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Intermediate Game Theory

Contact Information

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Textbooks

- Basic: McCarty & Meirowitz
- Alternate: Rasmusen

- Starting with “normal form games”
 - Read RAS first, then consult MM for breadth

Our challenge

- Goal: Credible scientific contributions
- Constraint: limited time, pressure to publish
- Temptation: Ignore your assumptions

Definitions of Progress

CREDIBILITY

- the quality of being believable or trustworthy
- Example
 - “Political scientists seek to offer credible explanations.”

LEGITIMATE

- in accordance with recognized or accepted standards or principles
- Example
 - “political science claims that are inconsistent with the scientific method are less often seen as legitimate.”

Question

- What are *you* doing to increase the credibility of
 - Your research?
 - Political science as a whole?

My argument

- Limited introspection about and documentation of assumptions undermines Political Science's credibility
- Our training and programs such as DA-RT and EITM are designed to help scholars
 - Increase procedural and analytic transparency
 - Increase documentational rigor

681 Fundamentals

- What is 681?
 - Literature reviews? NO. Skill transfer? YES
- Why it matters?
 - \exists real problems. Greater precision can yield social value.
- What we hope to accomplish.
 - No: "I know the relevant definitions."
 - Yes: "I am improving the effectiveness and efficiency of my research designs."
- Premise:
 - You will learn more about game theory by doing it rather than simply reading about it.

Our Goal

A Greater Commitment to Precision

Your Requirements

- Do the readings in advance.
- Problem sets (9@5% each)
 - Due at 5:00 pm one week after relevant Chapter is completed in class
- Article workshop whitepapers (10@2% each)
 - 250-500 words due 24 hours prior to the beginning of class
- Exams
 - Midterm, March 18(15%)
 - Final, [see exam schedule] (20%)

Tactic

- You: Try to do the readings *before* the class on which they are listed on the syllabus.
 - You gain the ability to ask questions about what you do not understand.
- Me: *I run behind, so that you can stay ahead.*

Outline

- The purpose of modeling
- Controversy
- Elements of Logic

The Purpose of Modeling

Philosophy

- Science contributes to society by simplifying complex phenomena.
 - Its value increases with the value of the simplification.
- Interesting topics are insufficient.
 - You must be able to lead people from where they are to a better conclusion.

The Basic Research Design Problem

- N problems = ∞ .
- For any problem, N theories = ∞ .
- For any theory, N models = ∞ .
- For any problem, the number of empirical specifications = ∞ .

Your research design problem

- Where are they?
 - Who is your target audience?
 - What factual premises/truth claims will they accept.
- Where do they want to be?
 - Which alternate conclusion will benefit them?
 - What burden of proof and standard of evidence do they impose?

What will you choose?

- All political scientists make assumptions about:
 - Players, Actions, Strategies, Information, Beliefs, Outcomes, Payoffs, and
 - Method of inference (e.g., “I know it when I see it,” path dependence, Nash Equilibrium, logit plus LLN).
- Some state their assumptions more precisely than others.
- Conclusions depend on assumptions.

Our Goal

A Greater Commitment to Precision

Is formal modeling needed?

Controversy

Scientific Method

- The collection of data through observation and experimentation and the formulation and testing of hypotheses.
- A basic expectation is to document, archive, and share *all methods* so that they are available for careful scrutiny by other scientists.

PT Johnson

<http://duckofminerva.blogspot.com/2010/12/to-science-or-not-to-science-is-that.html>

- “Scientific” research is
 - Systematic
 - features a logical relationship between premises and conclusions,
 - Public
 - susceptible to challenge
 - Worldly
 - Is “of the world” and does not rely on transcendent conjectures of the world's value or purpose.

Scientific Research Designs (KKV 7-8)

- 1. The goal is inference.
 - 2. The procedures are public.
 - 3. The conclusions are uncertain.
 - 4. The content is the method.
-
- It is a social phenomenon...

A challenge

- Goal: Credible scientific contributions
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1 . Common Threats to Credibility

Example 1. “Paradigm”

- Use a commercial statistical package to analyze survey data.
- Assume that the underlying causal model is some variant of $Y = a + b'X + e$,
 - $Y = a + b_1(\text{race}) + b_2(\text{race} * \text{something}) + b_3(\text{something}) + b_4 \dots m(\text{other things}) + e$

**What are we assuming about
this process?**

Example 2. “Stargazing”

- Begin with a hunch that a particular variable has an unappreciated association with voting behavior or turnout.
- Run a regression. Look for “stars.”
- If the stars support the hunch, STOP
- Otherwise, run more regressions.
- Stop “when the stars align.”

No easily defensible theory guides these decisions.

**What are we assuming about
this process?**

Example 3. “One Cause”

- Claim: “ X_1 , has no effect on Y .”
- Evidence: X_1 's coefficient is not “significant.”
 - So, X_1 does not have a statistically significant effect *within the stated model*.
- What if the true underlying data generating mechanism is not identical to the structure of the stated model?

**What are we assuming about
this process?**

Example 4. ANES Open-Ended Questions

- “political knowledge”
- “most important problem”
- candidate “likes-dislikes”
- Party “likes-dislikes”

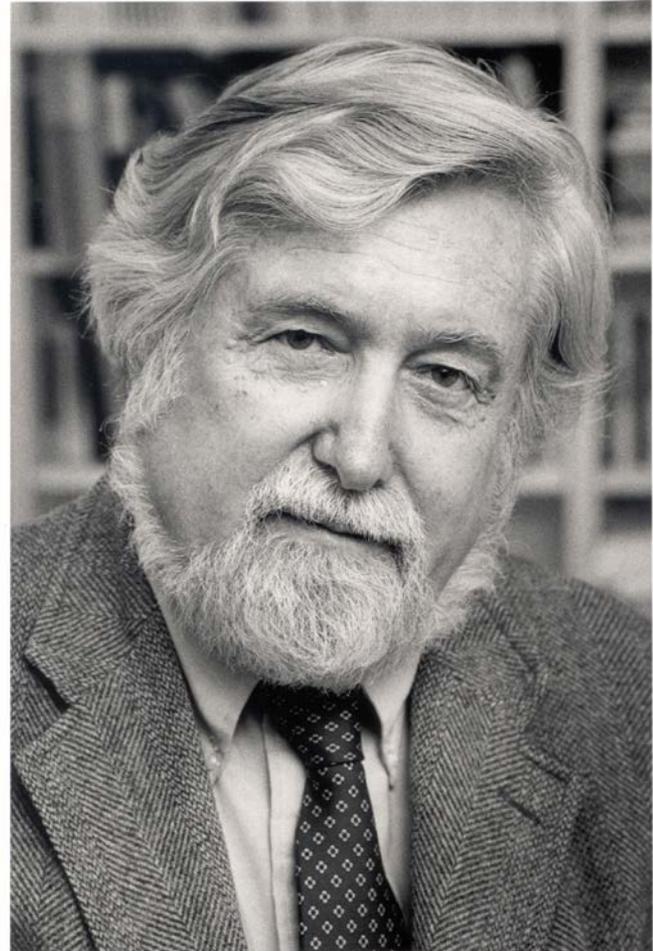
ANES Open-Ended Questions

- Errors in coding
- Procedural opaqueness
- Little or no documentation
- Meaning undermined, replicability impossible

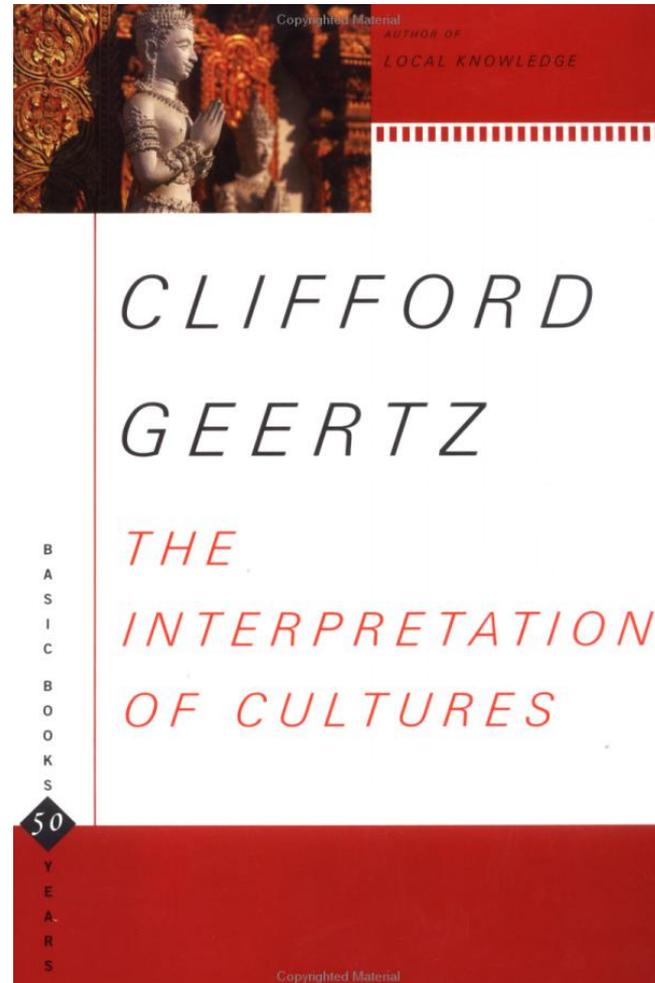
**What are we assuming about
this process?**

“Thick description”

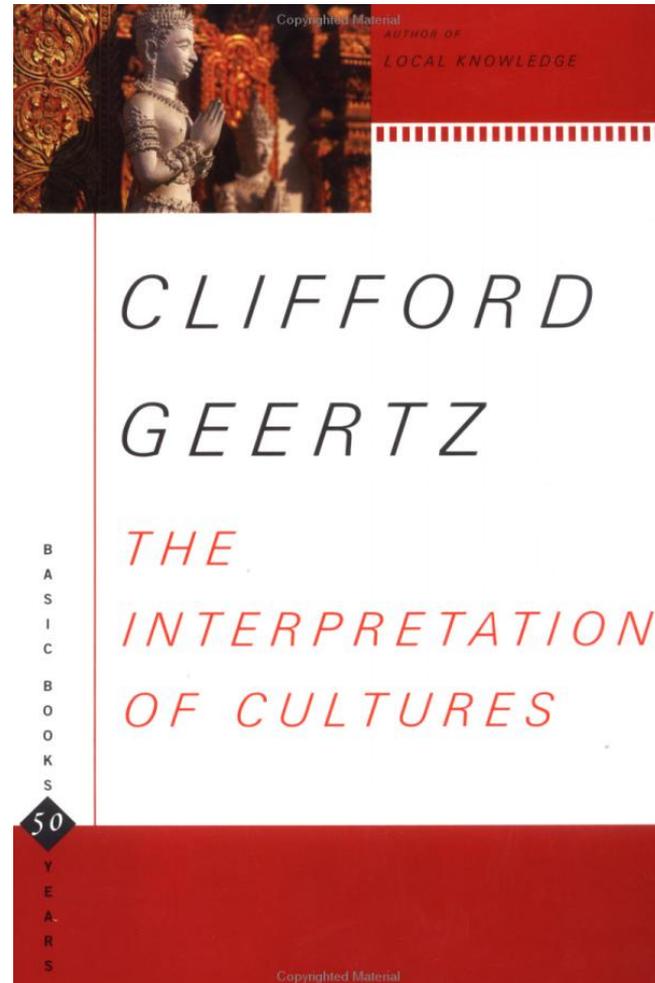
- A thick description of a human behavior is one that
 - explains not just the behavior,
 - but its context as well,
 - such that the behavior **becomes meaningful** to an outsider



The Interpretation of Cultures

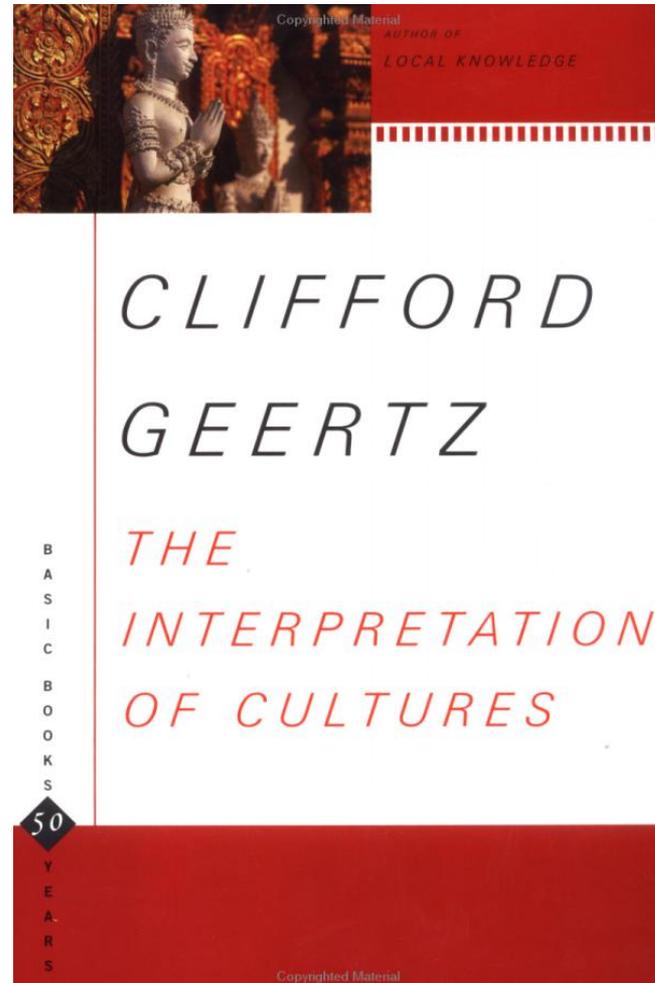


The Interpretation of Cultures



The Interpretation of Cultures

- **Dimensions:** 7.9 x 5.3 x 1.2 inches
- **Weight:** 1 pound



A comparison

THE INTERPRETATION OF CULTURES

- **Dimensions:** 7.9 × 5.3 × 1.2 inches
- **Weight:** 1 pound

A TYPICAL CHICKEN

- **Dimensions:** 8-18 inches
- **Weight:** 5-8 pounds

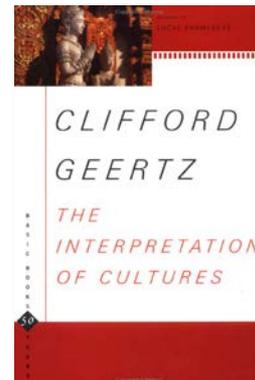
Reductionism

THE INTERPRETATION OF CULTURES

- **Dimensions:** 7.9 × 5.3 × 1.2 inches
- **Weight:** 1 pound

CHICKEN

- **Dimensions:** 8-18 inches
- **Weight:** 5-8 pounds



And procedural transparency still matters.

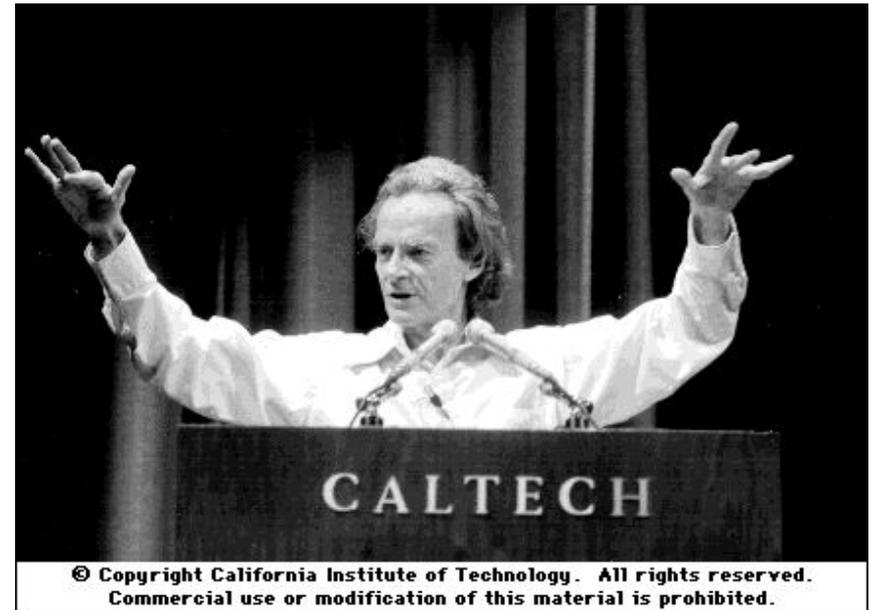
We're all reductionists now...

Remedies

- Track your assumptions, conclusions, and their relationships with
 - greater precision and
 - a commitment to complete documentation

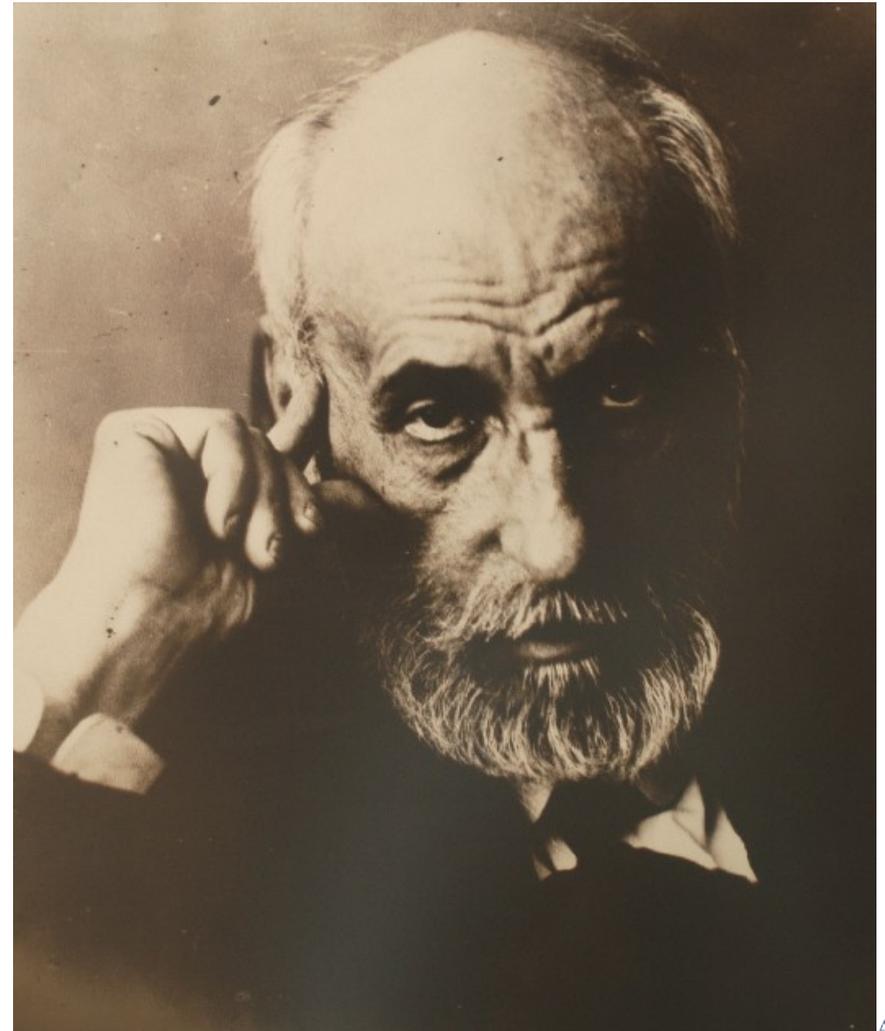
Richard Feynman (1974 – Caltech Commencement Address)

- [Scientific integrity] corresponds to a kind of **utter honesty**—a kind of leaning over backwards....
- In summary, the idea is **to give all of the information** to help others judge the value of your contribution; not just the information that leads to judgment in one particular direction...



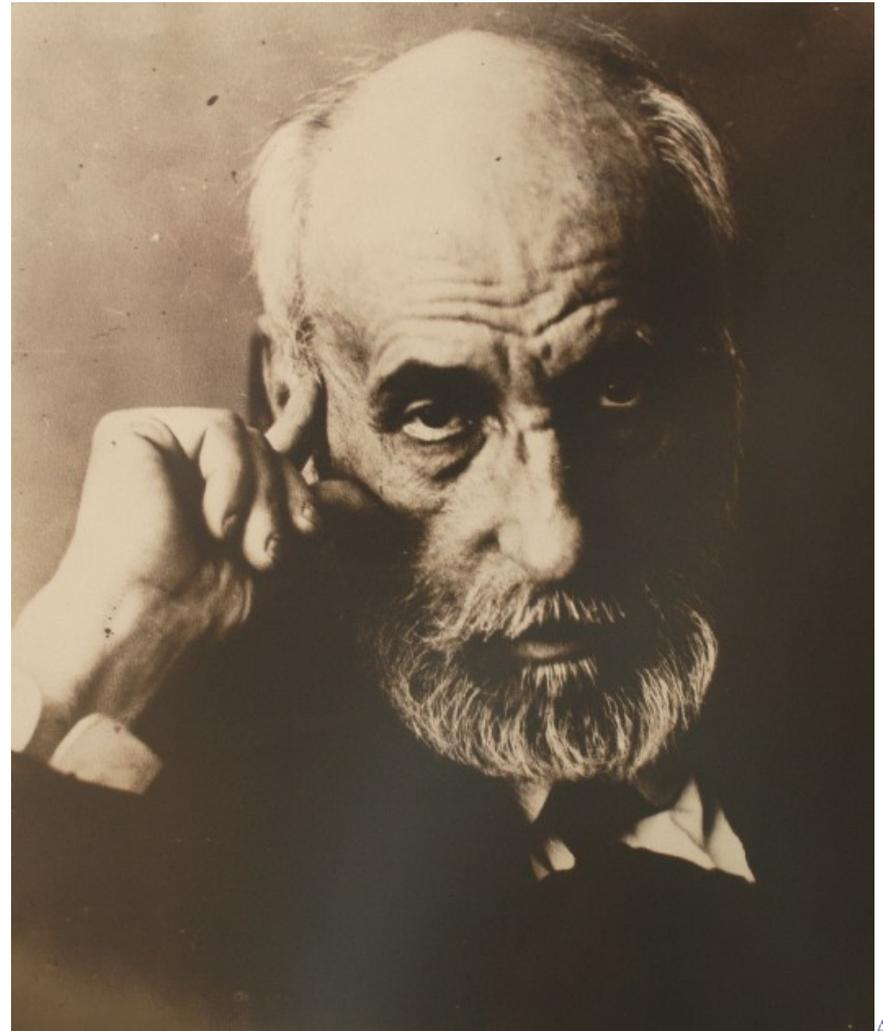
Santiago Ramon y Cajal (1916)

- “What a wonderful stimulant it would be for the beginner if his instructor, instead of amazing and dismaying him with the sublimity of great past achievements, would **reveal instead the origin of each scientific discovery...**”



Santiago Ramon y Cajal (1916)

- “What a wonderful stimulant it would be for the beginner if his instructor, instead of amazing and dismaying him with the sublimity of great past achievements, would reveal instead **the origin of each scientific discovery,**
- the series of errors and missteps that preceded it – information that, from a human perspective, is **essential to an accurate explanation of the discovery.**”



Scientific Method

- A basic expectation is to document, archive, and share all data and methodology so that they are available for careful scrutiny by other scientists.

The Basic Research Design Problem

- N problems = ∞ .
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What will you choose?

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 - Actions
 - Strategies
 - Information
 - Beliefs
 - Outcomes
 - Payoffs, and
 - Method of inference (e.g., “I know it when I see it,” path dependence, Nash Equilibrium, logit plus LLN).

What will you choose?

- **Scholars vary in the precision** with which they state premises, conclusions, and relations amongst premises and conclusions.

Our Goal

A Greater Commitment to Precision

Also see <http://www.fallacyfiles.org>

Logic and Argument

Arguments

- The currency of scientific communication.
- The components of an argument are:
 - The Conclusion
 - The Premises
- Value comes from explaining as much as possible with as little as possible.

Introduction to Logic

- Conclusion
 - The conclusion is what the argument is trying to prove.
- Premise
 - The premises are given as reasons for the conclusion.
 - Initial premises are offered without proof.

Introduction to Logic

- Logical Validity
 - Deductive
 - If all of the premises are true, then the conclusion **must be true**.
 - An argument in which the logical connection between premises and conclusion is one of necessity.
 - Inductive
 - If all of the premises are true, then the conclusion **may be true**.
 - An argument in which the logical connection between premises and conclusion is one of possibility.
 - Invalid
 - If all of the premises are true, then the conclusion **must be false**.
 - An argument in which the logical connection between premises and conclusion is one of impossibility.

Examples

- Barack Obama is a man.
- Barack Obama is over 5' 11" tall.
- All men who are over 5' 11" tall are the president.
- Therefore, Barack Obama is the president.

Examples

- Barack Obama is a man.
- Barack Obama is over 5' 11" tall.
- *Some* men who are over 5' 11" tall are the president.
- Therefore, Barack Obama is the president.

Examples

- Barack Obama is a man.
- Barack Obama is over 5' 11" tall.
- If a man is over 5' 11" tall, then he is not the president.
- Therefore, Barack Obama is the president.

Examples

- Random premise 1
- Random premise 2
- Therefore, Barack Obama is the president.

The value of logic in debate

- How to cast doubt on the reliability of a conclusion when an argument has the following logical properties:
- Invalid:
 - If the premises are believed to be true, then reveal the logical relationship.
- Inductively valid:
 - show that even if the premises are true the conclusion can be false or demonstrate that one or more of the premises is untrue.
- Deductively valid:
 - demonstrate that one or more of the premises is untrue.

Standards for another time

- Soundness
 - Waller (p 20), The argument “must be [deductively] valid *and* all of its premises must actually be true.”
- Reliability
 - Waller (p 21). “[A]n inductive argument with all true premises, and whose premises strongly support its conclusion, will be a *reliable* inductive argument.”
- These standards are more subjective.

Logical Fallacy: Denying the Antecedent

- If it's raining, then the streets are wet.
- It isn't raining.
- Therefore, the streets aren't wet.

Logical Fallacy: Affirming the Consequent

- If it's raining then the streets are wet.
- The streets are wet.
- Therefore, it's raining.

Logical Fallacy: Commutation of Conditionals

- If James was a bachelor, then he was unmarried.
- Therefore, if James was unmarried, then he was a bachelor.

The two faces of "or"

- Most logic texts claim that "or" has two meanings:
 - Inclusive (or "weak") disjunction: One or both of the disjuncts is true, which is what is meant by the "and/or" of legalese.
 - Exclusive (or "strong") disjunction: Exactly one of the disjuncts is true.
- Example
 - Today is Saturday or Sunday.
Today is Saturday.
Therefore, today is not Sunday
 - Suppressed premise: Saturday is not Sunday.

Logical Fallacy: Denying a Conjunct

- It isn't both sunny and overcast.
 - It isn't sunny.
 - Therefore, it's overcast.
-
- Not both **p** and **q**.
 - Not **p**.
 - Therefore, **q**.

Ockham's Razor (14th c.)

- Arguments are most helpful to an audience the extent that they actually bring clarity to the phenomena you're studying.
 - *lex parsimoniae* \approx entities should not be multiplied beyond necessity
 - In many cases, less is more.

Things That You Can Use a Model to Demonstrate

- Necessity
 - A is a necessary condition for B.
 - For B to be possibly true, I must show that A is true.
- Sufficiency
 - A is a sufficient condition for B.
 - If I show that A is true, then B must be true

Things That You Can Use a Model to Demonstrate

- Existence
 - A exists.
 - If A, then B is possible.
- Uniqueness
 - A if and only if B.

Questions to Ask Before You Begin

- Is the process static or dynamic?
- Do the actors have complete or incomplete information?
- Are there many actors or just a few?
- How have others modeled the political phenomena you're studying?

Action Item

- We can improve the discipline's credibility by establishing legitimating norms.
 - We can all contribute to increased procedural transparency.

What will you choose?

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