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Among those activities which are probably essential to the development of a scientific discipline, two which seem especially interesting to political scientists are model-building and theory-construction. There are several reasons for analyzing them in the same chapter. On the one hand, models and theories are structurally and, up to a point, functionally similar. On the other hand, their similarity often leads, as we will argue, to the unwarrented conclusion that they are identical. For instance, the social scientist Herbert Simon once began a paper entitled “The Uses and Limitations of Models,” with these words: “In contemporary usage...”
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Attributable not so much to the failure of political scientists to understand the nature of scientific theory, although this is one source of difficulty, as to the continued substitution of theory for philosophy, based on the unquestioned assumption that the two refer to the same activity. It is our point that they don't; the subject of this section is empirical political theory, not normative political philosophy.

A second distinction, the misleading one, is often made between theory and practice. As manifested in the widely heard statement, “That’s fine in theory, but it won’t work in practice,” it assumes that theory or theoretical thinking is false or unrealistic. The student of political theory Arnold Brecht has put it another way: “The relation between practice and theory is well indicated in the popular saying that we learn best through ‘trial and error.’ Trial is practice; error refers to theory. When theory miscarries in practical trials it needs correction”...

This chapter will attempt to demonstrate that there is no divorce in the above sense between theory and practice. Rather than being unrealistic or false, a sound theory is the basis for reliable knowledge of politics. Theories help us explain and predict political phenomena, and therefore, ultimately, to make well-founded practical decisions.

A second related and more sophisticated interpretation of the “theory versus practice” distinction views the former as the result of speculation. Its catch-phrase is, “That’s fine in theory, but it won’t work in practice.” The distinction is still a fundamental one, but theory is given a higher status. Now, at least, a theory is not necessarily false, for according to this interpretation, it is in effect elaborates a hypothesis, a set of guesses to be tested. Thus to be theoretical is as to be hypothetical, potentially true. While this view is more generous than the first, it too is misleading in ways which will become more evident as we move along.

**THE NATURE OF POLITICAL THEORY**

Having discussed what political theory is not, it is time to discuss what it is. There seem to be several variations which are popular.

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the latter can be empirically tested (confirmed or rejected), because their concepts are directly tied to observation, we can't test in the same way a generalization which contains theoretical (or, by definition, non-observable) concepts. However, this is not to say, as we will see, that theories cannot be tested and evaluated.

Despite their characteristic use of theoretical concepts, sound theories are empirical. We can say that a scientific theory has two features, one structural, the other substantive: one referring to the relationship between its concepts, the other to its empirical content. Carl Hempel has provided a more technical description of the elements of scientific theory: "Any . . . scientific theory may be conceived of as consisting of an uninterpreted, deductively developed system and of an interpretation which confers empirical import upon the terms and sentences of the latter." We might begin, for instance, with a purely formal logical system such as Euclidean geometry, in which concepts are implicitly or internally defined, and then directly define (tie to observables) some of its concepts. This would then give the other concepts, those we have labeled theoretical, indirect empirical import. There is a difference, then, between an uninterpreted mathematical or logical system and a scientific theory, and the difference is the latter's empirical nature.

THE FUNCTIONS OF THEORIES

Since theories are empirical, they can be evaluated according to their soundness. A close analysis of a proposed theory should indicate whether it is properly constructed and empirically based. But perhaps a more fruitful approach to the nature of scientific theory is through an examination of the functions it performs, for one way to evaluate a theory is to determine how well it is doing what it is expected to do. Several concepts have already suggested that a theory's major function is explanation—to explain singular facts and occurrences, but perhaps more importantly to explain empirical generalizations. This latter function is what gives the scientific theory its power.

Very briefly, a theory can explain empirical generalizations because it is more general, more inclusive than they are. The great
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For while a theory contains theoretical concepts, it is also tied to observation through an empirical interpretation. Thus it more or less describes the world. The theoretical concepts fill in the gaps and allow the theory to explain in more general terms that which has been explained by individual empirical laws.

Lacking behind explanation is another function of theories. Scientists use theories to organize, systematize, and coordinate existing knowledge in a particular area or field. According to the first notion of theory, a set of related empirical generalizations, a theory is in itself a systematization. A theory of voting behavior would be a set of relevant generalizations which have been collected and put into logical juxtaposition. According to the higher level notion of theory, a theory organizes as it explains. As several diverse generalizations are accounted for by the theoretical propositions of the theory, they are a set related and made parts of a system of knowledge.

Theories explain and organize existing knowledge. They also suggest potential knowledge by generating hypotheses. A theory can, on the basis of its highly abstract generalizations, often predict an empirical generalization—predict that a particular relationship holds. The hypothesis can then be tested and accepted or rejected. Thus it can be said that in addition to its explanatory and organizational functions, theory has an heuristic one—to suggest, to generate hypotheses.

THE PLACE OF THEORY IN POLITICAL SCIENCE

In determining the role of theory in political science, we ought to keep in mind the two notions of theory, for a different conclusion may be arrived at in regard to each. The first one that fronts us is, Do we have any scientific theories in political science? From what has been said in this chapter, the answer would appear to be no if we are talking about the higher-level notion of theory. But if this is the case, is there any point in spending time talking about theories? There are probably other methodological topics more significant to contemporary political scientists, is one reply. While, because of limited resources and time, there is some wisdom in this position, it is perhaps too restrictive. For even without a sound scientific theory in hand, the political scientist is not wasting his time if he takes an interest in theory-construction. That is, there is a payoff
Theories and models: Exploration and discovery. The meaning of model is based on the notion of isomorphism, which in simple terms refers to the similarity between one thing and another (its model). More technically, isomorphism requires: (1) that there must be a one-to-one correspondence between the elements of the model and the elements of the thing of which it is the model, and (2) that certain relations are preserved. Models of this sort are found in all areas of life (for instance, scale-model airplanes); in science the isomorphism is usually thought to hold between two theories, or more explicitly, their laws. This is what we will take as the core meaning of model. If the elements (generalizations or concepts) of one theory are in one-to-one correspondence to those of another theory and the required relations hold, the one may be called a model of the other.

This type of model—an isomorphism between two empirical theories—is for all purposes nonexistent in political science; the reason is clearly the lack of any sound scientific theories of politics. However, following May Brodbeck, we can mention another notion of model that also involves isomorphism, this time between an empirical theory (in the sense of a set of empirical generalizations) and a set of purely arithmetical truths. If this is the case, then the latter is called an arithmetical representation of the empirical theory. This meaning may be more relevant to political science, largely because of the increasing use of game theory, which may be considered as such an “arithmetical representation.” We will have more to say about this later in this chapter and in Chapter 11.

Besides these isomorphic models, there are, as Brodbeck notes, several other common usages of the term, none of them directly involving isomorphism. (1) “Any as yet untested or even untestable theory may be dubbed a ‘model.’” (2) Model may also be used to refer to abstracted theories, like those about economic man.” (3) Theories making use of ideal entities such as perfectly straight lines are often called models. (4) When numbers can be attached to the concepts of a theory, it is often called a model. Brodbeck calls these uses of model unnecessary. However, it would seem that they, or combinations and variations of them, are what political scientists

Models and the process of discovery

The philosopher of science May Brodbeck notes in answer to the question, “What exactly is a model and what purposes does it serve?” that “I venture to suggest that ten model builders will give at least five different, or at least apparently different answers to this question.” It is probably the case, then, that definitions of model are so numerous that we cannot mention all of them. However, there is one notion of model which does merit initial consideration. It is more rigorous than the others and usually serves as their foundation, often in a very indirect way. However, as we will see, in its fully developed form this notion of model is not the most widely accepted (or even recognized) in political science.

The technical, or what might be called the professionally accept-
THE USE AND MISUSE OF MODELS

Our argument begins with the realization that those political scientists who construct models often characterize them as unrealistic or idealized. In fact, this seems to be the most popular use of model or conceptual scheme in political science (although it diverges from or coexists with the technical use of models). While asserting its idealized nature, the political scientist will often attempt to use his model to explain phenomena. Or, more accurately, the creator of a model realizes its limitations as an explanatory device, while those who come after and use the model for their own purposes are prone to make more extravagant claims about its explanatory usefulness. Our point is that these claims, in their extravagance, are unfounded.

We will now attempt to show why the function of models is not to explain. Let us first consider arithmetical representations. Our primary example will be game theory, since it is one of the most popular and promising models in political science. Game theory is arithmetical because it defines rationality—maximizing one's gains and minimizing one's losses—in terms of probability calculus and set theory. It is supposedly isomorphic because the political scientist attempts to connect it to laws about political behavior. In this regard, Anthony Downs has provided a model of party politics. William Riker of coalition formation, and L.S. Shapley and Martin Shubik of power in a committee system. However, as May Brodbeck has noted, "The trick for the social scientist is to find appropriate descriptive terms which when coordinated to the arithmetical ones result in true empirical laws of human behavior." We would argue that, thus far, the confirmed empirical laws have not been discovered. But more important, the model builders usually admit that their models are unrealistic. For instance, Anthony Downs says of his model of rational decision making, "The model is not an attempt to describe reality accurately. Like all theoretical constructs in the social sciences, it treats a few variables as crucial and ignores others which actually have some influence." Notice that besides the model's isomorphic nature (not obvious from this quote) there is reference to idealization and abstraction. Returning to our central point, even while admitting that his model is unreal, Downs claims that, "It proposes a single hypothesis to explain government decision-making and party behavior in general." And at another point he argues that, "Theoretical models should be tested primarily by the accuracy of their predictions rather than by the reality of their

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of models logically similar to theoretical concepts? This is the crux of the issue; for if they are, then it would seem that theories are not entitled to a superior explanatory status.

Our answer is that idealized concepts which are admittedly unreal cannot be equated with theories which contain theoretical concepts. A theoretical concept is so labeled not because it is divorced from reality, but because it is derived from observational terms within a theory: "Theoretical notions cannot be understood apart from the particular theory that implicitly defines them." Furthermore, to be explanatory, such a theory must have some empirical content, so that the theoretical constructs are linked, at least indirectly, to observational phenomena. In his sense, the theoretical concepts are not nonempirical, idealized or admittedly unreal, but instead not observable; they fit within the empirical theory.

Thus we see that a model (in the idealizing sense) is not an empirical theory. Idealized concepts are no equivalent to theoretical concepts. Insofar as they are ideal they are unreal. The gist of all this is that empirically sound theories refer to experience; thus they can explain experience. If a mathematical model is truly isomorphic with a segment of political phenomena, then it will have empirical referents, and so be able to explain; at this point, following our usage, it becomes a theory.

We have now argued that models, as they are usually construed by political scientists, do not explain as theories can; this includes both notions of theory—a set of related observational-empirical laws, or a set of theoretical laws. But the criticizing the assumption that models in political science explain, we have not meant to detract from their overall scientific value. For models such as game theory can be of heuristic value. It is not difficult to see how. If the political scientist is trying to accumulate basic knowledge in his field, it probably helps to have something which stimulates his imagination and sharpens his insight. In fact, it is probably not an exaggeration to say that in a relatively immature discipline like political science, such stimulation and sharpening is absolutely necessary. These functions are admirably performed by some models. If the model is a simplified interpretation of reality, the researcher is forced to consider what the situation would be like if the
model did describe reality and to what extent the model is unreal. If it is conducted in a formal way, such as game theory, it has a set of relationships suggested which can be tested. If a model of politics is based upon a structure or interactions, a biological model for instance, the researcher has a potentially rich supply of hypotheses generated as he compares his field with the other.

The reason for our earlier assertion that all models are basically isomorphic now comes to the surface. Actually, models in political science are suggestive primarily because they are representations of something else. The heuristic use of models generally takes the following form: we observe theory or system A; we see certain similarities between it and our own area of interest, B (they appear to be isomorphic to some extent); so, we begin to wonder if some of the relationships which hold in A also hold in B. We recognize that certain adjustments and additions are probably necessary, but at least the model we derive from A will provide a basis for the formulation of hypotheses and the organization of our study of politics. It is at this point that the “familiarity” argument which we rejected in Chapter 7 as a sound criteria for explanations becomes relevant. If we use a familiar system, let us say the game of poker, to organize our study of an unfamiliar situation or area, international politics for instance, then progress has been made. The model, in this case similar game theory, opens the door.

The distinction between the explanatory and heuristic value of theories and models is based upon the more fundamental distinction between scientific justification and discovery. Throughout the analysis of the nature of generalizations and explanation and the function of theories in political inquiry, we have been dealing with scientific justification, the relationship of evidence to hypotheses. As we have seen, this is amenable to logical analysis. Scientific discovery, on the other hand, has to do with where the concepts, hypotheses and theories come from; how does the scientist-conceive of them. This deals with the psychology of scientists and so is an activity which emphasizes creativity, imagination, even genius.

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Therefore it is a more difficult process to analyze; so difficult that some have concluded it is impossible. Donald Schon in writing about those who have studied the subject of innovation in science, notes that their “theories on the subject fall into one of two categories: either they make the process mysterious and therefore intrinsically unexplainable; or they regard novelty as illusory and, therefore, requiring no explanation.”23 However, since models are an integral part of the process of discovery, and since models can be analyzed, it follows that certain aspects of the process can be analyzed.

If models are mainly of heuristic value, if their primary function within the scientific enterprise is to suggest relationships between concepts—to generate hypotheses—then they belong in the realm of scientific discovery and not explanation. This is our major conclusion. The objective of our analysis has not been to question the importance of models but only to point out that they have a different role to play in the development of scientific knowledge. And given the fact that there are few if any developed theories of similarity, the significance of any device which does suggest possible relationships cannot be exaggerated.

MODELS AND OTHER HEURISTIC DEVICES IN POLITICAL SCIENCE

We have evaluated game theory in very general terms as a model of politics. But there are others less explicit and more speculative. Part three, which begins with the next chapter, is a discussion of some of the more popular and promising models, conceptual schemes, or approaches used in the study of politics. But we will consider a few models here to make the argument more meaningful. Several are rough attempts at isomorphism, while others are idealized models or conceptual schemes. Their inability to explain, often realized by their creators, will become obvious, but their possible heuristic value will be emphasized.

Kenneth Boulding has examined several models of social conflict. He labels two of them the “ecological” model and “epidemiological” model.24 The former draws attention to “the similarity between

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The conflict of groups in human society and the competition of species in biological ecosystems. The latter compares the spread of contagious diseases through a population to certain types of group conflict, such as competition. Building on this, the main, provocative discussions of suggestive similarities between different systems of phenomena. No explanations or potential explanations are forthcoming. This building admits, "In applying simple mechanical models such as we have explored in this and in previous chapters to the enormously complex dynamism of conflict in society, we should look for insights rather than for exact correspondences." The key word is "insights," for it indicates the heuristic emphasis of model building.

More ambitious claims have been made by some social scientists interested in general systems theory. The comparison of systems of social behavior with chemical systems and biological systems, for instance, seems to some to lay the foundation for explanation. "... Models and theories are never perfect but simply approach the limit of correct explanation..." But we would argue that the mere noting of similarities between systems explains nothing. Analogies and metaphors are often enlightening, but they account for no facts. Once again, we return to the heuristic value of models. Anatol Rapoport has written in this regard, "Metaphor and analogy, although they cannot be accepted as scientific 'explanations' are sometimes important aids in the sense that they prepare the mind to make more precise investigations." This applies as well to the more sophisticated systems analyses of political scientists such as David Easton.

There is another kind of model building in political science that is seemingly remote from isomorphic analysis. It is characterized instead by idealized sets of assumptions about given areas of political phenomena. As we implied at the beginning of this section, this activity is perhaps the most prevalent of those that go under the name of model building. A sophisticated example, the decision-making approach of Richard C. Snyder and Glenn D. Paige, will be discussed in Chapter 12. Less elaborate models, this time of party systems, are analyzed by Samuel Eldersveld. He clearly uses them in a heuristic fashion to suggest relationships that can be tested. This use of ideal models can be traced back to the German sociologist Max Weber's notion of ideal types. In his studies of bureaucracy, Weber found that if he began with an idealized or perfect concept of bureaucracy, he could use it as a standard against which to compare real world bureaucracies. By "idealized" Weber meant "intentionally unreal." Likewise, the ideal models of modern political scientists are not meant to be descriptions of reality but useful heuristic devices.

As we have already implied, some political scientists call the kind of model we have just been discussing a "conceptual scheme." The term seems to imply a set of ideal assumptions about a given subject area. Thus William C. Mitchell has said in introducing his own "structural-functional" conceptual scheme: "A conceptual scheme or framework is an essential tool in all scientific investigation for it provides the elementary concepts, assumption, ideas, and directives that guide the selection and interpretation of facts." Once again it can be seen that models or conceptual schemes are more important for their suggestiveness than their explanatory power.

In addition to idealized or speculative models, there are other heuristic techniques, that is, strategies of discovery which are available to political scientists. These are alternatives to models but they can often be used in a complementary manner. We will conclude this chapter with a brief discussion of some of them. This will, it is hoped, clarify the heuristic nature of models and indicate that there

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10 Ibid., p. 123.
11 Ibid., p. 124.
12 Ibid., p. 137.
13 Ibid., p. 138.
are alternatives available. A popular heuristic device is Verstehen or empathic understanding. According to its users, Verstehen suggests possible relationships by somehow "getting into" other people's heads in order to speculate about how others would behave in certain situations. There are several related techniques of discovery in political inquiry. One of the most popular is the construction of "alternative futures," grounded speculations about what the world will be like in 10, 20, 50 years, based on present trends. One of the most famous proponents of this method is Herman Kahn. In the 1950s and 60s he predicted what the world would be like in the 1970s. That his predictions were not always accurate should not detract from the heuristic usefulness of his work, "as if" speculation is meant to be suggestive rather than predictive. A strategy which is somewhat similar to "as if" speculation but probably more empirically grounded has been described by Alexander George. "The analyst rehearses in his mind the different possible versions of a missing piece, trying to decide which version is most plausible, given the values of the pieces already known to him," 28 This might be interpreted as the first step toward theory building. This fact is true of a broader category of heuristic techniques, called generically, mind experiments. We have all performed such experiments while sitting at our desks, daydreaming in class. Let us quote J. A. Laponce, one of the few social scientists to think seriously about mind experiments. "In such an experiment the mind is treated as one would a laboratory; it is emptied of unwanted ideas, of unwanted variables; it is made to relate only the factors under study which are either left free to play and interact among themselves—or on the contrary have to interact according to specific rules. These experiments in the mind, these anticipatory experiments which, in a writer, produce plays and

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48 "A final word on the unique insight that Verstehen is an analytic process" (Herman Kahn, "Alternative World Futures," p. 145).

between explanatory theories and heuristic models, a distinction based on the difference between scientific justification and discovery. Part 3 will devote more time to the latter. The next few chapters will examine a number of approaches, ways of organizing our study of politics, which are to some extent more or less sophisticated models and to some extent potential theories of politics.