Preface

MANY FORMS OF INVESTIGATION, FROM FIELD STUDY TO analytic survey, seek to emulate the laboratory experiment. Why is the lab experiment the methodological ideal? Lab research is more precise than other kinds because it is carried out under optimal conditions for observation and measurement. But that is not the reason it is the ideal. The experiment is the ideal because of its logical structure and because, unlike other forms of investigation, that logical structure can be fully realized in the laboratory. There is considerable utility in knowing the logic of experiments. Knowing that logic is essential to the budding experimentalist seeking guidance in research design. To know how any investigation departs from that ideal is useful to anyone who would design a research project or who would critically understand a project designed by another.

A key to understanding experimental design is that there is not a single logic of the laboratory experiment, but two logics. Both are covered in detail in this book. For the *theory-driven experiment,* the design is given by the theory. The purpose of this kind of experimentation is to test theory and, to that end, theory designs the experiments that test it. This kind of experiment is at least four centuries old. As we show, the logic of theory-driven experimentation crosses the sciences. It is the same in sociology as it is in physics. Having read this book, few, if any, readers would agree that fundamental differences between the sciences make experimentation a less plausible and less useful research strategy for sociology than for other sciences.

The second kind of logic, of the *empirically driven experiment,* is founded on the method of difference. The purpose of this kind of experimentation is to discover new phenomena, new relations in the world by constructing at least two circumstances as similar to each other as possible—but for a single difference. A discovery is made if that difference is followed by distinct outcomes. This kind of experimentation is also quite old and is used today under the same logic across the sciences. Compared to the theory-driven kind, the empirically driven experiment has the advantage that one need not await the development of a theory to begin investigation. It has the disadvantage that its results can never be as sure or as general as those of a theory-driven experiment. The two kinds of experimentation, individually or together, form a powerful methodology for the advancement of scientific knowledge.

We conceived this book as a way to introduce the logic, techniques, and procedures of laboratory experimentation to broader audiences. One such audience is those currently learning the methods of social research. This is a methods text, which, through the extensive use of examples, provides the understanding needed to conduct experiments. Although this is a methods text, it is also something more than a methods text.

To the active scholar nothing can be more important than knowing what a method of investigation can and cannot do. That broad array of active scholars is the second audience to which this book is addressed. The literature on the logic of experimentation, how experiments are designed and run, and the kind of knowledge that results is at best incomplete. Nowhere in the methodological literature will you find the logic of theory-driven experiments laid out, their design explained, and examples given of appropriate procedures. Only one of the two types of experimental research is recognized, yet one finds broad generalizations about experimentation that are simply false. For example, it is widely asserted that generalizing experimental results from the laboratory is difficult, perhaps impossible. Importantly, the results of theory-driven experiments are not generalized. Very different procedures, procedures that we explain, quite effectively bring their results to bear outside the lab.

Chapter 1 introduces the experiment in broad outline. In Chapter 2 we focus on how scientists carry out their work beginning with the questions that motivate research. We trace how a simple theory is stated and how an experiment is designed to test it. In Chapter 3 we analyze empirically driven experiments, reconstructing their logic as it is embodied in Mill's canons and

in the statistical methods pioneered by Fisher. As a practical guide, we critically analyze a series of example experiments.

Are experiments in sociology different from experiments that have contributed to the explosive growth of knowledge in other sciences? Chapter 4 answers that question by showing that the logic of theory-driven experiments is identical across widely different sciences. Again a series of critically analyzed example experiments show the researcher how to design effective studies. Chapter 5 looks at the experimenter-subject relationship. We cover the ethics and humane treatment of research subjects, the experimental setting as a source of artifacts, as well as experimenter and subject bias. Here the reader is introduced to computer-mediated experimentation and its advantages insofar as minimizing artifact are concerned. In Chapter 6 we show how small, simple, and idealized social systems in the laboratory are connected to events in large, complex, and dirty systems outside it. We conclude by revisiting the logic of theory-driven experiments to show how other forms of investigation can take the same logical form and have comparable results.

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