

distills my advice to undergraduates on writing class papers. What should a short paper look like? These are my suggestions. I give it to classes along with all paper assignments.

For educating me on many matters discussed here I thank Robert Arseneau, with whom I discussed many of these issues while he taught PS3 at U.C. Berkeley. For comments on these chapters and/or these issues I also thank Steve Ansolabehere, Bob Art, Andy Bennett, Tom Christensen, Alex George, Charlie Glaser, Chaim Kaufmann, Peter Liberman, John Mearsheimer, Bill Rose, Scott Sagan, Jack Snyder, Marc Trachtenberg, Steve Walt, Sandy Weiner, and David Woodruff. I also thank the many teachers, students, and colleagues who have commented on my work through the years. Much of what I offer here is recycled advice they once gave me.

C H A P T E R 1

Hypotheses, Laws, and Theories: A User's Guide

What Is a Theory?

Definitions of the term "theory" offered by philosophers of social science are cryptic and diverse.¹ I recommend the following as a simple framework that captures their main meaning while also spelling out elements they often omit.

Theories are general statements that describe and explain the

1. Most posit that theories explain phenomena and leave it at that. The elements of an explanation are not detailed. See, for example, Brian Fay and J. Donald Moon, "What Would an Adequate Philosophy of Social Science Look Like?" in Michael Martin and Lee C. McIntyre, eds., *Readings in the Philosophy of Social Science* (Cambridge: MIT Press, 1994), p. 26: a social theory is a "systematic, unified explanation of a diverse range of social phenomena." Likewise Earl Babbie, *The Practice of Social Research*, 7th ed. (Belmont, Calif.: Wadsworth, 1995), p. 40: "A theory is a systematic explanation for the observations that relate to a particular aspect of life." See also Kenneth Waltz, quoted in note 9. Each leaves the components of an explanation unspecified.

Leaving even explanation unmentioned is W. Phillips Shively, *The Craft of Political Research*, 3d ed. (Englewood Cliffs, N.J.: Prentice-Hall, 1990): "A theory takes a set of similar things that happen—say, the development of party systems in democracies—and finds a common pattern among them that allows us to treat each of these different occurrences as a repeated example of the same thing" (p. 2).

causes or effects of classes of phenomena. They are composed of causal laws or hypotheses, explanations, and antecedent conditions. Explanations are also composed of causal laws or hypotheses, which are in turn composed of dependent and independent variables. Fourteen definitions bear mention:

law

An observed regular relationship between two phenomena. Laws can be deterministic or probabilistic. The former frame invariant relationships ("if *A* then always *B*"). The latter frame probabilistic relationships ("if *A* then sometimes *B*, with probability *X*"). Hard science has many deterministic laws. Nearly all social science laws are probabilistic.

Laws can be causal ("*A* causes *B*") or non-causal ("*A* and *B* are caused by *C*; hence *A* and *B* are correlated but neither causes the other").² Our prime search is for causal laws. We explore the possibility that laws are noncausal mainly to rule it out, so we can rule in the possibility that observed laws are causal.³

2. Generic laws (which might be causal or noncausal) should be stated in associative language ("if *A*, then *B*," or "the greater *A*, the greater *B*," or "the higher *A*, the smaller *B*," etc.). Causal laws can also be framed with causal language ("*A* causes *B*").

3. Causal laws can assume four basic causal patterns: direct causation ("*A* causes *B*"), reverse causation ("*B* causes *A*"), reciprocal causation ("*A* causes *B* and *B* causes *A*"), and self-undermined causation ("*A* causes *B* and *B* lessens *A*"). Hypotheses, discussed below, can assume the same formats. To establish a specific causal relationship ("*A* causes *B*"), we must rule out the possibility that an observed relationship between *A* and *B* is spurious ("*C* causes *A* and *B*") or reverse-causal ("*B* causes *A*"). We may also investigate whether reciprocal causation or self-undermined causation is at work.

hypothesis

A conjectured relationship between two phenomena.⁴ Like laws, hypotheses can be of two types: causal ("I surmise that *A* causes *B*") and noncausal ("I surmise that *A* and *B* are caused by *C*; hence *A* and *B* are correlated but neither causes the other").

theory

A causal law ("I have established that *A* causes *B*") or a causal hypothesis ("I surmise that *A* causes *B*"), together with an explanation of the causal law or hypothesis that explicates how *A* causes *B*. Note: the term "general theory" is often used for more wide-ranging theories, but all theories are by definition general to some degree.

explanation

The causal laws or hypotheses that connect the cause to the phenomenon being caused, showing how causation occurs. ("*A* causes *B* because *A* causes *q*, which causes *r*, which causes *B*.")

antecedent condition⁵

A phenomenon whose presence activates or

4. This follows P. McC. Miller and M. J. Wilson, *A Dictionary of Social Science Methods* (New York: John Wiley, 1983), p. 58: "[A hypothesis is] a conjecture about the relationships between two or more concepts." Carl Hempel uses "hypothesis" more broadly, to include conjectures about facts as well as relationships. Thus, for Hempel, descriptive conjectures (for instance, estimates of the height of the Empire State Building or the size of the national debt) are also hypotheses. See Carl G. Hempel, *Philosophy of Natural Science* (Englewood Cliffs, N.J.: Prentice-Hall, 1966), p. 19. I use the term "propositions" to refer to what Hempel calls "hypotheses": thus, for me, propositions can be hypotheses or descriptive conjectures. Babbie, *Practice of Social Research*, also uses "hypothesis" broadly (see p. 49); under "hypothesis" he includes predictions inferred from hypotheses (which I call "predictions," "observable implications," or "test implications" of theory).

5. The term is from Carl G. Hempel, *Aspects of Scientific Explanation and Other Essays in the Philosophy of Science* (New York: Free Press, 1965), pp. 246–47 and passim. The term "antecedent" merely means that the condition's presence pre-

magnifies the action of a causal law or hypothesis. Without it causation operates more weakly ("A causes some B if C is absent, more B if C is present"—e.g., "Sunshine makes grass grow, but causes large growth only in fertilized soil") or not at all ("A causes B if C is present, otherwise not"—e.g., "Sunshine makes grass grow, but only if we also get some rainfall").

We can restate an antecedent condition as a causal law or hypothesis. ("C causes B if A is present, otherwise not"—e.g., "Rainfall makes grass grow, but only if we also get some sunshine").

Antecedent conditions are also called "interaction terms," "initial conditions," "enabling conditions," "catalytic conditions," "preconditions," "activating conditions," "magnifying conditions," "assumptions," "assumed conditions," or "auxiliary assumptions."

variable

A concept that can have various values, e.g., the "degree of democracy" in a country or the "share of the two-party vote" for a political party.

independent variable
(IV)

A variable framing the causal phenomenon of a causal theory or hypothesis. In the hypothesis "literacy causes democracy," the degree of literacy is the independent variable.

cedes the causal process that it activates or magnifies. Antecedent conditions need not precede the arrival of the independent variable onto the scene; they can appear after the appearance of high values on the independent variable that they activate or magnify.

dependent variable
(DV)

A variable framing the caused phenomenon of a causal theory or hypothesis. In the hypothesis "literacy causes democracy," the degree of democracy is the dependent variable.

intervening variable
(IntV)

A variable framing intervening phenomenon included in a causal theory's explanation. Intervening phenomena are caused by the IV and cause the DV.⁶ In the theory "Sunshine causes photosynthesis, causing grass to grow," photosynthesis is the intervening variable.

condition variable (CV)⁷

A variable framing an antecedent condition. The values of condition variables govern the size of the impact that IVs or IntVs have on DVs and other IntVs. In the hypothesis "Sunshine makes grass grow, but only if we also get some rainfall," the amount of rainfall is a condition variable.

study variable (SV)

A variable whose causes or effects we seek to discover with our research. A project's study variable can be an IV, DV, IntV, or CV. The overarching hypothesis that frames the relationship between a theory's independent and dependent variables.

prime hypothesis

6. Whether a specific variable is dependent, independent, or intervening depends on its context and changes with context, as with A in these statements: (1) "A causes B": A is the independent variable; (2) "Q causes A": A becomes the dependent variable; and (3) "Q causes A, and A causes B": A becomes an intervening variable.

7. Condition variables are also known as "suppressor" variables, meaning that controlling values on these variables suppresses irregular variance between independent and dependent variables. See Miller and Wilson, *Dictionary of Social Science Methods*, p. 110.

explanatory hypothesis	The intermediate hypotheses that constitute a theory's explanation. ⁸
test hypothesis	The hypothesis we seek to test. Also called the "research hypothesis."

Note: a theory, then, is nothing more than a set of connected causal laws or hypotheses.⁹

We can always "arrow-diagram" theories, like this:

$$A \rightarrow q \rightarrow r \rightarrow B$$

In this diagram A is the theory's independent variable, B is the dependent variable. The letters q and r indicate intervening vari-

8. These last four terms—"condition variable," "study variable," "prime hypothesis," and "explanatory hypothesis"—are my own nominations to fill word-gaps in the lexicon.

9. For a different view see Kenneth N. Waltz, *Theory of International Politics* (Reading, Mass.: Addison-Wesley, 1979), pp. 2, 5. To Waltz, theories are not "mere collections of laws" but rather the "statements that explain them" (p. 5). These statements include "theoretical notions," which can take the form of concepts or assumptions. I prefer my definition to Waltz's because all explanations for social science laws that I find satisfying can be reduced to laws or hypotheses. His definition of "explanation" also lacks precision because it leaves the prime elements of an explanation unspecified.

For a third meaning, more restrictive than mine, see Christopher H. Achen and Duncan Sidal, "Rational Deterrence Theory and Comparative Case Studies," *World Politics* 41 (January 1989): 147. A theory is "a very general set of propositions from which others, including 'laws,' are derived." Their definition omits modestly general ideas that I call theories.

Nearer my usage is Carl Hempel: "Theories . . . are bodies of systematically related hypotheses." Carl G. Hempel, "The Function of General Laws in History," in Martin and McIntyre, *Readings in the Philosophy of Social Science*, p. 49. Likewise Miller and Wilson, *Dictionary of Social Science Methods*: "[A theory is] a set of integrated hypotheses designed to explain particular classes of events" (p. 112). Similar are Gary King, Robert O. Keohane, and Sidney Verba, *Designing Social Inquiry: Scientific Inference in Qualitative Research* (Princeton: Princeton University Press, 1994), p. 99: "Causal theories are designed to show the causes of a phenomenon or set of phenomena" and include "an interrelated set of causal hypotheses. Each hypothesis specifies a posited relationship between variables."

ables and comprise the theory's explanation. The proposal " $A \rightarrow B$ " is the theory's prime hypothesis, while the proposals that " $A \rightarrow q$," " $q \rightarrow r$," and " $r \rightarrow B$ " are its explanatory hypotheses.

We can add condition variables, indicating them by using the multiplication symbol, " $\times$."¹⁰ Here C is a condition variable: the impact of A on q is magnified by a high value on C and reduced by a low value on C .

$$\begin{array}{l} A \rightarrow q \rightarrow r \rightarrow B \\ \times \\ C \end{array}$$

An example would be:

$$\begin{array}{l} \text{Amount of} \quad \text{Amount of} \quad \text{Amount of} \\ \text{sunshine} \rightarrow \text{photosynthesis} \rightarrow \text{grass growth} \\ \times \\ \text{Amount of} \\ \text{rainfall} \end{array}$$

One can display a theory's explanation at any level of detail. Here I have elaborated the link between r and B to show explanatory variables s and t .

$$\begin{array}{l} A \rightarrow q \rightarrow r \rightarrow s \rightarrow t \rightarrow B \\ \times \\ C \end{array}$$

One can extend an explanation to define more remote causes. Here remote causes of A (Y and Z) are detailed:

10. The multiplication sign is used here only to indicate that the CV magnifies the impact of the IV, not to mean that the CV literally multiplies the impact of the IV (although it might).

$$\begin{array}{c}
 Y \rightarrow Z \rightarrow A \rightarrow q \rightarrow r \rightarrow s \rightarrow t \rightarrow B \\
 \times \\
 C
 \end{array}$$

We can detail the causes of condition variables, as here with the cause of C:

$$\begin{array}{c}
 Y \rightarrow Z \rightarrow A \rightarrow q \rightarrow r \rightarrow s \rightarrow t \rightarrow B \\
 \times \\
 X \rightarrow C
 \end{array}$$

There is no limit to the number of antecedent conditions we can frame. Here more conditions (D , u , v) are specified.

$$\begin{array}{c}
 Y \rightarrow Z \rightarrow A \rightarrow q \rightarrow r \rightarrow s \rightarrow t \rightarrow B \\
 \times \qquad \qquad \times \\
 X \rightarrow C \qquad \qquad u \\
 \times \qquad \qquad \times \\
 D \qquad \qquad v
 \end{array}$$

One can add more avenues of causation between causal and caused variables. Here two chains of causation between A and B (running through intervening variables f and g) are added, to produce a three-chain theory:

$$\begin{array}{c}
 \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow f \rightarrow \\
 Y \rightarrow Z \rightarrow A \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow g \rightarrow B \\
 \rightarrow q \rightarrow r \rightarrow s \rightarrow t \rightarrow \\
 \times \qquad \qquad \times \\
 X \rightarrow C \qquad \qquad u \\
 \times \qquad \qquad \times \\
 D \qquad \qquad v
 \end{array}$$

A "theory" that cannot be arrow-diagrammed is *not a theory* and

Interesting point for class conv
 (needs reframing to become a theory. (According to this criteria much political science "theory" and "theoretical" writing is not theory.)

What Is a Specific Explanation?

Explanations of specific events (particular wars, revolutions, election outcomes, economic depressions, and so on) use theories and are framed like theories. A good explanation tells us what specific causes produced a specific phenomenon and identifies the general phenomenon of which this specific cause is an example. Three concepts bear mention:

specific explanation

An explanation cast in specific terms that accounts for a distinctive event. Like a theory, it describes and explains cause and effect, but these causes and effects are framed in singular terms. (Thus "expansionism causes aggression, causing war" is a theory; "German expansionism caused German aggression, causing World War II" is a specific explanation.) Specific explanations are also called "particular explanations" (as opposed to "general explanations.")

Specific explanations come in two types. The second type ("generalized specific explanation") is more useful:

nongeneralized specific explanation

A specific explanation that does not identify the theory that the operating cause is an example of. ("Germany caused World War II." The explanation does not answer the ques-

generalized specific explanation

tion "of what is Germany an example?")¹¹ A specific explanation that identifies the theories that govern its operation.¹² ("German expansionism caused World War II." The operating cause, "German expansionism," is an example of expansionism, which is the independent variable in the hypothesis "expansionism causes war.")

Specific explanations are composed of causal, caused, intervening, and antecedent phenomena:¹³

causal phenomenon (CP)	The phenomenon doing the causing.
caused phenomenon (OP)	The phenomenon being caused.
intervening phenomena (IP)	Phenomena that form the explanation's explanation. These are caused by the causal phenomenon and cause the outcome phenomenon.
antecedent phenomena (AP)	Phenomena whose presence activates or magnifies the causal action of the causal and/or explanatory phenomena. ¹⁴

11. Such explanations rest on implicit theories, however, as Carl Hempel has explained. See Hempel, "Function of General Laws in History."

12. The theories thus identified are sometimes termed the "warrants" of the argument or explanation. See Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams, *The Craft of Research* (Chicago: University of Chicago Press, 1995), pp. 90-92, 111-31. "The warrant of an argument is its general principle, an assumption or premise that bridges the claim and its supporting evidence" (ibid., p. 90).

13. Specific explanations are composed of singular phenomena that represent specific values on variables, not of variables themselves. As such they are "phenomena," not "variables." On assessing specific explanations see "How Can Specific Events Be Explained," in this chapter.

14. These last seven terms—"specific explanation," "nongeneralized specific explanation," "generalized specific explanation," "causal phenomenon," "caused phenomenon," "intervening phenomenon," and "antecedent phenomenon"—

We arrow-diagram specific explanations the same way we do theories:

A theory	Expansionism → Aggression → War
A generalized specific explanation	German expansionism → German aggression → World War II
A nongeneralized specific explanation	Germany → Outbreak of fighting on September 1, 1939 → World War II

What Is a Good Theory?

Seven prime attributes govern a theory's quality.

1. A good theory has *large explanatory power*. The theory's independent variable has a large effect on a wide range of phenomena under a wide range of conditions. Three characteristics govern explanatory power:

Importance. Does variance in the value on the independent variable cause large or small variance in the value on the dependent variable?¹⁵ An important theory points to a cause that has a large impact—one that causes large variance on the dependent vari-

are my suggested labels for these concepts. Others use "explanandum phenomenon" for the caused phenomenon, and "explanans" for a generalized explanation and its components (the causal, intervening, and antecedent phenomena). See, for example, Hempel, *Philosophy of Natural Science*, p. 50. (In Hempel's usage only generalized specific explanations comprise an explanans—nongeneralized specific explanation do not.)

15. A theory's importance can be measured in "theoretical" or "dispersion" terms. A theoretical measure of importance asks: how many units of change in the value on the dependent variable are caused by a unit of change in the value on the independent variable? (How many additional votes can a candidate gain by spending an additional campaign dollar on television ads?) A dispersion measure asks: what share of the DV's total variance in a specific data set is caused by variance of this IV? (What percentage of the variance in the votes received by various congressional candidates is explained by variance in their television spending?) I use "importance" in the former sense, to refer to theoretical importance. See Christopher H. Achen, *Interpreting and Using Regression* (Beverly Hills: Sage, 1982), pp. 68-77.

able. The greater the variance produced, the greater the theory's explanatory power.

Explanatory range. How many classes of phenomena does variance in the value on the theory's independent variable affect, hence explain? The wider the range of affected phenomena, the greater the theory's explanatory power. Most social science theories have narrow range, but a few gems explain many diverse domains.¹⁶

Applicability. How common is the theory's cause in the real world? How common are antecedent conditions that activate its operation? The more prevalent the causes and conditions of the theory, the greater its explanatory power.¹⁷ The prevalence of

16. Karl Deutsch used the terms "combinatorial richness" and "organizing power" for attributes similar to what I call explanatory range, with "combinatorial richness" expressing "the range of combinations or patterns that can be generated from" a model, and "organizing power" defining the correspondence of the theory or model to phenomena other than those it was first used to explain. Karl Deutsch, *The Nerves of Government* (New York: Free Press, 1966), pp. 16-18. Examples of social science theories with wide explanatory range include Mancur Olson's theory of public goods, Robert Jervis's offense-defense theory of war and arms racing, Stanislaw Andreski's military-participation ratio (MPR) explanation for social stratification, and Stephen Walt's balance-of-threat theory of alliances. See Mancur Olson, *The Logic of Collective Action* (Cambridge: Harvard University Press, 1971); Robert Jervis, "Cooperation under the Security Dilemma," *World Politics* 30 (January 1978): 167-214; Stanislaw Andreski, *Military Organization and Society* (Berkeley: University of California Press, 1971), pp. 20-74; and Stephen M. Walt, *The Origins of Alliances* (Ithaca: Cornell University Press, 1987), pp. 17-33.

17. Even causes that produce powerful effects can have little explanatory power if these causes are rare in the real world, or if they require rare antecedent conditions to operate. Conversely, causes that produce weaker effects can have greater explanatory power if the cause and its antecedent conditions are common. Thus great white shark attacks are often lethal, but they explain few deaths because they are scarce in the real world. The cause is strong but rare, hence it explains little. Sunburn is less lethal but explains more death (through skin cancer) because it is more common. Likewise, scuba diving is often lethal if hungry great white sharks are around, but scuba diving explains few deaths because divers avoid shark-infested waters. The cause is powerful under the right conditions (hungry sharks nearby), but these conditions are rare, hence the cause explains few events. Sunburn explains more deaths because it does not require rare conditions to produce its harmful effects.

these causes and conditions in the past govern its power to explain history. Their current and future prevalence govern its power to explain present and future events.

2. Good theories elucidate by simplifying. Hence a good theory is *parsimonious*. It uses few variables simply arranged to explain its effects.

Gaining parsimony often requires some sacrifice of explanatory power, however. If that sacrifice is too large it becomes unworthwhile. We can tolerate some complexity if we need it to explain the world.

3. A good theory is "*satisfying*," that is, it satisfies our curiosity. A theory is unsatisfying if it leaves us wondering what causes the cause proposed by the theory. This happens when theories point to familiar causes whose causes, in turn, are a mystery. A politician once explained her election loss: "I didn't get enough votes!" This is true but unsatisfying. We still want to know why she didn't get enough votes.

The further removed a cause stands from its proposed effect, the more satisfying the theory. Thus "droughts cause famine" is less satisfying than "changes in ocean surface temperature cause shifts in atmospheric wind patterns, causing shifts in areas of heavy rainfall, causing droughts, causing famine."

4. A good theory is *clearly framed*. Otherwise we cannot infer predictions from it, test it, or apply it to concrete situations.

A clearly framed theory fashions its variables from concepts that the theorist has clearly defined.

A clearly framed theory includes a full outline of the theory's explanation. It does not leave us wondering how *A* causes *B*. Thus "changes in ocean temperature cause famine" is less complete than "changes in ocean temperature cause shifts in atmospheric wind patterns, causing shifts in areas of heavy rainfall, causing droughts, causing famine."

A clearly framed theory includes a statement of the antecedent conditions that enable its operation and govern its impact. Other-

unsatisfying
cause the
unsatisfying

wise we cannot tell what cases the theory governs and thus cannot infer useful policy prescriptions.

Foreign policy disasters often happen because policymakers apply valid theories to inappropriate circumstances. Consider the hypothesis that "appeasing other states makes them more aggressive, causing war." This was true with Germany during 1938–39, but the opposite is sometimes true: a firm stand makes the other more aggressive, causing war. To avoid policy backfires, therefore, policymakers must know the antecedent conditions that decide if a firm stand will make others more or less aggressive. Parallel problems arise in all policymaking domains and highlight the importance of framing antecedent conditions clearly.

5. A good theory is in principle *falsifiable*. Data that would falsify the theory can be defined (although it may not now be available).¹⁸

Theories that are not clearly framed may be nonfalsifiable because their vagueness prevents investigators from inferring predictions from them.

Theories that make omnipredictions that are fulfilled by all observed events are also nonfalsifiable. Empirical tests cannot corroborate or infirm such theories because all evidence is consistent with them. Religious theories of phenomena have this quality: happy outcomes are God's reward, disasters are God's punishment, cruelties are God's tests of our faith, and outcomes that elude these broad categories are God's mysteries. Some Marxist arguments share this omni-predictional trait.¹⁹

6. A good theory *explains important phenomena*: it answers ques-

18. Discussing this requirement of theory is Hempel, *Philosophy of Natural Science*, pp. 30–32.

19. For other examples see King, Keohane, and Verba, *Designing Social Inquiry*, p. 113, mentioning Talcott Parsons's theory of action and David Easton's systems' analysis of macropolitics. On Easton see also Harry Eckstein, "Case Study and Theory in Political Science," in Fred I. Greenstein and Nelson W. Polsby, eds., *Handbook of Political Science*, vol. 7, *Strategies of Inquiry* (Reading, Mass.: Addison-Wesley, 1975), p. 90.

(Unless people aren't asking the right qs?)
tions that matter to the wider world, or it helps others answer such questions. Theories that answer unasked questions are less useful even if they answer these questions well. (Much social science theorizing has little real-world relevance and thus fails this test.)

7. A good theory has *prescriptive richness*. It yields useful policy recommendations.

A theory gains prescriptive richness by pointing to manipulable causes, since manipulable causes might be controlled by human action. Thus "capitalism causes imperialism, causing war" is less useful than "offensive military postures and doctrines cause war," even if both theories are equally valid, because the structure of national economies is less manipulable than national military postures and doctrines. "Teaching chauvinist history in school causes war" is even more useful, since the content of national education is more easily adjusted than national military policy.

A theory gains prescriptive richness by identifying dangers that could be averted or mitigated by timely countermeasures. Thus theories explaining the causes of hurricanes provide no way to prevent them, but they do help forecasters warn threatened communities to secure property and take shelter.

A theory gains prescriptive richness by identifying antecedent conditions required for its operation (see point 4). The better these conditions are specified the greater our ability to avoid misapplying the theory's prescriptions to situations that the theory does not govern.

How Can Theories Be Made?

There is no generally accepted recipe for making theories.²⁰ Some scholars use deduction, inferring explanations from more

20. Arguing the impossibility of a recipe is Hempel, *Philosophy of Natural Science*, pp. 10–18. Also see Milton Friedman, *Essays in Positive Economics* (Chicago: University of Chicago Press, 1953): constructing hypotheses "is a creative act of inspiration, intuition, invention . . . the process must be discussed in psychologi-

general, already-established causal laws. Thus much economic theory is deduced from the assumption that people seek to maximize their personal economic utility. Others make theories inductively: they look for relationships between phenomena; then they investigate to see if discovered relationships are causal; then they ask "of what more general causal law is this specific cause-effect process an example?" For example, after observing that clashing efforts to gain secure borders helped cause the Arab-Israeli wars, a theorist might suggest that competition for security causes war.²¹

Nine aids to theory-making bear mention. (The first eight are inductive, the last is deductive.)

1. We can examine "outlier" cases, that is, cases poorly explained by existing theories.²² Unknown causes must explain their outcomes. We try to identify these causes by examining the case.

Specifically, to make a new theory we select cases where the phenomenon we seek to explain is abundant but its known causes are scarce or absent. Unknown causes must be at work. These causes will announce themselves as unusual characteristics of the case and as phenomena that are associated with the dependent variable within the case. We nominate these phenomena as candidate causes.²³ We also cull the views of people who experienced

cal, not logical, categories; studied in autobiographies and biographies, not treatises on scientific method; and promoted by maxim and example, not syllogism or theorem" (p. 43). On the subject of theory-making see also Shively, *Craft of Political Research*, pp. 163–66, where Shively notes the possibility of creating theories by induction, deduction, and borrowing theories from other fields.

21. From there the theorist could move further by returning to deduction, for instance, deducing that conditions that intensify competition for security—such as an advantage for the offensive on the battlefield—are also causes of war.

22. Such cases lie furthest from the regression line expressing the relationship between the dependent variable and its known causes; hence the term "outlier" cases. Another term for exploring outlier cases is "deviant-case analysis." See Arend Lijphart, "Comparative Politics and the Comparative Method," *American Political Science Review* 65 (September 1971): 692.

23. For example, India is a democracy with a low level of public literacy. Literacy

the case or know it well and nominate their explanations as candidate causes.

To infer a theory's antecedent conditions (CVs), we select cases where the dependent variable's causes are abundant but the dependent variable is scarce or absent. This suggests that unknown antecedent conditions are absent in the case. Study of the case may identify them.

2. The "method of difference" and "method of agreement" (proposed by John Stuart Mill)²⁴ can serve as aids to inductive theory-making. In the method of difference the analyst compares cases with similar background characteristics and different values on the study variable (that is, the variable whose causes or effects we seek to discover), looking for other differences between cases. We nominate these other cross-case differences as possible causes of the study variable (if we seek to discover its causes) or its possible effects (if we seek its effects). We pick similar cases to reduce the number of candidate causes or effects that emerge: the more similar the cases, the fewer the candidates, making real causes and effects easier to spot.²⁵ Likewise, in the method of

is an established cause of democracy, hence India is an "outlier" case, falling far from the regression line expressing the relationship between degree of democracy (the dependent variable) and levels of literacy (the independent variable). Exploring the India case will uncover causes of democracy that operate independently of literacy and in addition to it.

24. John Stuart Mill, *A System of Logic*, ed. J. M. Robson (Toronto: University of Toronto Press, 1973), chap. 8, "Of the Four Methods of Experimental Inquiry," pp. 388–406.

25. An example of using paired method-of-difference case studies for theory-making is Morris P. Fiorina, *Congress: Keystone of the Washington Establishment* (New Haven: Yale University Press, 1977), chap. 4, pp. 29–37. Fiorina sought to explain why marginal congressional districts ("swing" districts where Democrats and Republicans compete evenly in congressional elections) were disappearing. To generate hypotheses he compared two districts highly similar in character but different in result: one district had always been and remained marginal, the other had changed from marginal to nonmarginal during the 1960s. He nominated the key cross-district difference that he observed (greater constituent servicing by the congressional incumbent in the newly nonmarginal

agreement the analyst explores cases with different characteristics and similar values on the study variable, looking for other similarities between the cases, and nominating these similarities as possible causes or effects of the variable.²⁶

3. We can select cases with extreme high or low values on the

district) as a possible cause of the general decline of marginality. The growth of government, he theorized, had created opportunities for incumbents to win the voters' favor by performing constituent service, and this bolstered incumbents who seized the opportunity.

I also had an early social science adventure inferring a hypothesis by method-of-difference case comparison (although I was oblivious of J. S. Mill at the time). In 1969 I sought to explain why black political mobilization remained low in the rural Deep South even after the passage of the 1965 Voting Rights Act. I inferred an explanation—holding that economic coercion by whites was retarding black mobilization—partly from Delphi-method interviews (see note 27) but also from a method-of-difference comparison.

I started by comparing two very similar black-majority Mississippi counties. Holmes and Humphries counties were virtual twins on nearly all socioeconomic dimensions except one: blacks had won county-wide elections in Holmes but lost badly in next-door Humphries. This spurred my search for a second difference between them. It was easy to spot. Holmes had the Mileston project, a community of black landowners who bought small farms through the New Deal Farm Security Administration in the 1940s. Humphries had nothing similar. As a result Holmes had far more black landowners than Humphries. Further investigation (process tracing) revealed that these landowners had played a key role in building Holmes County's black political organization. Interviews further suggested that fear of eviction among black tenant farmers deterred their political participation throughout Mississippi, and the Mileston farmers were emboldened to participate by their freedom from fear of eviction. A large-*n* test using all twenty-nine black-majority Mississippi counties then found a significant correlation between measures of black freedom from economic coercion and black political mobilization. This further corroborated the hypothesis that economic coercion depressed black political mobilization in the Mississippi black belt and suggested that such coercion might explain low levels of black mobilization across the rural Deep South.

The results of this study are summarized in Lester M. Salamon and Stephen Van Evera, "Fear, Apathy, and Discrimination: A Test of Three Explanations of Political Participation," *American Political Science Review* 67 (December, 1973): 1288–1306. (Unfortunately, our article omits my Holmes county interview and process-tracing data. Still wet behind the ears, I assumed that only large-*n* tests were valid and never thought to present Holmes county as a case study.)

26. The method of difference is more efficient when the characteristics of available cases are quite homogeneous (that is, when most aspects of most cases are

study variable (SV) and explore them for phenomena associated with it. If values on the study variable are very high (if the SV phenomenon is present in abundance), its causes and effects should also be present in unusual abundance, standing out against the case background. If values on the SV are very low (if the SV phenomenon is nearly absent), its causes and effects should also be conspicuous by their absence.

4. We can select cases with extreme within-case variance in the value on the study variable and explore them for phenomena that covary with it. If values on the study variable vary sharply, its causes and effects should also vary sharply, standing out against the more static case background.

5. Counterfactual analysis can aid inductive theorizing. The analyst examines history, trying to "predict" how events would have unfolded had a few elements of the story been changed, with a focus on varying conditions that seem important and/or manipulable. For instance, to explore the effects of military factors on the likelihood of war, one might ask: "How would pre-1914 diplomacy have evolved if the leaders of Europe had not believed that conquest was easy?" Or, to explore the importance of broad social and political factors in causing Nazi aggression: "How might the 1930s have unfolded had Hitler died in 1932?" The greater the impact of the posited changes, the more important the analysis.

When analysts discover counterfactual analyses they find persuasive, they have found theories they find persuasive, since all counterfactual predictions rest on theories. (Without theories the analyst could not predict how changed conditions would have changed events.) If others doubt the analysis (but cannot expose fatal flaws in it), all the better: the theory may be new, hence a real discovery. At this point the analyst has only to frame the theory in

similar). The method of agreement is preferred when the characteristics of cases are heterogeneous (that is, when most aspects of most cases are different).

a general manner so that predictions can be inferred from it and tested. The analyst should ask: "What general causal laws are the dynamics I assert examples of?" The answer is a theory.

Counterfactual analysis helps us recognize theories, not make them. Theories uncovered by counterfactual analysis must exist in the theorist's subconscious before the analysis; otherwise the theorist could not construct the counterfactual scenario. Most people believe in more theories than they know. The hard part is to bring these theories to the surface and express them in general terms. Counterfactual analysis aids this process.

6. Theories can often be inferred from policy debates. Proponents of given policies frame specific cause-effect statements ("If communism triumphs in Vietnam, it will triumph in Thailand, Malaysia, and elsewhere") that can be framed as general theories ("Communist victories are contagious: communist victory in one state raises the odds on communist victory in others"; or, more generally, "Revolution is contagious; revolution in one state raises the odds on revolution in others"). We can test these general theories. Such tests can in turn help resolve the policy debate. Theories inferred in this fashion are sure to have policy relevance, and they merit close attention for this reason.

7. The insights of actors or observers who experienced the event one seeks to explain can be mined for hypotheses. Those who experience a case often observe important unrecorded data that is unavailable to later investigators. Hence they can suggest hypotheses that we could not infer from direct observation alone.²⁷

27. I used this technique—the "Delphi method"—to infer a hypothesis explaining why black political mobilization remained low in the rural Deep South even after the passage of the 1965 Voting Rights Act. At that time (1969) political scientists widely assumed that low black political mobilization stemmed from black political apathy. I thought the skill of local organizers might be key. Interviews, however, revealed that rural black community leaders doubted both theories. They instead argued that fear of white coercion deterred black participation, and freedom from coercion helped explain pockets of black political mobiliza-

8. Large-*n* data sets can be explored for correlations between variables. We nominate discovered correlations as possible cause-effect relationships. This method is seldom fruitful, however. A new large-*n* data set is usually hard to assemble, but if we rely on existing data sets, our purview is narrowed by the curiosities of previous researchers. We can only explore theories that use variables that others have already chosen to code.

9. We can fashion theories by importing existing theories from one domain and adapting them to explain phenomena in another.²⁸ Thus students of misperception in international relations and students of mass political behavior have both borrowed theories from psychology. Students of military affairs have borrowed theories from the study of organizations. Students of international systems have borrowed theories (e.g., oligopoly theory) from economics.

How Can Theories Be Tested?

We have two basic ways to test theories: experimentation and observation. Observational tests come in two varieties: large-*n* and case study. Thus, overall we have a universe of three basic testing methods: experimentation, observation using large-*n* analysis, and observation using case-study analysis.²⁹

tion. Further investigation found substantial evidence to support their argument. (This hypothesis also emerged from a method-of-difference comparison of two Mississippi counties. See note 25.)

28. Suggesting this technique is Shively, *Craft of Political Research*, p. 165.

29. Deduction supplies a fourth way to evaluate theories. Using deduction to evaluate the hypothesis that *a* causes *b*, we would ask if *a* and *b* are examples of more general phenomena (*A* and *B*) that are already known to cause each other. If so, we can deduce that, since *A* causes *B*, and *a* and *b* are examples of *A* and *B*, then *a* must cause *b*. On deductive assessment of theory see, e.g., Hempel's discussion of "theoretical support" for theories in his *Philosophy of Natural Science*, pp. 38–40, and his related discussion of "deductive-nomological" explanations and "covering laws" on page 51 of the same work. The former are explana-

1. *Experimentation*. An investigator infers predictions from a theory. Then the investigator exposes only one of two equivalent groups to a stimulus. Are results congruent or incongruent with the predictions? Congruence of prediction and result corroborates the theory, incongruence infirms it.

2. *Observation*. An investigator infers predictions from a theory. Then the investigator passively observes the data without imposing an external stimulus on the situation and asks if observations are congruent with predictions.³⁰

Predictions frame observations we expect to make if our theory is valid. They define expectations about the incidence, sequence, location, and structure of phenomena.³¹ For instance, we can always predict that values on the independent and dependent variables of valid theories should covary across time and space, other things being equal. Values on intervening variables that form the theory's explanation should also covary with the independent variable across time and space. Variance on the independent vari-

tions that operate by deduction from general laws, the latter are general laws from which specific explanations are deduced.

Most "commonsense" explanations are theories we accept because they are supported by deductions of this sort; however, a deductive evaluation is not a test of a theory. Rather, it applies a previously tested law to a new situation. 30. Observation research designs are also called "quasi-experimental." See Donald T. Campbell and Julian C. Stanley, *Experimental and Quasi-Experimental Designs for Research* (Boston: Houghton Mifflin, 1963), p. 34.

31. I use "prediction" to define expectations about the occurrence of phenomena in both the past and the future if a theory is valid. Others call these expectations the "observable implications" or the "test implications" of theory. King, Keohane, and Verba, *Designing Social Inquiry*, pp. 28–29 and passim; Hempel, *Philosophy of Natural Science*, pp. 7, 30. Still others use "postdiction" to refer to expectations about what the historical record will reveal, reserving "prediction" for expectations about the future.

We use predictions to design tests for hypotheses, but predictions are also hypotheses themselves. They frame phenomena that the independent variable should cause if the hypothesis operates. These phenomena include observable aspects of the dependent variable or intervening variables and effects that these variables produce. Thus the distinction between a prediction and a hypothesis lies not in their nature but the use to which they are put.

able should precede in time related variance on the dependent variable. If a social theory is being tested, actors should speak and act in a manner fitting the theory's logic (for example, if "commercial competition causes war," elites deciding for war should voice commercial concerns as reasons for war).

Some hard sciences (chemistry, biology, physics) rely largely on experiments. Others (astronomy, geology, paleontology) rely largely on observation. In political science experiments are seldom feasible, with rare exceptions such as conflict simulations or psychology experiments. This leaves observation as our prime method of testing.

Two types of observational analysis are possible:

1. *Large-n*, or "statistical," analysis.³² A large number of cases—usually several dozen or more—is assembled and explored to see if variables covary as the theory predicts.

2. *Case-study* analysis. The analyst explores a small number of cases (as few as one) in detail, to see whether events unfold in the manner predicted and (if the subject involves human behavior) whether actors speak and act as the theory predicts.³³

Which method—experiment, large-*n*, or case study—is best? We should favor the method that allows the most strong tests. (I discuss strong tests later in this chapter.) More tests are better than fewer; strong tests are better than weak; many strong tests are best, as are methods that allow them. The structure of available data decides which method is strongest for testing a given theory.

32. Primers on large-*n* analysis include Babbie, *Practice of Social Research*; Shively, *Craft of Political Research*; William G. Cochran, *Planning and Analysis of Observational Studies* (New York: Wiley, 1983); Edward S. Balian, *How to Design, Analyze, and Write Doctoral or Masters Research*, 2d ed. (Lanham, Md.: University Press of America, 1988); Edward R. Tufte, *Data Analysis for Politics and Policy* (Englewood Cliffs, N.J.: Prentice-Hall, 1974); D. G. Rees, *Essential Statistics*; George W. Snedecor and William G. Cochran, *Statistical Methods* (Ames: Iowa State University Press, 1989); and David Freedman et al., *Statistics*, 2d ed. (New York: Norton, 1991).

33. Landmark writings on the case-study method are listed in note 1 to Chapter 2.

Most theories of war are best tested by case-study methods because the international historical record of prewar politics and diplomacy, which serves as our data, usually lends itself better to deep study of a few cases than to exploration of many cases. A few cases are recorded in great depth (the two World Wars) but the historical record deteriorates sharply as we move beyond the fifteenth or twentieth case. As a result case studies often allow more and stronger tests than large-*n* methods. Conversely, large-*n* methods are relatively more effective for testing theories of American electoral politics because very large numbers of cases (of elections, or of interviewed voters) are well recorded. Case studies can be strong tools for exploring American politics, however, especially if in-depth case studies yield important data that is otherwise inaccessible,³⁴ and large-*n* analysis can be a strong method for exploring international politics if relevant test data is recorded for many cases (see, for example, the many good large-*n* tests of democratic peace theory.)³⁵ Experimentation is the least valuable approach because experiments are seldom feasible in political science.

Strong vs. Weak Tests; Predictions and Tests

Strong tests are preferred because they convey more information and carry more weight than weak tests.³⁶

34. Examples include Richard E. Fenno, *Home Style: House Members in Their Districts* (New York: HarperCollins, 1978), and Fiorina, *Congress: Keystone of the Washington Establishment*.

35. For example, Steve Chan, "Mirror, Mirror on the Wall . . . Are the Freer Countries More Pacific?" *Journal of Conflict Resolution* 28 (December 1984): 617-48; Erich Weede, "Democracy and War Involvement," *ibid.*, pp. 649-64; and Zeev Maoz and Bruce Russett, "Normative and Structural Causes of Democratic Peace, 1946-1986," *American Political Science Review* 87 (September 1993): 624-38.

36. Discussions of strong tests include Eckstein, "Case Study and Theory," pp. 113-31, discussing what he terms "crucial-case studies" (his term for cases supplying strong tests), and Arthur L. Stinchcombe, *Constructing Social Theories* (New York: Harcourt, Brace & World, 1968), pp. 20-22.

A strong test is one whose outcome is unlikely to result from any factor except the operation or failure of the theory. Strong tests evaluate predictions that are *certain* and *unique*. A *certain* prediction is an unequivocal forecast. The more certain the prediction, the stronger the test. The most certain predictions are deterministic forecasts of outcomes that must inexorably occur if the theory is valid. If the prediction fails, the theory fails, since failure can arise only from the theory's nonoperation. A *unique* prediction is a forecast not made by other known theories. The more unique the prediction, the stronger the test. The most unique predictions forecast outcomes that could have no plausible cause except the theory's action. If the prediction succeeds, the theory is strongly corroborated because other explanations for the test outcome are few and implausible.

Certainty and uniqueness are both matters of degree. Predictions fall anywhere on a scale from zero to perfect on both dimensions. Tests of predictions that are highly certain and highly unique are strongest, since they provide decisive positive and negative evidence. As the degree of certitude or uniqueness falls, the strength of the test also falls. Tests of predictions that have little certitude or uniqueness are weakest, and are worthless if the tested prediction has no certitude or uniqueness.

We can distinguish four types of tests, differing by their combinations of strength and weakness:

1. *Hoop tests*. Predictions of high certitude and no uniqueness provide decisive negative tests: a flunked test kills a theory or explanation, but a passed test gives it little support. For example: "Was the accused in the state on the day of the murder?" If not, he is innocent, but showing that he was in town does not prove him guilty. To remain viable the theory must jump through the hoop this test presents, but passage of the test still leaves the theory in limbo.

2. *Smoking-gun tests*. Predictions of high uniqueness and no certitude provide decisive positive tests: passage strongly corrobo-