Philosophy of Science // Fall 2015

Handout 16

Explanation: Friedman

Purposes of scientific explanation. Friedman begins by observing that the object of scientific explanation is usually regularities, rather than events. Also, a typical scientific explanation proceeds by relating the behaviour of problematic phenomena A to the behaviour of less problematic phenomena B. Friedman says that this is 'reduction'. But what kind of reduction is involved, e.g., in the explanation of steam: "The behaviour of water is reduced to the behaviour of molecules"?

Understanding. Explanation generates understanding. But we cannot in advance say how it is done. Available accounts of explanation yield unintuitive consequences about understanding. We can learn from their mistakes.

Prediction. Just because we expect a certain phenomenon need not entail that we understand why it happens. Observing the barometer's behaviour I may expect a storm to begin, but of course I do not understand why it will happen. Here notice that the D-N model touted as an account of explanation is also naturally viewed as an account of prediction. But is it reasonable to think that whenever we can predict we can also explain, and vice versa?

Question 1. Try to give an example in which one can explain X but cannot predict it.

Familiarity. So what is the explanation relation? Dray's proposal: to explain is to relate the explanandum to the already familiar explanans. This is a non-starter. We explain the light phenomena (very familiar) by relating them to the very unfamiliar concepts (electromagnetic waves).

Reduction to the already understood. Another proposal: to explain is to relate the explanandum to the already understood explanans. Not good: we are often happy to explain by relating phenomena to the explanans not themselves understood. For example, the orbits of the planets were said to be explained by the gravitational pull of the Sun, but gravitation itself is not (certainly was not at the time) well understood.

Unification. Requirements for a successful explanation: generality, objectivity, and improvement of understanding. Previous proposals fail at least one of these requirements. New proposal: explanation works by unification. In every given epistemic situation there are certain *brute facts*. Each of them seemingly have no connection with each other: we say that they are *independently acceptable* (i.e. acceptable independently of each other). A successful explanation transforms the situation K_1 into another situation K_2 where there are fewer brute facts. Observe that explanation so interpreted is concerned with explaining laws (empirical generalities), rather than individual events. (Why?)

Unification in action. Why should we treat Newtonian mechanics as explanatory at all? It leaves many of its central concepts unexplained. Do we understand what force really *is*? Or momentum? Or do we understand gravitation? However, it allows us to connect previously unconnected phenomena. From the laws of mechanics we can derive the laws describing the behaviour of celestial bodies (Kepler's laws) and the laws describing the falling bodies in the vicinity of our planet (Galileo's laws). So: at the end of the day, science has mysteries, but it works by lowering the number of these mysteries.

Some technical details. We need a method for identifying brute facts in a given epistemic situation. This is done by isolating K-atomic sentences. Roughly put, these sentences cannot be logically decomposed into independently acceptable sentences. So to explain is to reduce the number of K-atomic sentences.

YSB