Scientific Explanation I

Preliminary Remarks

- Last two weeks: Laws of Nature

- One of the demands we placed on accounts of laws of nature is that they do justice to the explanatory power laws seem to possess.

- This week and the next: Scientific Explanation

Scientific Explanation (1)

- Two types of question central to science:

  (1) What will happen in the future?

  (2) Why do things happen?

- Some intuitions about explanations:

  - answer why-questions

  - confer understanding

  - objective

Scientific Explanation (2)

- There seem to be different kinds of explanation:

  - causal
  - nomic
  - psychoanalytic
  - evolutionary
  - functional
  - ….

- Question: Can they all be subsumed under one account of good scientific explanation?

The Covering Law Model

- Origin: Logical Empiricists
- The Covering-law model takes explanations to be:
  - Arguments containing laws as premises.
  - By and large, reconstructions.
  - Symmetrical with predictions.
- CLM encompasses two complementary models of explanation:
  1) Deductive-Nomological
  2) Inductive-Statistical

Deductive–Nomological Model

- Scientific Explanations are deductive arguments whose premises include at least one law.
- More precisely, 4 conditions must be satisfied:

  1) Deductive validity 3) Empirical content

  2) True premises 4) At least one natural law
- Logical Form of D-N explanations:

  1. $C_1, C_2, \ldots, C_n$ explanans

  2. $\underline{L_1, L_2, \ldots, L_m}$

  $\therefore O_1, O_2, \ldots, O_k$ explanand-um/-a

Deductive–Nomological Model (2)

- Prominent proponents: Hempel, Oppenheim, Nagel and most other Logical Empiricists.
- Example:

  Question: Why do these two objects (feather and rock) reach the bottom of a vacuum at the same time?

  Answer:

  All freely falling bodies fall with constant acceleration (law)

  This feather and this rock are freely falling bodies in a vacuum (ic)

  This feather and this rock are released from height *x* at the same time (ic)

  ∴ This feather and this rock will reach the bottom at the same time
- The explanandum can be a singular statement or a universal one.

D-N Model – Problems

- Not all D-N explanations are good
  (i.e. D-N requirements are not sufficient)

  - Flagpole example (Bromberger)
  - Pressure-Volume example (Bird)

Generalise: To create more counterexamples exchange one non-law premise for conclusion.

NB1: Asymmetry between explanation and prediction!!!

NB2: Causation seems to be ingredient missing.

D-N Model – Problems (2)

- Not all good explanations are D-N.
  (i.e. D-N requirements are not necessary)

  - ink bottle example (Scriven)

  Generalise: Take any explanation that does not appeal to a law of nature or any other of the requirements that D-N puts forth.

Food for Thought

- Can we modify the covering-law model to get a more viable account of scientific explanation?

Reading

- Bird, A. (1998) Philosophy of Science, ch.2, pp. 61-85.