an introduction to models in the social sciences

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As we indicate in Chapter 1, this book is an introduction to thinking analytically about human behavior. We try to describe both a basic style of speculation and four specific speculative models that are useful and enjoyable in predicting, understanding, influencing, and appreciating human life. Our efforts are based on three simple assumptions:

1. A central feature of modern thinking in the social and behavioral sciences is the use of formal models, normally in mathematical form.
2. It is possible to exhibit the development and use of social science models in a way that is both precise enough to explicate important ideas and simple enough to require no mathematics beyond high school algebra.
3. Much of the power, beauty, and pleasure of models comes from inventing and elaborating them, and from exploring their implications in new domains.

The book is about model building, but it is not a methodology book in the customary sense. The more technical questions of specifying and testing models are slighted in favor of exploring model building as a creative art. Toward that end, readers are encouraged to accept an active role in devising new models and finding new implications of old ones. The text provides frequent occasions on which the reader is asked to pause and think about the ideas being examined. In addition, there are a great many problems that include applications to a wide variety of situations. The mode of reading is intended to be active.

The book can serve a number of different instructional pur-
poses: It can be used as a text or supplement in an introductory course or in courses in methodology or models; it can also be used as casual reading in bed. It requires neither previous exposure to the social and behavioral sciences nor college mathematics, but it is consistent with advanced training in these fields. We have used the materials with high school seniors, college freshmen, graduate students, and faculty colleagues. Anyone who reads the book and does a good sample of the problems should develop a reasonable basic grasp of how to engage in creative theoretical thinking in the social sciences.

Most of all, the book is testimony to the delights of the game. All authors have a fantasy that what they write will be useful to their readers, that something can be learned from the words so carefully chosen and cruelly edited. We endorse that fantasy and add a grander one: We hope that readers will come to enjoy not only the book but also the pleasures of imagination that it celebrates.

C.A.L.
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chapter
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This book is about the social sciences. It is not, however, a grand tour of what the social sciences are. It is a first excursion into a few domains of social science imagination. It does not claim the scholarly virtues of comprehensiveness and balance. It is a brief introduction to the pleasures of thinking about human behavior.

To speak of pleasures is probably dangerous and certainly pretentious. Few people rely solely on any social science for their pleasures, and attaining a suitable level of contentment involves work. We regret the latter problem. It is a nuisance, but God has chosen to give the easy problems to the physicists. We do not regret the former problem. We have no intention of suggesting that poetry and sex be abandoned. Rather, we invite you, in the moments left between Byron and bed, to join us in speculating about ordinary human existence.

Speculation presumes observation. We rely on the difficult and creative drudgery required to retrieve the record of social events. The data are lost in the files of bureaucracies, diaries of servants, accounts of businesses, and memories of participants. They are discovered through the paraphernalia of research and manipulated by the technology of inference. Precise and imaginative empirical observation distinguishes fine work in anthropology, business administration, demography, economics, education, geography, history, journalism, law, linguistics, political science, psychology, and sociology.

Many smart and patient people have accumulated knowledge from observations of individuals, groups, and institutions in society. Others have articulated the methodology of the social sciences. We are in debt to both traditions, but our approach is different. Our theme is more a way of thinking about observations than an inventory of them; it is more concerned with the invention of conjectures than with the formal rules for talking about them.

We propose a practical guide to speculation. We explore the arts of developing, elaborating, contemplating, testing, and revising models of human behavior. The point of view is that of a person trying to comprehend the behavior around him. The primary emphasis is on using a few simple concepts and a little imagination to understand and enjoy individual and collective human behavior.

Speculation is the soul of the social sciences. We cherish attempts to discover possible interpretations of behavior. The effort is complicated and subtle, it has a distinguished history. Aristotle, Smith, Toynbee, Marx, Malinowski, Camus, James, Weber, Don-
tovsky, Freud, Durkheim, Cervantes and a host of other figures have added to our understanding of human behavior.

Despite such an impressive ancestry our ambitions are not heroic. We think that playing with ideas is fun. We think there are some interesting ideas in the social sciences. We think that an increase in the quality of speculation both in the social sciences and in everyday life would be good. We would like to contribute to an understanding of models in the social sciences and to enjoyment of their pleasure.

What is a model? How do you invent one? What are some common models in the social sciences? How do you apply them in new situations? What makes a good model? This book attempts to answer such questions by engaging the reader in the process of invention. By the end of the book we will have presented enough examples of models to make a definition superfluous. At the outset, however, we begin with an intact characterization: A model is a simplified picture of a part of the real world. It has some of the characteristics of the real world, but not all of them. It is a set of interrelated guesses about the world. Like all pictures, a model is simpler than the phenomena it is supposed to represent or explain.

Consider a scale model of a train. We call it a "model" train because it has some of the characteristics of a train. It is similar in appearance to a real train, has similar parts, and possibly moves in a similar manner. It does not have all of the characteristics of a real train, however. By examining a scale model of a train, we can learn something about a real train's general size and design, but we cannot tell much about its horsepower, speed, capacity, or mechanical dependability.

Since a model has only some of the characteristics of reality, it is natural to have several different models of the same thing, each of which considers a different aspect. A diagram of the energy flow in the train's power plant would also be a model of the train. It would be useful for answering some questions that the scale model does not. Neither of these models, however, could tell us whether the train would be an economic success. To determine this we need a performance table (model) showing the relations among tonnage hauled, speed, and fuel consumption. There are many other possible models of a train, each representing some but not all of the train's attributes. Each could be used to say something, but not everything, about a real train.

Whether we are talking of modeling trains, societies, groups, or individuals, the modeling process is the same. We construct
models in order to explain and appreciate the world. Sometimes we
call our simplifications theories, paradigms, hypotheses, or simply
ideas. In a more formal treatise we might make distinctions among
some of the labels; but we will not do so here. We will talk simply
of models as a generic term for any systematic set of conjectures
about real world observations.

Speculative models are central to science, history, and litera-
ture. They are also a part of normal existence. We are constantly
forming partial interpretations of the world in order to live in it.
Because we do not always label our daily guesses about the world
as “models,” we sometimes overlook the extent to which we are all
theorists of human behavior. The activity is not mysterious.

We will treat models of human behavior as a form of art,
and their development as a kind of studio exercise. Like all art,
model building requires a combination of discipline and playfull-
ness. It is an art that is learnable. It has explicit techniques, and
practice leads to improvement. We can identify a few of the neces-
sary skills:

1. An ability to abstract from reality to a model. Problems in
social science are complex and frequently personal. It is neces-
sary, but not easy, to form abstract representations of a deli-
cately intricate reality.

2. A facility at derivation within an abstract model. Models be-
come rich through their implications. It is necessary to devise
models that yield significant derivations and to develop skill at
producing meaningful implications.

3. A competence at evaluating a model. Not all models are good
ones. Some are unattractive because their derivations are in-
accurate; some because their consequences are immoral; some
because they are unsophisticated. It is necessary to know how to
reject inadequate models.

4. A familiarity with some common models. The number of models
in the social sciences is large; but a few are common enough
to make familiarity with them essential. It is necessary to have
command of a few standard models and to know how to apply
them to a wide variety of situations.

It is possible to identify a set of common models in the social
sciences that are relatively simple, easily modified to extend their
scope, and suggestive of the varieties of formal reasoning that
might be used. And though they do not immediately require more
than high school mathematics, they do involve abstraction, derivation, and evaluation.

Beginning in Chapter 4, we consider four such models:

1. **Individual Choice.** The processes by which individuals choose among alternatives, make decisions, and solve problems. For example, investment behavior, gambling, voting, occupational choice, consumer behavior, the selection of mates. The basic model is a model of rational choice under risk. We examine the fundamentals of decision trees, expected value calculations, and alternative criteria for rational choice. The rational model is applied to a variety of choice situations found throughout the study of human behavior.

2. **Exchange.** Exchange as a special case of individual and collective choice. We introduce the basic ideas of indifference curves and the ways in which mutually acceptable trades are made in the market, the cold war, small groups, marriage, and politics. Some effort is made to apply the basic model (drawn largely from economics) to a variety of "noneconomic" situations.

3. **Adaptation.** Modification of behavior by individuals and collectivities in response to experience. The basic model is a probability learning model taken from psychology. The ideas are applied to learning, personality development, socialization, organizational change, attitude change, and cultural change. Special attention is given to superstitious learning and mutual adaptation.

4. **Diffusion.** The spread of behaviors, attitudes, knowledge, and information through a society. The basic models are borrowed from epidemiology and sociology and include both simple versions of contact, transmission, and contagion and more complicated models of the spread of a "disease" in a social structure. The models are applied to the spread of fads, innovations, rumors, political allegiances, emotions, and ideas.

These four varieties of models comprise the basic substantive content of the book. By the end of the book a reader who has worked through the problems and examples should be able to apply the models to any reasonably well-defined situation for which they are relevant. He should be able to make a first approach to asking theoretically interesting questions about almost any situation involving human behavior.
Models of choice, exchange, adaptation, and diffusion are not the only kinds of models we might have considered. Indeed, the variations are considerable and limited mostly by our ability to invent interesting metaphors. The social sciences include ideas about transition: how people change from one job to another, from one social class to another over time. The social sciences include ideas about demography: how entry (birth) rates, exit (death) rates, and the movement of people (migration) change the age distribution and other features of a population of a society or a part of society. The social sciences include ideas about structure: how attitudes, memory, social positions, classes, associations, and language are organized.

Each of these, as well as the four models with which we will deal, is an exhibit in modern social science art. Each has its admirers and its critics; each has its geniuses and its hacks. We hope that the identification of model building as a form of art is not empty, although it may be optimistic. It is intended to communicate the frustrations, aesthetic charm, and unanticipated discovery to be found in the analysis of human behavior.

The major pleasures of the social sciences stem from an elementary property of human beings: Man is capable of producing more complex behavior than he is capable of understanding. The behavior of an infant baffles a psychologist, and vice versa. As a result, models of human behavior are knowledge, ideology, and art. They are metaphors by which we seek to ensure that our understanding of behavior, the complexity of behavior, and the number of questions about behavior all increase over time. Our excitements are those of participating in this spiral.

We invite you to join the game. Participation requires effort, but it does not (in the beginning) require extensive knowledge about the literature of the social sciences. We have used these materials in formal courses and in casual reading, in graduate seminars and in freshman required courses, in professional schools and in high schools, in the United States and abroad. Prior exposure to the social sciences sometimes helps, but a willingness to play with ideas, to construct images, and to solve puzzles seems much more important.

Of greatest importance, however, is the commitment to working through a set of problems. These problems are found at the end of each subsequent chapter of the book. Each problem asks the reader to develop some model, its implications, use it as a basis for recommending social policy, or evaluate it. The problems range
from simple exercises to complicated social questions requiring considerable ingenuity to answer. They require involvement, time, and thought on the part of the reader. The text provides a guide to possible ideas and some examples; but it is the problems at the end of the chapters that are intended to serve as the locus of major effort.

As you go through the rest of the book, we hope that you will experience some of the enjoyment that we do in the activity. We hope you will discover a general style of approaching the social sciences that encourages a playful exercise of disciplined thought, allows the invention of new ways for thinking about familiar things, and treats human behavior as mystery and social scientists as detectives or artists.

References