I. Purpose of Science

All sciences seek to explain phenomena (events, behavior, or conduct)

Patterns of phenomena can be explained by general theories
- why do earthquakes occur?
- why does cancer occur?
- why do countries democratize?
- why do welfare policies vary?

Specific phenomena might be explained by idiosyncratic explanations
- why did I get cancer?
- Why did Spain democratize in 1976?

Scientists prefer general explanations to idiosyncratic explanations. Why?
- parsimony: explain more with less (Occam’s razor)
- prediction: general theories can predict future events
- control: using a theory, one might be able to prevent harmful outcomes and create good ones

Social sciences are different from physical sciences
- Law is a statement of regularity
- Laws predominate in many physical sciences, e.g., Boyle’s law, law of gravity
- Few laws in social sciences

II. Theories, Causes and Explanations

Theories provide explanations
Explanations relate specific events to general class of events
- today’s thunderstorm is related to thunderstorms in general
- the civil war in Colombia is related to civil wars in general
- explanations are not descriptions
Theory: set of interrelated generalizations (axioms) about a range of phenomena
- specifies independent (explanans) and dependent variables (explanandum)

Independent Variables → Dependent Variables
X → Y

- axioms are abstractions about empirical world
- deduce hypotheses from axioms
  hypotheses: prediction about relations between variables, usually stated in if, then format
  If a country grows economically, then it will democratize

Ad-hoc hypothesis testing is inferior to theory-generated hypotheses

Causation and Theories

Theories identify causes

Causation v. correlation

Correlation: regular association between variables
- Not all correlations reflect causal relationships…
  correlation may be spurious
- But correlations still be useful as predictors (e.g. per capita income and democratic survival)

Three Views of Causation

1) Covering Law View of Causation (C. Hempel):
To say that C is the cause of E, is to say that C is regularly followed by E (C → E)

Necessary and sufficient conditions
- C is necessary for E; without C, no E
- C is sufficient for E; if C, then E
2) **Probabilistic Causation**: C → E some percentage of the time (e.g., smoking as a cause of cancer;).

3) **Causal Mechanisms**: processes (often unobservable) by which C generates E.

**Contingency and Causation**

In social sciences, it very difficult to find necessary and sufficient conditions

Contingency (chance) plays a large role

- Solar eclipses v. traffic jams (Tilly)