CAUSATION

Chapter 4

Humean Reductionism – Analyses in Terms of Nomological Conditions

Many different accounts of causation, of a Humean reductionist sort, have been advanced, but four types are especially important. Of these, three involve analytical reductionism. First, there are approaches which start out from the general notion of a law of nature, then define the ideas of necessary, and sufficient, nomological conditions, and, finally, employ the latter concepts to explain what it is for one state of affairs to cause another. Secondly, there are approaches that employ subjunctive conditionals, either in an attempt to give a purely counterfactual analysis of causation (David Lewis, 1973 and 1979), or as a supplement to other notions, such as that of agency (Georg von Wright, 1971). Thirdly, there are approaches that employ the idea of probability, either to formulate a purely probabilistic analysis (Hans Reichenbach, 1956; I. J. Good, 1961 and 1962; Patrick Suppes, 1970; Ellery Eells, 1991; D. H. Mellor, 1995) - where the central idea is that a cause must, in some way, make its effect more likely -- or as a supplement to other ideas, such as that of a continuous process (Wesley Salmon, 1984). Finally, a fourth approach involves the idea of offering, not an analytic reduction of causation, but a contingent identification of causation, as it is *in this world*, with a relation whose only constituents are non-causal properties and relations. One idea, for example, is that causal processes can be identified with continuous processes in which relevant quantities are conserved (Wesley Salmon, 1997 and 1998; Phil Dowe, 2000a and 2000b).

4.1 Causes and Nomological Conditions

One very familiar approach to causation involves attempting to analyze causation in terms of nomological concepts. Given the idea of a law of nature, one can define what it is for a state of affairs to be a nomologically necessary condition of some other state of affairs, or a nomologically sufficient condition of another states of affairs. Similarly, one can define what it is for a state of affairs to be nomologically necessary in the circumstances, or nomologically sufficient in the circumstances, for another state of affairs. The proposal is then that what it is for one state of affairs to cause another can be analyzed in terms of these nomological concepts.

According to one version, a cause is a condition that is necessary in the circumstances for its effect, where to say that event c is necessary in the circumstances for event e is roughly to say that there is some law, l, and some circumstance, s, such that the non-occurrence of c, in circumstance s, together with law l, logically entails the non-occurrence of e. (Ignoring temporal

constraints upon the relation between cause and effect, this answer is essentially that advanced by Ernest Nagel (1961 pp. 559-60). It is also considered seriously, but rejected, by Michael Scriven (1966, particularly section 8, pp. 258-62), while a very similar view is defended by Raymond Martin (1972, pp. 205-11).)

Alternatively it may be held instead that a cause is a condition that is sufficient in the circumstances for its effect, where to say that event c is sufficient in the circumstances for event e is to say that there is some law, l, and some circumstance, s, such that the occurrence of c, in circumstance s, together with law l, logically entails the occurrence of e. (If, once again, we ignore the addition of temporal constraints, this answer is essentially equivalent, for example, to views advanced by John Stuart Mill (1874, Book 3, ch. 5), R. B. Braithwaite (1953, pp. 315-8), H. L. A. Hart and A. M. Honoré (1959, pp. 106-7), C. G. Hempel (1965, p. 349), and Karl Popper (1972, p. 91).)

Another possibility is that for one event to cause another is for its occurrence to be both necessary and sufficient in the circumstances for the occurrence of the other event -- a view that was seriously entertained, but ultimately rejected, by Richard Taylor (1966, ch. 3).

4.2 Objections

These accounts, however, are open to a number of very serious objections. First, it seems very plausible, especially in view of quantum physics, that probabilistic causal laws are logically possible, and while such laws do not preclude there being nomologically necessary conditions for a given type of event, they do entail that there are no nomologically sufficient conditions. So if probabilistic causal laws are possible, all of the above accounts, except for the first, are ruled out.

Secondly, all of the above fall prey to the underdetermination problem, set out in the preceding section.

Thirdly, it would certainly seem that there could be laws that are not causal -- such as, for example, Newton's Third Law of Motion. But given that law, all of the above analyses have the unacceptable consequence that A's exerting a certain force on B at a given time causes B to exert an equal and opposite force on A at that very same time.

One way of attempting to escape this objection would be by reformulating the account in terms of basic laws, and then arguing that all non-causal laws must be derivable from causal laws. But it is not at all easy to see how one might establish the latter thesis.

Finally, and most seriously of all, no account of causation in terms of nomological relations alone can provide any account of the direction of causation. Thus, if our world were a Newtonian one, where the basic laws are time-symmetric, the total state of the universe in 1950 would have been both

necessary and sufficient not only for the total state in 2050, but also for the total state in 1850. It would therefore follow, on any of the above accounts, that events in 1950 had caused events in 1850.

The only way to escape this problem within the context of this general approach is by adding the requirement that one event can be the cause of another event only if the one is temporally prior to the other. To make this part of the definition of a cause seems, however, unsatisfactory. For while it may be true that a cause necessarily precedes its effect, if this is true, it should be a deep analytical result, not an immediate consequence of the analysis of causation --`given that readers and writers of science fiction have certainly thought that they could imagine scenarios involving backward causation.