Chapter 1

Portraits of the past

The Pacific Ocean covers one-third of the surface of the earth. Thousands of islands are scattered over this vast and sometimes fatal expanse of water, shifting winds, and strong currents. There are people living on hundreds of these islands. Generations ago their forefathers greeted the first European explorers to reach the Pacific. Somehow the islands of the South Seas had been found and colonized by men and women long before the beginnings of modern navigation and technology. Where had those true discoverers of the Pacific come from? How far back in time would we need to travel to be there to greet those pioneers as they came ashore on the first island claimed by the human race? What had lured them away from home and out onto the ocean?

Unhappily we have no written records bearing on this part of the world that date from before the sixteenth century. No human fossils or artifacts have been found on the islands east of New Guinea and Australia that can be taken to infer the human species evolved in the Pacific from some pre-human ancestor. Until there is evidence to the contrary, the conclusion appears inescapable that the first islanders must have sailed or rafted out on the ocean from somewhere else in the world. But there is little solid evidence to resolve even the most elementary historical issues, such as the date people first entered the realm of the Pacific or how well early voyagers could navigate and control their passage over the sea.

If written records older than the sixteenth century do not exist, is there some other way to find out about the ancient history of the islanders? Could we, for instance, rely on island myths and legends to tell us what we want to know?

The Trobriand Islanders of eastern New Guinea told the anthropologist Bronislaw Malinowski that their ancestors, before they appeared on earth, had lived underground. "They dwelt in identical local communities, were divided into clans and sub-clans, were grouped into districts, and lived as good a family life as do present-day natives" (Malinowski 1929, 497). When at last their ancestors decided to come up to the surface of the earth, they gathered together all their belongings and emerged in those localities in the Trobriands that they wished to claim as their own. In this fashion, the ancestors established many of the traditions of life and ownership handed down to their living descendants.

Solitary Easter Island lies far out in the Pacific over 9,600 kilometers east of the Trobriands. In 1886, Paymaster William J. Thomson, U.S. Navy, was told there by one islander that Easter Island had been discovered by a man named

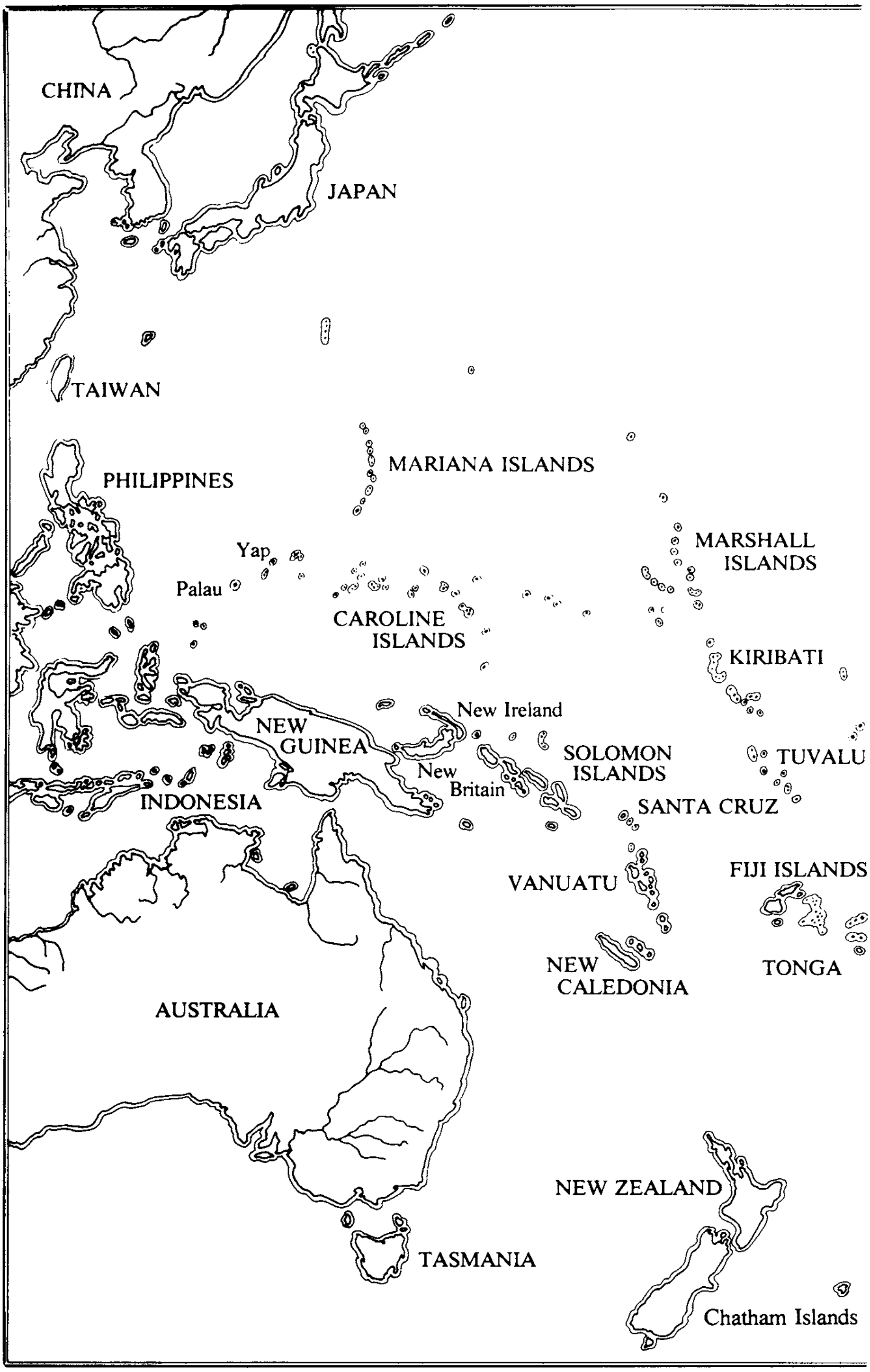
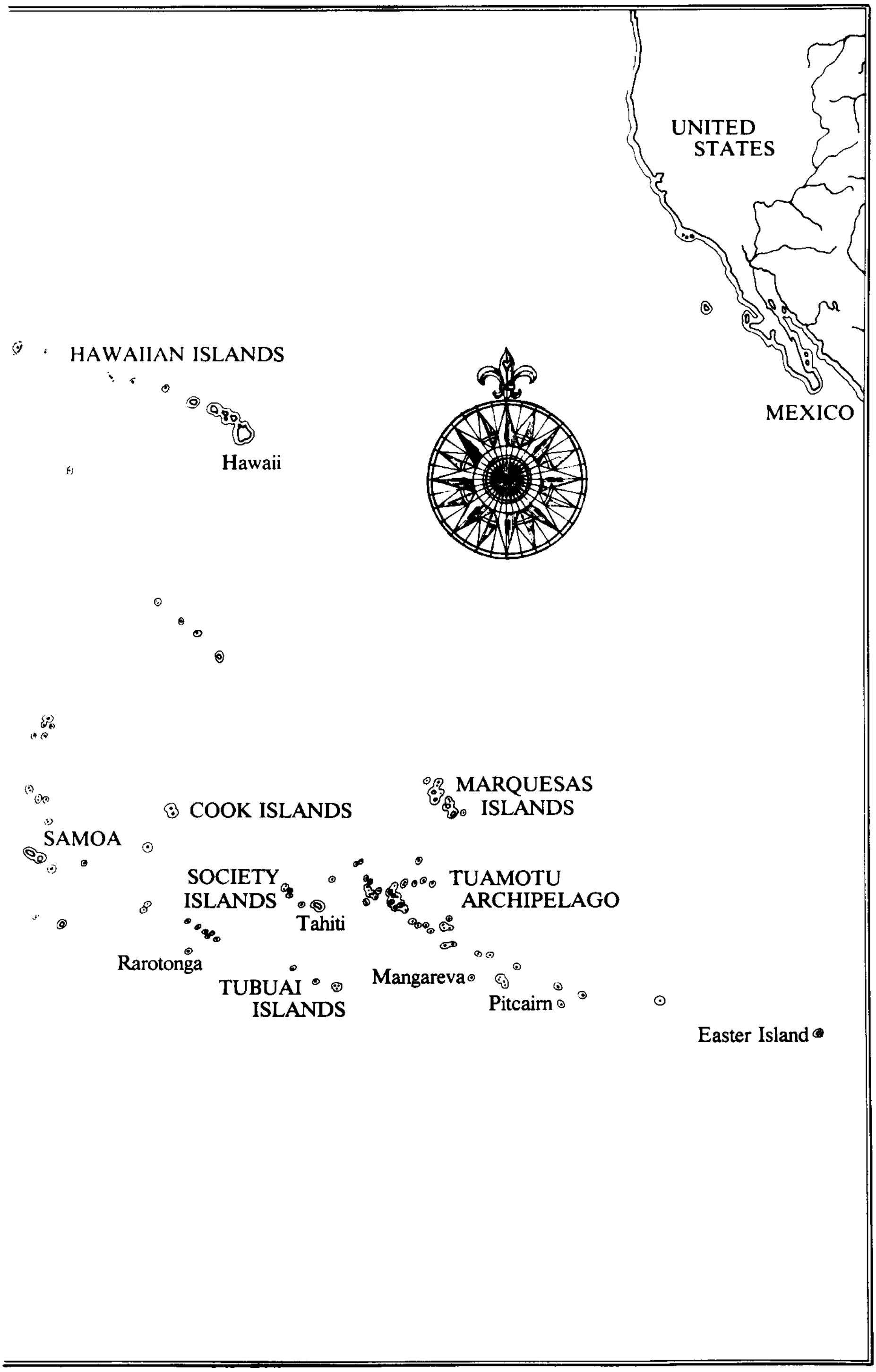


Fig. 1. The Pacific Islands. The region in the Pacific called *Near Oceania* includes New Guinea, New Britain, New Ireland, and the Solomon Islands; *Far* or *Remote Oceania* includes all



of the other islands east of New Guinea as far north as the Hawaiian Islands and as far south as New Zealand and the Chatham Islands.

Hotu-matua (Thomson1889). This great chief had sailed from the east in two large double canoes with three hundred chosen followers. They brought with them yams, potatoes, bananas, tobacco, sugarcane, and the seeds of other useful plants. More recent versions of this legend place the homeland of the Easter Islanders to the west rather than to the east (Métraux 1940, 55–6; 1957, 208–11). But they concur that Hotu-matua had been forced to flee the land of his birth after a quarrel, in order to escape death or dishonor.

Few of us might put much faith in how the Trobriand Islanders explained their origins to Malinowski. Their tradition violates our understanding of what is possible and what is impossible in the factual world. But it is more difficult to know what to think about the legend of Hotu-matua. It makes sense to us to think the ancestors of the Easter Islanders sailed there from somewhere else. Yet over the passage of time, as former events are told and retold, historical fact may become clouded with doubt and controversy. How wise, therefore, would it be in either case to think that what happened during the prehistory of the Pacific Islands can be gleaned from mythology? It is widely accepted today that modern scientific techniques can be used to investigate what happened in the past. Would it be better to turn to science instead to find out what we want to know about the islanders?

The biologist François Jacob has remarked that mythology and science are not as far apart as many people suppose. "In some respects at least, myths and science fulfill a similar function: they both provide human beings with a representation of the world and of the forces that are supposed to govern it. They both fix the limits of what is considered as possible" (Jacob 1982, 9). Moreover, what people think of as possible, whether in mythology or in science, is always largely a product of the human imagination. For contrary to popular belief, as Jacob adds, science is not just a process of gathering information and deducing theories from what has been observed. "One can watch an object for years without ever producing any observation of scientific interest. Before making a valuable observation, it is necessary to have some idea of what to observe, a preconception of what is possible" (1982, 11).

While both mythology and science may set the limits of what people imagine to be possible, the two are by no means identical pursuits of the human mind. For instance, myths and legends often seem to explain too much by the same simple argument. The Trobriand myth, as a case in point, not only tells us where their ancestors came from but also, in the same way, why their descendants claim ownership of certain lands and village sites near the magical "holes" in the ground through which their ancestors emerged. Science, like mythology, "always involves a certain representation of the unknown, that is, of what is beyond that which one has logical or experimental reason to believe" (Jacob 1982, 11–12). But scientific arguments are usually smaller, less encompassing, than mythological ones.

The reason is that science aims to build representations of the world that come closer and closer to observed reality. Science, unlike mythology, must confront the possible with the actual. What science says about the world and the forces that govern it must sooner or later be judged, or evaluated, by logical scrutiny and experimental tests to separate what is merely possible from what, in everyday language, we speak of "as really there."

Consequently, scientists need to ask questions that are modest and specific enough to be studied with some hope of success. Mythology may try to answer why there is life in the universe and what the purpose of human existence is. But scientists are usually content to deal with less ambitious problems, such as why there are so many kinds of animals and plants, or how fast human numbers could have multiplied on each new island in the Pacific colonized by our species.

Knowing that science, unlike mythology, is a two-step process requiring both imagination and evaluation points to a way in which we might learn about the prehistory of the Pacific Islands in spite of the fact that we have no explorer's journals, sailing logs, missionary accounts, or government records older than the 1500s. Consider, for example, the problem of how pioneers in the Pacific managed to find new islands to colonize in the vast reaches of open sea. If people did not evolve on the islands from pre-human ancestors and if people did not emerge there from underground, then the kind of event told about in the Easter Island legend of Hotu-matua – ignoring specific details such as the number of people said to have been in the two canoes, the listing of foodstuffs they carried with them, the direction from whence they sailed, and so on – must have been a common occurrence in Pacific prehistory as men and women traveled across the ocean in search of new homes. Therefore, we need to use imagination to try to think of all the ways in which pioneering voyagers could have discovered new islands. Then we must come up with ways to evaluate and sort out from these possible methods of island-finding the ones most probably used by early colonists. It is unlikely we shall ever be fully confident that we have narrowed the list of possible methods to the actual one they employed. They may well, in fact, have used several methods. But we should be able to isolate a few of the most likely solutions to this kind of historical problem.

Using this two-step process of scientific problem-solving or historical detective work – imagination and evaluation – is not easy. A lively imagination, after all, is sometimes said to be more a gift than a learned skill. Much has been written about different ways to evaluate ideas. And the real world is not simple and easy to figure out. But these are not reasons to be discouraged. It is true that philosophers and scientists sometimes write as if they wish every experiment, for instance, could be designed to lead always to 100 per cent certainty that some idea is positively right or absolutely wrong. But certainty of so high a degree is rarely to be had. As the late British biologist C. H. Waddington wrote: "All science can do is to show that some things are very likely, others unlikely. Its picture of the world is more like a portrait drawn by a painter than like a precise theorem in logic" (Waddington 1977, 121).

Every portrait has its own perspective. Every painter has a favorite technique. There are numerous ways of capturing images, features, and effects. Some are detailed and realistic; others are more abstract. In this book, the portrait we will draw of prehistory in the Pacific Islands will have two main characteristics. First, we will examine the processes or manner in which people may have succeeded in doing such things as voyaging across the open sea, finding new islands to colonize, building new communities, and creating the many and varied ways of life of the Pacific Islanders. Second, we will try to imagine how these deeds and accomplishments might have been achieved by drawing our portrait of the past with people in it. That is, we will sketch some of the ways in which people, acting on their own or by working together, could have done what we suspect they did during Pacific prehistory.

Scientific models

How should we create portraits of the past? What tools and techniques would be appropriate? Must we sketch the past with all the realism that imagination can bring into being? Or should we be more abstract or more impressionistic?

Bronislaw Malinowski once argued that myths are not true historical records of the past. Nor are they only stories, or an aimless outpouring of vain imaginings. On the contrary, he said, myths are a vital ingredient of human civilization. "Myth fulfills in primitive culture an indispensable function: it expresses, enhances, and codifies belief; it safeguards and enforces morality; it vouches for the efficiency of ritual and contains practical rules for the guidance of man" (Malinowski 1948, 79). Myths achieve this function, he argued, by bringing primeval reality back to life to serve as a guide, or charter, for moral values, social order, and magical belief.

Our own interest in the past may perhaps not be so practical or profoundly motivated. Yet what are some of the features of myth – or of folklore in general – distinguishing such products of the human mind as something more than stories or historical chronicles, fanciful or true? What techniques do myths use to create what Malinowski spoke of as "narrative resurrections" of primeval reality?

Several qualities set myths apart as imaginative creations of a special kind. To begin with, as Malinowski argued, myths and other kinds of folklore are handed down from generation to generation by word of mouth for many practical, social reasons, in addition to the fact they they may serve to entertain and inform those who hear them. Partly as a result, myths are highly selective in what they relate. Many things we might like to know about are often left unmentioned, apparently because they are not needed for the reasons a tale is being told. Other things and events are often lumped together without regard to what we might think would be their obvious individuality. For example, in the tale of Hotu-matua we hear next to nothing about the three hundred followers who are said to have arrived with him. They are treated as if they were of little importance beyond the fact that they sailed along on his voyage of discovery and were thus the first settlers of Easter Island.

We can say in summary, therefore, that myths (and other kinds of folklore) are simplified or metaphorical representations of the world. They are selective in what they relate, and they may often seem arbitrary in what they emphasize as worthy of mention. Finally, different kinds of folklore – such as myths, legends, proverbs, and song – vary in style and content, in the context in which they are appropriate, in the manner in which they are to be told, or "used," and so on, depending on the different purposes they serve and the different kinds of situations they are to be told in.

These several characteristics do not really describe fully how myths differ, say, from modern short stories, novels, or poems, all of which could be described in exactly the same ways. These features have been emphasized, however, because they are characteristics also of those imaginative creations that are called scientific models. And just as myths may resurrect primeval reality, so too we can argue that scientific models may be used to make portraits of the past.

Like myths (or short stories), scientific models are also simplified, metaphorical representations of the world. Like myths, scientific models are selective in what they portray. They ignore everything that does not seem important to the problem being studied. Yet, at the same time, scientific models attempt to make clear statements about what does seem important and about how the various features of the problem being examined appear to be related to each other.

In both folklore and science, when we build models, tell myths, or draw historical portraits, we resort to collective generalities, such as "three hundred followers" or "the Pacific Islanders" – simplifications which eliminate much, if not in fact most, of the detail that forms the real world as we know it. But there is good reason for being so cavalier with factual detail. The human mind as a thinking machine can handle only so much detail, only so much information, without breaking down. And that is one reason for model building: an effective way to study something complex is to break it down into simpler things instead. A practical way of doing that is to select only a small number of things to study at any one time and then create a model of how you suspect those things may go together. Said differently, a good way to study complex reality is to make models dealing only with simplified and selected portions of what may actually exist.

From this account of some of the major features of scientific models we can see a few of the practical benefits models offer us. First, model building forces us to decide which aspects, or *variables*, of the situation we are studying are the ones we think are important. Second, to put together models we must tell both how these variables are believed to go together and what we think happens to them when things or events are set in motion. Thus one of the main rewards of model building is that it makes us clarify our thinking – especially our theories –

about what we are studying. Of course, clarification of this sort often means simplifying our ideas, too. But the drawbacks of cutting our thoughts down to fit our models can usually be got around by building as many models as we need to fully explore our theories and hypotheses.

Richard Levins, a biologist who has built an international reputation for his skillful work with scientific models, has said: "all models leave out a lot and are in that sense false, incomplete, inadequate. The validation of a model is not that it is 'true' but that it generates good testable hypotheses relevant to important problems" (Levins 1966, 430). In other words, single models are rarely complete enough to fully depict situations of real complexity. As a rule of thumb, we should expect to build many models, we must be wary if it looks as if only one model will do to represent some problem we are studying, and, as a result, we can feel free to treat our models and those proposed by others with doubt, but not disrespect.

Saying that scientific models are "false, incomplete, inadequate" is not counsel for despair. Turning ideas into working models can be a remarkably useful way of exposing deficiencies in both our thinking and our facts. For instance, trying to put together even an uncomplicated model often quickly uncovers flaws in logic, blatant inconsistencies, false assumptions, unneeded variables, missing steps, and similar weaknesses in our thinking (Lehman 1977, 11).

Benefits such as these, however, are corrective rather than creative. Possibly the strongest reason for model building in science is the prodding it can give us to think new ideas, to develop new hypotheses, to ask better questions. In short, model building is a way of gradually learning how to answer the decisive question: what do we need to find out about?

Rules of model building

In practice, scientific models can be mechanical devices, mathematical equations, computer programs, diagrams, or even verbal statements (Solomon 1971, 34). The kind of model built – like the kind of folk tale told – depends both on what we want to accomplish and also on how much we already know. If we do not yet know much about what we are investigating, we can hardly build elaborate, polished models right away.

Considering how important models are in scientific work, it is surprising that there are few established rules of model building. It is vital that models should not get too complex, but even this rule is often ignored or forgotten by many practicing scientists who should know better. It is much more useful to build different models to explore different features of the problem being studied than to build a single model that is so elaborate it can no longer be understood with ease (Haggett and Chorley 1967, 22–3; Levins 1966).

It also makes a difference what materials we decide to use. Nowadays, for example, computers are commonly used to make models, because computers can handle so much more information at one time than a human brain can without breaking down. But this ability is not always a virtue, because if we do not watch out, a computer model can easily get much too complicated – in a sense, too realistic – to be used without danger of hidden errors and false calculations.

While there may be no fixed rules of model building in science, there are two major requirements that make practical sense. First, following from what we said earlier, we have got to decide what is important, that is, which features of the situation or problem being represented need to be included. Second, we must explain how all the features selected are believed to go together: that is, how our model, once assembled, is supposed to work.

Maps are one type of model we are all familiar with, and many of the models we will build in later chapters will be maps of several different kinds. Speaking generally, maps vary in the methods used to render them, in the scale adopted, in the amount of detail or "information" they present, in the sorts of distortion of shape and area introduced to express the more or less spherical shape of the earth on the flat surface of a piece of paper, and so on (George 1967, 48). All of these kinds of variation are features, or attributes, of maps as models.

However, it is important to notice that these attributes are not all of equal interest. Some, such as how maps are drawn, are merely characteristics of maps themselves: they are what make maps abstractions rather than parts of the things they stand for. Model makers and model users must be aware of model attributes like these, because they can be sources of error and false prediction. But they are not otherwise of much interest. Instead, the truly helpful attributes of maps are those features that capture significant, practical information about the earth in ways that are sufficiently exact and handy to enable us to use maps as guides, plans, and the like. Model attributes of this helpful kind are called *model variables*. In the case of maps, model variables might be how towns and cities are arranged in classes with the aid of different kinds of map symbols to show their population size, political importance, etc., or the ways in which the landscape of a region is represented using different colors, shadings, and other techniques.

In broad terms, we can define model variables as *the kinds of information about the real world thought to be significant for the studies being done or the purposes to be served*. Such information, we have seen, is always selective. That is, in deciding what to show, huge amounts of information about the world are discarded or never collected in favor of a reduced amount of information believed to capture the essence of the situation, or problem being studied, in an easily managed fashion (Levins 1966, 427–30).

If we want to be technical, model variables can be labeled in several ways: as *input* or *independent* variables, as *output* or *dependent* variables, as *status* or *constant* variables, and so on (Harvey 1967, 552–3). But it is usually enough to speak of simply two main kinds of model variables: *causal variables*, that is, the things or events we suspect are causing other things or events to happen, and *descriptive* *variables*, or the things or events we want to explain (Clark and Terrell 1978, 309–13).

If models are to be helpful tools of thought, we must also know how they work. We must be given rules telling us how to use the various symbols and variables employed. For instance, in the case of maps we need to know how towns and cities have been classified according to their size, political importance, and so on. We have got to know which side of a map is "up," that is, what the proper compass directions are. And we must be told what scale to use in figuring out real distances on the ground from map measurements. In other words, as well as being told about the model variables employed, we must also be told the *rules of operation* to be followed.

Just as we divided model variables into two kinds, causal and descriptive, so we can also speak of several different kinds of operating rules in model building (Harvey 1967, 553–4). First, there are *deterministic* or *cause-and-effect* rules which say "if this is done or happens, then that must also happen." Rules of this sort are hard to come by, in part because we rarely know enough about the world to feel safe in saying a given effect absolutely must follow a particular cause, and in part because the real world itself may not always behave in such an ironclad fashion (Prigogine and Allen 1982, 5). For these reasons, it is wise to allow for a second class of rules claiming only that effects will follow on the heels of certain causes with some degree of likelihood. Weather forecasters rely on such *statistical* or *probability* rules when they report that because of falling barometric pressure and other indicators (model variables), they think there is a 35 per cent chance of scattered showers by late afternoon. Finally, it is also useful to set up a third class of rules, although this class may not seem as obvious as the other two. This is the class of *functional* or *correlation* rules: statements saying that if something happens or is observed then something else is likely to happen or be seen, too, without necessarily implying the former causes the latter. An example would be the statement that if you are 65 years old, you probably have some gray hair. We know biological causes, not time itself, cause hair to turn gray. And gray hair has never caused anyone to be 65 years old. But as a general correlation, both often do go together. Another example of a functional rule would be the statement that 1 centimeter on a map you are looking at correlates with 100 meters on the ground.

These technical distinctions between causal and descriptive variables, on one hand, and deterministic, statistical, and functional rules of operation, on the other, are worth remembering to avoid confusion later on. At first we will label variables and rules when they are introduced. But eventually we will assume the distinctions are understood.

One last point about model building. We have said descriptive variables are the things or events we want to explain. That suggests descriptive variables are always things that can be seen or in some other way confirmed by experience. Sometimes that is true, but often descriptive variables are merely assumptions. That is, things we suppose must happen (or once happened). Or things we