I. Administrative

A. Problem Set #4 – this is due in class next Tuesday, 12/8

B. Questions?

II. Inductive Arguments Handout

III. Reasoning about Causes

A. When we reason about the world, we are often interested in identifying causes of effects that matter to us.

1. These will depend on the facts of particular cases

2. We will bring these facts under causal generalizations

B. We can express causal generalizations as general conditionals

1. As conditionals, these have an “if-then” structure

2. They are general in the sense that they will hold for all members of a particular category: “For all x, if x has feature F, then x has feature G” (232).

   a. Here, having feature F is a sufficient condition for having feature G

   b. Having feature G is a necessary condition for having feature F.

3. Not all general conditionals are to be understood causally, but all causal conditionals are (according to our authors) general conditionals.
4. Thus, if we can establish that a causal conditional is false by virtue of the logical properties of its general formulation, then we will have refuted it.

5. Examples—some of these are from Ch. 10, Ex. 1; look also at Ch. 10, Ex. 2

   a. Being an integer is a sufficient condition for being an even number.

   b. Being an integer is a necessary condition for being an even number.

   c. Being an awesome ping pong player is a sufficient condition for being a human being.

   d. Being a philosopher is a necessary condition for being a moral philosopher.

IV. Tests for Causal Reasoning

A. Sufficient Condition Test:

   1. We can establish that A is not a sufficient condition for B just in case A is present and B is not

   2. Failure to find a case where A is present and B is absent does not prove that A is a sufficient condition for B

B. Necessary Condition Test:

   1. We can establish that A is not a necessary condition for B just in case A is not present and B is

   2. Failure to find a case where A is absent and B is present does not prove that A is a necessary condition for B

C. Joint Test: Apply the above rules simultaneously

D. We should aim to test these rigorously, looking to vary contexts as much as possible. At the very least, we should look for contexts in which the evaluated conditions are present and contexts in which they are absent.
V. Going Deeper into Causal Reasoning

A. This is only part of the pursuit of causal generalizations, though

1. Again, failure to find a counterexample does not prove that we have a causal relationship

2. How can we reach positive conclusions?
   a. “Normal” conditions
   b. Background information

3. Causes vs. causal factors
   a. Sometimes we cite necessary conditions—e.g., Legionnaires’ disease
   b. Sometimes we cite sufficient conditions—e.g., a stove burner left on as the start of a fire

4. Examples – see handout

B. Method of Concomitant Variation

1. Given that we have two phenomena, A and B, that are correlated strongly and perhaps causally, we can evaluate four possibilities:
   a. A is the cause of B
   b. B is the cause of A
   c. They are both effects of a common cause
   d. The correlation is accidental

2. One way to evaluate these is by “wiggling” one and seeing what happens with the other
   a. If we wiggle A and nothing happens to B, then that works against the idea that A causes B
   b. If we wiggle B and nothing happens to A, then that works against the idea that B causes A
   c. If A and B co-vary while everything else is held constant, then that militates against the existence of a common cause
3. Examples

a. For a particular United States president, there is a negative correlation between the number of hairs on his head (A) and the population of China (B).

b. It has been claimed that there is a strong positive correlation between those students who take sex education courses (A) and those who contract venereal disease (B).

c. At one time there was a strong negative correlation between the number of mules in a state (A) and the salaries paid to professors at the state university (B). In other words, the more mules, the lower professional salaries.

d. There is a high positive correlation between the number of fire engines in a particular borough in New York City (A) and the number of fires that occur there (B).