

## BOOK REVIEWS

*The Philosophical Review*, Vol. 114, No. 4 (October 2005)

James Woodward, *Making Things Happen*. Oxford: Oxford University Press, 2003. Pp. vi, 410.

*Making Things Happen* offers a detailed exposition and defense of a “manipulationist” account of causation and scientific explanation. The book unifies and expands upon themes of Woodward’s that have been scattered among a number of journal articles, and provides the most comprehensive development of the “manipulationist” account to date. As such, *Making Things Happen* is bound to generate discussion for years to come, and will likely become a mandatory read for anyone interested in philosophical issues concerning causation.

Woodward’s main aim is to offer accounts of causation (chaps. 2 and 3), and explanation (chaps. 4–6). The central idea is that causal and explanatory relations differ from other associations by having features that allow for control (though not necessarily by us). For example, the barometer’s falling may allow one to *predict* rain, but fiddling with the reading will not *change* the weather. Woodward takes this connection with control as the metaphysical basis for an account of causation.

The basic idea of his account of causation is this:

- (1) X causes Y iff (a) there is a possible intervention on X for Y, and (b) if the value of X were changed as a result of that intervention, then the value of Y would change.

(This is Woodward’s account of a “total cause” (51); he uses multiple interventions to characterize “contributing” and “singular” causes (59, 84).) In (1), ‘X’ and ‘Y’ are variables. These are *event determinables*: ‘X’ might stand for *reading of the barometer (in mmHg)*, ‘Y’ for *amount of rainfall (in mm)*. The barometer reading does not cause subsequent rainfall because (a) is true and (b) is false: there is a possible intervention such as moving the pointer with one’s finger, but if this were to occur the amount of rainfall would not change.

The concept of an intervention is central to Woodward’s project. Roughly, his idea (99) is that an *intervention* on X for Y is an event (/variable) that causally influences X, but affects Y, if at all, *only* by means of X. That is, there is a causal pathway from the intervention I to X, but no causal pathways from I to Y, except perhaps ones that pass through X.

Woodward argues that his account of causation solves an impressive list of problems, including preemption (77–81), overdetermination (83–84), transitivity (57–59), and asymmetry (197–98).

Woodward’s account is *nonreductive*: he uses some causal relations (interventions) to characterize others. He argues that interventions solve a number of problems for reductive counterfactual accounts, especially Lewis’s (chap 3.6).

To provide an account of explanation, Woodward extends the idea of (1):

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- (2) Suppose there is a function  $f$  relating values of  $X$  to values of  $Y$ :  $Y = f(X)$ . This relation is *invariant under interventions* iff (a) there is a possible intervention on  $X$  for  $Y$ , and (b) for some nonactual value  $x$  of  $X$ , if  $X$  were set to  $x$  as a result of that intervention, then  $Y$  would have the value  $f(x)$ .

An important feature of this definition is that causal relations can be more and less invariant: (b) can be true for wider or narrower ranges of values for  $X$ . So, generalizations such as the Ideal Gas Law, Hooke's Law, etc. may be invariant to some useful degree despite the fact that they break down for extreme values.

Woodward suggests (203) that a good scientific explanation of fact  $f$  cites some particular facts and an invariant generalization that jointly entail  $f$ . The more invariant the generalization is, the better the explanation.

One of Woodward's main claims is that invariant generalizations play the explanatory role that is usually reserved for *laws*. He objects that the Deductive-Nomological model is overly demanding (chaps. 4 and 5). "Explanatory generalizations" in the special sciences lack features of laws, especially *exceptionlessness*. Woodward emphasizes that a generalization  $G$  can be explanatory even if it is only partially invariant, and that in using  $G$  to explain an event we need not know  $G$ 's exact range of invariance. We need know only that some such range exists, and that it includes the case in question. By contrast, he suggests that a proper D-N explanation would have to pack into its generalizations a full specification of all the circumstances in which they break down. We typically lack such information. Woodward concludes that good explanations require only generalizations that are invariant to some degree, rather than "laws" in any good sense of the term.

Objections to Woodward's account of causation are likely to focus on the claim that interventions are necessary for causation. For example, the Big Bang presumably causes quite a bit, but it is difficult to see what an intervention on it could be. Woodward considers a related objection of Elliot Sober's (129–32): the moon causes the tides on earth, but any way of changing the moon's orbit would be "too ham-fisted" to count as an intervention (that is, would affect the tides in other ways). Woodward responds that interventions need not be nomologically possible: "[A]n intervention ... will be 'possible' [in the sense of (1) and (2)] as long as it is logically or conceptually possible for a process meeting the conditions for an intervention ... to occur" (132). In the case of the tides, "Newtonian theory itself delivers a determinate answer to questions about what would happen to the tides under an intervention that doubles the moon's orbit" (131).

Woodward's response here raises a few questions. First, in considering this counterfactual, we are supposed to imagine a miraculous event that transports the moon to a higher orbit without affecting the tides. It seems dubious that "Newtonian theory itself" could tell us what happens given such a miracle (that is, in situations in which Newton's law are not even approximately correct).

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Second, Woodward's appeal to this miracle seems simply unnecessary. Newton's laws tell us that in situations in which a satellite  $x$  (similar to the moon) is further away from an object  $y$  (similar to the earth), and the other gravitational influences are similar to those on the earth, the tides on  $y$  are weaker than they are on the earth. That seems sufficient for the moon's orbit to cause and explain the tides, and it looks like a straightforward covering law explanation. This explanation involves a comparison of (lawfully) possible cases, but it does not require that there is any way to *intervene* to *change* one into the other.

In addition, while Woodward relies heavily on counterfactuals, he says surprisingly little about their truth conditions. (He criticizes Lewis for using *non-intervention* counterfactuals, but does not say what makes any of them true.) This raises puzzles because standard theories appeal directly to natural laws: ' $A \rightarrow C$ ' is true iff  $A$ , background facts, and actual laws jointly imply  $C$ . Woodward offers an account of laws: "Paradigmatic laws are simply generalizations with wide scope that are invariant under a large and important set of changes [interventions]" (286). This account would generate a tight circle if Woodward then appealed to laws in an account of counterfactuals: a generalization  $G$  figures in truth conditions of counterfactuals only if  $G$  is invariant;  $G$  is invariant only if certain counterfactuals are true. So, it remains unclear what lies at the root of Woodward's account.

I hypothesize that Woodward thinks the connection between causation, explanation, and counterfactuals is *analytically basic*: it is a fundamental fact of meaning (/concepts) that intervention counterfactuals are explanatory. This would explain why Woodward seems unconcerned with their truth conditions. But Woodward's arguments support only the weaker contention that there is some close connection between counterfactuals and causal explanation. For example, it remains open to say that this connection is that the truth conditions of counterfactuals immediately involve laws, and that their causal and explanatory force derives from that fact.

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