between the terms of the analogy that we cannot make explicit.

Multiplicity of Perspectives

Scenarios are stories. They are told by different tellers from different perspectives for different purposes. Burke (1945) provides a structure which may help us see how a multiplicity of stories can arise. (For a somewhat different analysis, focusing on "doomsday" stories, see Krieger, 1987).

According to Burke, stories involve at least the following elements: an agent, an action, a goal, a setting, and an instrument. The telling of a story is motivated by a trouble. A trouble arises when there is a lack of fit between two or more elements of the story; for example, an agent is not at home in a setting, or the instrument at hand is not suitable for achieving some stated goal (see also Bruner, 1987).

Stories about human responses to global warming can be told from the point of view of a number of different agents: individuals as producers, consumers, or householders; collectives such as neighborhoods, communities, towns, businesses, unions, or clubs; governments at the local, state, or federal levels. The actions are whatever is bringing about global warming and what is being done in response to it. The setting is the planet Earth and its resources. Reasonable people have very different views regarding the action and the setting. The goal could be prevention, mitigation, or adaptation. The instruments are the policies or behaviors that are available for trying to realize the goal. These range from doing nothing to imposing various informal or formal sanctions or incentives.

When the structure of a story is laid out in this way, it is easy to see how a multiplicity of stories can arise, each with its own claim to plausibility. We are therefore able to tell a number of different stories, each individually plausible, yet collectively inconsistent.

This can be valuable for a number of reasons. By inviting a multiplicity of stories we can gain a number of different glimpses of the future. Taken together, a multiplicity of scenarios may provide a much richer picture of the future than any single scenario. Different scenarios may illuminate different features of the future. Or we might see inconsistent scenarios converging on a similar future, or similar scenarios suggesting very different futures. Since scenarios are not predictions, we are not compelled to search for *the* single "right" scenario among the many that might be produced. ***When it comes to scenario construction, a multiplicity of collectively inconsistent scenarios is a resource rather than a weakness.***

Communicability and Usability

The scenarios that are the output of the CSA are usable for policy purposes in ways that other kinds of technical reports often are not. Predictions, charts, graphs, and computer projections do not in themselves lead to understanding or provide guides for action, however precise and accurate they may be. Appropriately, there is massive anecdotal evidence for the conclusion that decisionmakers often act on the basis of an especially moving story, even if the story is uncharacteristic and the decision appears to be insensitive to well-documented facts (Bruner, 1987; Martino, 1983, 148; Neustadt and May, 1986; Tversky and Kahneman, 1986).

We can see in our own lives how much we have been influenced by stories. For example, we learn not to lie from the story of George Washington and the cherry tree, and we learn to be persistent from the story of the tortoise and the hare. Stories can convey values as well as facts, and integrate them in ways that invite reflective judgment.

Stories are also conducive to communication. Because quantitative data carry the aura of authority, they often seem to quash discussion rather than stimulate it. This is especially unfortunate when we are concerned with complex problems the parameters

of which are very uncertain. Stories, on the other hand, invite question and discussion. Different stories about how the future might go represent different points of view. When these stories are brought into conversation they can shape and modify each other. We often have less resistance to appreciating a story than to appreciating an argument or assertion. Yet appreciating a story that is different from the one we would tell involves understanding another point of view. This characteristic of scenarios has made them popular in business for purposes of mediation and long-range planning (Huss and Horton, 1987).

TRAPS AND PITFALLS

There are dangers to be avoided when using the case scenario approach. I will discuss three: lack of definition, straining an analogy, and failure of an analogy.

Lack of Definition

Stories are told by a teller, from a point of view, in order to serve a purpose. It is important that we are very clear about why we are constructing scenarios, and how we want them to be used. This is especially true when constructing scenarios based on analogy. Analogical reasoning is, as I have suggested, extremely pragmatic in that its soundness is dependent on context and interests. Everything is analogous to everything else, in some respect, from some perspective. It is important for us to be clear about why we are privileging some respects and perspectives.

It is clear at the outset that our investigation presupposes that global warming is a problem. This suggests (following Burke, 1945) that there is a lack of fit between an agent, an action, a goal, a setting, or an instrument. Perhaps our actions do not conduce to our goals, or our goals are not consistent with our setting. There are other ways as well in which trouble could arise.

In this case the nature of the problem is suggested by the metaphor that is commonly used to characterize global warming: "the greenhouse effect." As the earth warms it will be as though we are trapped inside of a greenhouse. This way of setting the problem also suggests some solutions: prevent the greenhouse from being constructed, figure out how to let the heat escape, develop some way of cooling the greenhouse, or learn to live in greenhouse conditions.

There is nothing wrong with viewing global warming as a problem, and metaphorically identifying it with the problem of being trapped in a greenhouse. What is important is that we recognize this as one way of thinking about global warming, and that we are convinced that this is a good way of thinking about it (for additional discussion of the use of this metaphor, see Glantz, this volume).

This is especially important when our problem-definition is established by a metaphor. Recent research suggests that metaphors deeply affect the way we perceive, think, and act (Lakoff and Johnson, 1980; Johnson, 1987; Lakoff, 1987). Metaphors can be helpful in guiding our thinking, but they can also obscure and obfuscate alternative ways of looking at a situation. Sometimes we begin with an apt metaphor, and then later hear it as a literal description. We come to think that reality is exhausted by the content of our metaphor.

An example of an area in which a bad metaphor has misled discussion is fiscal policy (McCloskey, 1986). We tend to identify the national budget with a family budget, and to view the significance of a deficit as being the same in both cases. Yet the consequences of a government deficit, and the alternatives available for responding to it, are very different than in the case of families.

A scenario embodies a particular way of viewing a situation. It is important that we characterize the situation carefully, and that we are very clear about what we want to do with our scenarios.

Straining an Analogy

A good analogy will do a lot for us, but there are some things it cannot do while retaining its virtue. As we have seen, constructing scenarios on the basis of analogy involves projecting beyond the points of one-to-one correspondence. Sometimes the projection is a matter of "filling in" in a fairly natural way. Sometimes it involves extending the story in ways that are more imaginative, but still grounded in the analogy. Other times, however, we find ourselves spinning important parts of the story out of whole cloth. When this occurs, the analogy is being strained.

Consider the following example of a strained analogy (see Scriven, 1976, 213). During the Watergate Hearings, John Erlichman was asked why burglarizing the office of Daniel Ellsberg's psychiatrist was regarded by the Nixon White House as an appropriate tactic in their efforts to silence Ellsberg. Erlichman responded with an analogy. Suppose that you have discovered that there is a map in a safety deposit box, showing the location of an atomic bomb that will explode tomorrow in downtown Washington. Wouldn't it be right for you to break into the bank vault? Similarly, Erlichman suggested, it was appropriate to break into the office of Ellsberg's psychiatrist.

There are some points of analogy between these two cases. In both cases the actor will suffer bad consequences unless the action is undertaken. In both cases there seem to be no other alternatives open to the actor to prevent these consequences. Despite these points of analogy there are important differences in these two cases. In the atom bomb case the stakes are very much higher than in the Ellsberg case. Moreover, in the atom bomb case, the bad consequences would be caused by an act of gratuitous violence, and would be suffered by innocent people. In the Ellsberg case the bad consequences would be suffered by those of questionable innocence, and would be caused by acts of political dissent. These differences are so significant that it is reasonable to say that the analogy between these two cases has been strained.

Sometimes it is hard to tell when an analogy is being strained. When we are focusing on global warming, for example, our reading of other cases is conditioned by our interests. Disanalogies tend to be ignored in favor of points of analogy. This is virtually unavoidable, and indeed, without such selective reading, the case scenario approach would be impossible. Analogy, after all, is not identity. Still, interesting cases are very complex and extremely rich. One and the same case can be analogous to many different cases. It is important that, in our eagerness to find interesting analogies, we do not ignore important points of disanalogy.

Failure of Analogy

Sometimes we are tempted to force analogies between what we know and what we are confronted with. It has been persuasively argued that succumbing to this temptation is often an important reason why social policy goes wrong. During the Vietnam War, for example, American decisionmakers tended to see the Vietnamese as analogous to the Nazis in the threat they posed to American interests and in their willingness to wage a wider war. Consequently a negotiated settlement with the Vietnamese was seen as capitulation to an insatiable aggressor: It would be another "Munich" (Neustadt and May, 1987).

In the area of human response to climate change, analogies may fail for a number of different reasons. I will discuss three.

Proposed historical or cross-cultural analogies sometimes fail due to significant differences in technological possibilities. It has been suggested that the Medieval Warm Epoch (c. 800–1200 A.D.) is analogous to the climate regime that we will face in case of global warming (Bolin et al., 1986, 288). Although this proposed analogy may be useful for some purposes, it is doubtful that we will be able to learn much about possible human responses to global warming from an account of how people responded in the Medieval Warm Epoch. The technological possibilities for response that we have today are much different than those that were available a millenium ago.

A second reason why analogies can fail is due to differences in political and social organization. Our society has institutions devoted to responding to emergencies. A society that failed to have such institutions, or one that was much more highly organized in this respect, might be importantly disanalogous to us in ways that would matter.

A third reason why analogies fail is due to different informational positions. Suppose that some society, virtually like ours in many important respects, faced some environmental changes similar to those that we will face in the near future. If their information about these changes was radically better or worse than ours, analogies between their responses and ours could be wholly inappropriate.

CONCLUSION

Good scenarios about various subjects are found in a broad range of different literatures: novels, histories, anthropological, geological, and biological accounts. These scenarios are based on a wide variety of sources. Some of the most useful scenarios of our time have been produced by writers as diverse as Darwin and Brecht. The case scenario approach constructs scenarios on the basis of analogies. It is one way of grappling for a glimpse of the future.

As I have described this approach it may sound more like science fiction than science. In some ways it is like science fiction: Science fiction involves scenario construction, and good science fiction is plausible and insightful. Scenarios can vary, however, in their level of abstraction and detail. A good scenario concerning global warming may be more like the "small" stories embedded in everyday discourse than like a Russian novel.

Still, we should not object to the close relationship between the CSA and literature. For the affinities between them do not undermine the CSA's scientific standing. Scientific thought, from its very origins, has often moved in metaphor. Newtonian space, for example, has been thought of as being like a container, and Newtonian time as flowing like a river. With the advent of relativity theory the metaphors and analogies changed. The notion of "curved" space-time is constructed by analogy with curves on two-dimensional planes. Stories about trains and travelers have been important in explanations of relativity theory. In general, scientific discourse is replete with metaphors and analogies that we would be hard put to eliminate (Gentner, 1982; Hesse, 1966; Hoffman, 1980; Jones, 1982). Indeed, scientific writing may be closer to story-telling than many have thought. Perhaps reports of scientific research are suppressed narratives, with many of the same features as other narratives in other genres. Perhaps some of the significance of climate models rests implicitly on their evoking stories about what it would be like to live in worlds with different climates.

These speculations may be extreme. Ultimately, the viability of the case scenario approach does not rest on the truth of the scenarios. What matters in assessing the CSA, or any method, is whether or not it contributes to our understanding of the phenomena under investigation.

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REFERENCES

Associated Press, 1987: Law against predicting future causes confusion. *Daily Camera*, 28 February, A6.

Bolin, B., R.D. Döös, J. Jäger, and R. Warrick (Eds.), 1986: *The Greenhouse Effect, Climatic Change, and Ecosystems.* SCOPE 29. New York, NY: John Wiley and Sons.

Bruner, J., 1987: Life as narrative. *Social Research, 54*, 11–32.

Burke, K., 1945: *The Grammar of Motives.* New York, NY: Prentice-Hall.

Chomsky, N., 1965: *Aspects of the Theory of Syntax.* Cambridge, MA: MIT Press.

Dreyfus, H., and S. Dreyfus, 1985: *Mind over Machine: The Power of Human Intuition and Expertise in the Era of the Computer.* New York, NY: MacMillan.

Fiske, D.W., and R.A. Shweder, 1986: *Metatheory in Social Science: Pluralisms and Subjectivities.* Chicago, IL: University of Chicago Press.

Gentner, D., 1982: Are scientific analogues metaphors? In D.S. Miall (Ed.), *Metaphor: Problems and Perspectives.* Atlantic Highlands, NJ: Humanities Press, 106–32.

Goodman, N., 1970: Seven strictures on similarity. In *Problems and Projects.* Indianapolis, IN: Hackett Publishing Company, 437–46.

Hesse, M.B., 1966: *Models and Analogies in Science.* Notre Dame, IN: Notre Dame University Press.

Hoffman, R.R., 1980: Metaphor in science. In R. Honeck, and R.R. Hoffman, (Eds.), *Cognition and Figurative Language.* Hillsdale, NJ: Lawrence Erlbaum Associates, Inc., 393–423.

Huss, W.R., and E.J. Horton, 1987: Alternative methods for developing business scenarios. *Technological Forecasting and Social Change, 31*, 219–38.

Johnson, M., 1987: *The Body in the Mind.* Chicago, IL: The University of Chicago Press.

Jones, R.S., 1982: *Physics as Metaphor.* New York, NY: New American Library.

Krieger, M.H., 1987: The possibility of doom. *Technology and Society, 9*, 181–90.

Lakoff, G., 1987: *Women, Fire, and Dangerous Things: What Categories Reveal About the Mind.* Chicago, IL: University of Chicago Press.

Lakoff, G., and M. Johnson, 1980: *Metaphors We Live By.* Chicago, IL: University of Chicago Press.

Martino, J.P., 1983: *Technological Forecasting for Decision Making.* Second Edition. New York, NY: Elsevier Science Publishing Co.

McCloskey, D.N., 1986: *The Rhetoric of Economics.* Madison, WI: University of Wisconsin Press.

McNown, R., 1986: On the uses of econometric models: A guide for policy-makers. *Policy Sciences, 19*, 359–80.

Neustadt, R.E., and E.R. May, 1986: *Thinking in Time: The Uses of History for Decision-Makers.* New York, NY: Free Press.

Passmore, J., 1974: *Man's Responsibility for Nature: Ecological Problems and Western Traditions.* New York, NY: Charles Scribner's Sons.

Popper, K., 1957: *The Poverty of Historicism.* New York, NY: Harper and Row.

Ricoeur, P., 1984: *Time and Narrative.* Chicago, IL: University of Chicago Press.

Roth, P., 1987: *Meaning and Method in the Social Sciences.* Ithaca, NY: Cornell University Press.

Scriven, M., 1976: *Reasoning.* New York, NY: McGraw-Hill Book Company.

Skorstad, J., B. Falkenhainer, and D. Gentner, 1987: Analogical processing: A simulation and empirical corroboration. In *Proceedings of the AAAI-87, The Sixth National Conference on Artificial Intelligence*, 369.

Traub, J., 1979: Futurology: The rise of the predicting profession. *Saturday Review*, December, 24–32.

Tversky, A., and D. Kahneman, 1986: Judgements under uncertainty: Heuristics and biases. In H.R. Arkes, and K.R. Hammond (Eds.), *Judgement and Decisionmaking.* Cambridge, UK: Cambridge University Press, 38–55.

Wigley, T.M.L., P.D. Jones, and P.M. Kelly, 1986: Empirical climate studies. In B. Bolin, D. Döös, J. Jäger, and R. Warrick (Eds.), *The Greenhouse Effect, Climatic Change, and Ecosystems.* SCOPE 29. New York, NY: John Wiley and Sons, 271–322.

Winch, P., 1958: *The Idea of a Social Science.* London, UK: Routledge and Kegan Paul.