Toby Handfield, ed.
Dispositions and Causes.
Oxford: Clarendon Press 2009.
304 pages
US$99.00 (cloth ISBN 978-0-19-955893-3)

Fragility is a disposition. A fragile vase is one that is disposed to shatter when struck. A thrown stone may cause the vase actually to shatter. Dispositional and causal concepts and terms enter our common and scientific accounts of what the world is like and what happens in it. Presumably the referents of such terms are dispositional properties and causal events. How are we to understand what these are? David Lewis proposed a conditional analysis, an integral part of his reduction of all entities and modalities to categorical properties. On the conditional analysis of dispositions, *x* has a disposition iff if *x* were in a characteristic triggering circumstance, *x* would exhibit a characteristic manifestation. On the analysis of causation, *C* is a cause of *E* iff if *C* had not occurred, *E* would not have occurred also. According to the conditional analysis, dispositions and causes reduce to certain true sentences: dispositions and causes reduce to counterfactual conditionals about objects and events, respectively.

Recently the conditional analysis has faced challenges in counterexamples with colorful names such as 'finks', 'antidotes', and 'masks'—names which show how an object may possess a disposition while the corresponding conditional is false. Lewis' own example of a fink involves a wizard who casts a magic spell on the vase the moment it's struck by a stone, preventing it from shattering. The vase was fragile when struck, but failed to shatter under the spell's power. So the conditional analysis fails to provide a necessary condition of having a disposition. A counterexample to a conditional analysis of causation is late pre-emption. Suppose Jack and Jill each accurately throw a stone at the vase, but Jill's strikes first and the vase shatters. On the conditional analysis, had Jill's rock not struck the vase, the vase would not have shattered. But this is false, since Jack's stone would have done the job instead.

A current non-reductive view of dispositions posits irreducible dispositions that ground necessities in nature. Dispositional essentialists have done much to articulate the relation between fundamental dispositional properties (e.g., the spin and charge of an electron) and laws of nature, but relatively little investigation has been done on the relation of dispositions to causes. *Dispositions and Causes* is an excellent collection of papers by nine metaphysicians and philosophers of science on this and related topics. Editor Handfield provides a very helpful introductory essay guiding readers through the leading theories of laws, dispositions, and causation—those of David Lewis, David Armstrong, and dispositional essentialism—and a section on the intrinsicness of dispositions and causation. Ontology is one of a number of themes identifiable here.

In 'Dispositions, Causes, and Reduction', Jennifer McKitrick argues that dispositions cannot be metaphysically (or conceptually) reduced to causes, but causes may be metaphysically reduced to dispositions. A metaphysical reduction of dispositions to causes holds dispositions to be nothing more than causes. McKitrick takes a necessary condition of metaphysical reduction to be global supervenience: 'there cannot be a difference in dispositions without a difference in causes; any possible world with the same causes must also have the same dispositions' (33). But consider possible worlds W_1 and W_2 with identical causal histories: some object in W_1 instantiates a disposition that is never manifested and its counterpart in W_2 doesn't instantiate it. So dispositions fail to reduce to causes. McKitirick considers reductive responses by Lewis's theory of Humean supervenience and David Armstrong's theory of causal laws, but finds both wanting.

McKitrick sees, however, a possibility of a metaphysical reduction of causes to dispositions. The principle of global supervenience says here that there cannot be a difference in causes without a difference in dispositions. Consider worlds W_1 and W_2 with identical histories up to t_1, and each containing a lump of uranium with probability P of ejecting a particle the next instant at t_2. Suppose (for the sake of argument) an event occurs at t_1 in the W_1 lump that causes particle emission at t_2. No similar event occurs in the W_2 lump, so there is a difference of causes at t_1. But there is also a difference of dispositions: at t_1 the W_1 lump is disposed to eject a particle at t_2 with a higher degree of probability than the W_2 lump. Thus causes may globally supervene on and reduce to dispositions—a surprising conclusion indeed.

Alexander Bird defends a monistic dispositional essentialism by which all fundamental natural properties have essences that are dispositional. Structural properties, such as shape and spatial displacement, may provide counterexamples to dispositional monism, since such properties have usually been conceived as purely categorical and active only under contingent laws of nature, so failing to be essentially dispositional. In 'Structural Properties Revisited', Bird sets out to defend dispositional monism by arguing that spatial displacement is a fundamental natural property with a dispositional essence.

Dispositional monism attributes a dispositional essence to a property that is fundamental and figures in a law of nature. Spatial displacement seems to be fundamental and appears in laws of nature, e.g., the term 'r' in Newton's law: $F = Gm_1m_2/r^2$. Ruled out are such structural properties as triangularity, since it is not fundamental and does not appear in natural laws. But does displacement have a disposition to do anything at all? Bird introduces an action-reaction principle from physics, which says that something can be an agent only if it is a potential patient. If space gives rise to a characteristic manifestation under certain conditions, then it has, at least, a passive disposition, like fragility, and may have an active disposition yet to be discovered. Bird argues a passive disposition cannot be found in the classical theory of space as an unchanging background substance. But the relational theory of spacetime in General Relativity provides an example: 'The mass of each object is its disposition to change the curvature of spacetime,

that is to change the dynamical properties of each spacetime point. Hence all the relevant explanatory properties in this set-up may be characterized dispositionally' (240). Bird's conclusion contradicts fellow dispositional essentialist Brian Ellis, who argues that structural properties must be categorical if causal powers are to have locations.

In 'Causal Structuralism, Dispositional Actualism, and Counterfactual Conditionals', Anthony Eagle argues that dispositional essentialists fail to show an essential link between dispositions and counterfactual conditionals expressing essential causal powers. Dispositional essentialists take, e.g., the property of negative charge to be the truthmaker for the necessary truth that 'if e has N, and e had been placed sufficiently near a body e' such that Ne', e would have moved away from e'.' But if a positively charged particle p were to be between e and e', e would move toward p, making the conditional false. Extrinsic factors sever links between characterizing counterfactuals and the intrinsic dispositions that are supposed to ground them. Eagle argues that attempts by dispositionalists to neutralize defeating extrinsic conditions with a *ceteris paribus* operator fail for circularity and triviality. Eagle advocates a Humean view of characterizing dispositions with habitual sentences: 'for instance, we could propose that x has the disposition characterized by "$A \mathrel{\Box\!\!\rightarrow} C$" [if it had been that A, it would have been that C] iff C habitually happens to x when A happens to x' (90). Because habitual sentences tolerate exceptions, they fail to satisfy the dispositional essentialist's need for conditional statements expressing necessary truths about the behavior of objects instantiating fundamental dispositions.

Articles by Stephen Barker and Ann Whittle can be paired up with the preceding ones for interesting comparative readings. Barker argues in 'Leaving Things to Take their Chances' that causes and dispositions should be grounded in chance—an interesting discussion of the possibility of backwards-directed causation and chances can be found here too—and in 'Causal Nominalism' Whittle rejects a realist account of dispositions as universals or tropes, proposing instead we treat them nominalistically.

Other articles here are by Nancy Cartwright ('Causal Laws, Policy Predictions, and the Need for Genuine Powers'), Richard Corry ('How is Scientific Analysis Possible?'), Timothy O'Connor ('Agent-Causal Power'), and Marc Lange ('Why do the Laws Explain Why?') on the themes of ontology and the success of scientific enquiry, free-will and causal powers, and the relation of laws to counterfactual conditionals.

Dispositions and Causes offers stimulating reading in the intersection of metaphysics and the philosophy of science. The papers advance discussion on the metaphysics of dispositions and provide challenges for the dispositionalist to consider. It will be exciting to see how those challenges will be addressed in response.

Duncan C. Maclean
McMaster University