This brief overview of the book does not do justice to the complexity, details, and nuances of it. But I hope it suffices to give an idea of the fascinating journey that goes from a serious re-appraisal of the role of scientific instruments in artistic and scientific representation, to the more general issue of how science represents nature, and how its modalities and operations should not be conflated with the philosopher's problem of the external world, according to van Fraassen. This is a book with an important and intricate story to tell, and it does it with so much attention to historical, philosophical, scientific, and even artistic details that makes it an occasion for a thousand wider meditations.

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Dispositions and Causes
TOBY HANDFIELD (ED.)
Oxford, Clarendon Press, 2009
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This collection of papers on dispositions, causation, and related matters arose from a 2005 conference at the University of Bristol. It aims to link the topics in its title, and their diverse treatments by metaphysicians and philosophers of science, into a 'coherent and unified volume'. Toby Handfield's excellent introduction, 'The Metaphysics of Dispositions and Causes', rightly locates the link in the conditionals that dispositions and causes apparently support, as (roughly) in: fragility *disposes* a thing to break if dropped, and dropping it will *cause* it to break if it would break if dropped and not if not. The question then is which theories of conditionals, dispositions, and causation can between them best explain this link. Handfield starts with Lewis's theory of causation and conditionals, Armstrong's theory of dispositions, and the dispositionalist view of Ellis and others that properties like mass dispose things to conform to the laws (e.g. of motion) they occur in. He then considers what it is for properties to be intrinsic and hence how 'Humean' dispositionalists about properties and/or causation can be.

My only objection to this introduction is to its unargued assumption that dispositionalism requires the laws that properties like mass occur in to be metaphysically necessary (17). Not so, because every such property occurs in many different laws (e.g. of gravity as well as motion). So, just as I could have slightly different traits, the mass that makes things conform to actual (e.g. relativistic) laws could make them conform to slightly different (e.g. Newtonian) ones. If a property can be or entail a conjunction of dispositions, as a determinable like mass must to be dispositional at all, it can certainly be or entail a disjunction of such conjunctions.

Antony Eagle, 'Causal Structuralism, Dispositional Essentialism, and Counterfactual Conditionals', offers another objection to grounding necessary truths in dispositions,

namely that the conditionals these support are 'habitual' ones, like 'glass breaks if it's struck firmly' (89), that admit exceptions. And though I believe Eagle is wrong about this, his is still one of the volume's most original and enlightening papers.

But Eagle's idiosyncratic view of conditionals also illustrates why this volume has less coherence than Handfield claims: too few of its authors relate their topics and terminology to each other's. On the one hand, not all authors use the same name for what seems to be the same thing. Nancy Cartwright ('Causal Laws, Policy Predictions, and the Need for Genuine Powers') and Richard Corry ('How Is Scientific Analysis Possible?'), for example, call a thing's one-kilogramme mass a 'capacity', and the forces this makes it exert on other things 'exercises' of that capacity; whereas I and most others, whether or not we put masses and forces on a par, call both 'dispositions', since forces either are or reduce to dispositions of locations in gravitational and other fields to accelerate things with masses, charges, etc. located there. Cartwright's rejection of this standard terminology only obscures her main argument, which I accept, that scientific realism requires properties like mass to be dispositions.

Debates about the relata of singular causation are more subtly obscured by authors who all call them 'events' but differ on what they take events to be: changes in things (e.g. people dying); things having a property at a time (being cold); or particulars that may or may not be able to be more or less fine-grained (is a death that is both quick and painless one event or two?).

To this complaint it may be replied that 'event', 'disposition', 'capacity', 'cause', 'law' 'intrinsic', 'natural property', etc., are terms of theoretical art that different artists are bound to use differently. If so, the diverse theories this volume rightly includes will naturally give some shared terms different connotations. It may therefore be unfair to criticise the volume as a whole for lacking an unattainable coherence. Perhaps it is only as a collection of papers, only loosely related by their subject matter, that it can be fairly reviewed. How then, as such, does it fare?

It certainly fares well on scope: its ten authors tackle an impressively wide range of topics. These, besides those mentioned above, are: Jennifer McKittrick, 'Dispositions, Causes, and Reduction', on whether dispositions reduce to causation or *vice versa*; Stephen Barker, 'Leaving Things to Take Their Chances: Cause and Disposition Grounded in Chance', on how to explain and link dispositions and causation not by conditionals but by chances; Timothy O'Connor, 'Agent-causal Power', on how to conceive causation compatibly with free will; Alexander Bird, 'Structural Properties Revisited', on how background-free theories can let all natural properties be dispositions; Ann Whittle, 'Causal Nominalism', advocating nominalism about causal properties; and Marc Lange, 'Why Do the Laws Explain Why?', on how phenomena can be explained by unexplained laws.

As I lack space to comment properly on all the papers that impressed me, notably those by Eagle, Bird, and Whittle, I confine myself to the one paper which, *pace* Handfield, promises to free the metaphysics of dispositions and causation from theories of conditionals. This is Barker's theory that an event c causes an event e 'if and only if there is a realised chance of e at t_c, the time of c, issuing in a *chance process*

linking *c* to *e*', where 'realised chance of *e*' means that *e* (a) has a chance and (b) occurs, while dispositional properties are those that feature in the conditional chances that determine (unconditional) chances. Barker argues that his theory beats those based on counterfactuals, especially those crediting effects with chances greater than they would be without their causes.

But it doesn't, being scuppered by a consequence of its assumption that *all* events with realised chances have causes. Take for example a rabid dog bite that gives me a chance *p* of getting rabies, and hence a chance 1 – *p* of not getting it. If I do get rabies, the first chance is realised; if not, the second is. Yet my *not* getting rabies, if I don't, cannot be caused by the bite just *because* my getting it, if I did, would be. (Not even medical quacks who claim to explain any outcome of their treatment, offer the *same* explanation of failure as of success.) Yet if all Barker's other conditions on causation are met if I do get rabies, all but one will also be met if I don't, the exception being that my not getting rabies is not an event but the absence of one. And absences of events are not events, on any of the readings of 'event' noted above, any more than absences of things are things: 'nothing' no more names an event in 'nothing happened' than it names a thing in 'nothing was there'.

But this difference, between events and non-events, cannot be what stops the dog bite causing me not to get rabies if I don't. For suppose my chance of getting rabies after I'm bitten is reduced by a subsequent injection. Then if the bite causes me to get rabies if I have no injection and do get rabies, the injection must equally cause me not to get rabies if I don't get it: the two cases are clearly on a causal par. Equally, if the bite doesn't cause me not to get rabies if I don't, my injection can't cause me to get rabies if I do. So the reason the bite doesn't cause me not to get rabies cannot be that non-events can't be effects: they can, and often are, as the injection case shows.

What then does stop what causes an event, if it happens, also being what causes it not to happen if it doesn't? Barker's theory cannot say, while counterfactual chance-raising theories can—since what raises an event's chance of happening cannot also raise its chance of not happening—which is why his theory fails to beat them after all.

This oversight of Barker's stems from a far more serious and widespread error: that of taking all causes and effects to be events rather than facts, in the minimal sense of 'fact' given by the principle that a truth-bearer '*P*' is true if and only if *P* is a fact. This error in turn stems from representing all singular causation as instances of (i) '*c* causes *e*' instead of instances of (ii) '*Q* because *P*' that (*inter alia*) entail but are not entailed by '*P*' and '*Q*'. For since '*P*' and '*Q*' can be negated and '*c*' and '*e*' can't, (ii) immediately accommodates the causation by and of absences that advocates of (i) need *ad hoc* devices to account for. This matters because if, as I believe, as many causes and effects are absences as are presences of events, (i) will cover only a quarter of them. So while I cannot defend (ii) fully here—I've done it in chapters 9–12 of Mellor (1995)—I hope it is not too *parti pris* to regret that a book on the metaphysics of causation lacks any discussion, not only of which of the species of events I've listed causes and effects are, but of whether they are events at all.

References

Mellor, D. H. 1995. *The facts of causation.* London: Routledge.

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What Is Biodiversity?

JAMES MACLAURIN & KIM STERELNY
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'[B]iodiversity, the term, comes to us from conservation biology' (1). James Maclaurin and Kim Sterelny open their book, *What Is Biodiversity?*, with this statement. Believing the claim that biodiversity is important and that its conservation is a pressing issue, the authors want to provide a more precise account of what biodiversity is and how it can be measured. The definition of biological diversity that they cite as early as the first page is taken from the Convention on Biological Diversity (CBD), which was one of the results of the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. By positioning their work in this context, the authors lay out the ambitious scope of their book. They discuss theoretical aspects of the concept 'biodiversity' while aiming at a context of application: the conservation of biodiversity.

The introductory chapter 1 presents the overall argument in a nutshell: a definition of biodiversity needs to address 'the purposes to which the idea of biodiversity is put' (2). One important line of the authors' reasoning is the difference between *cause* and *effect*, which they consider a central conceptual ambiguity that has too often been neglected in theories of 'biodiversity'. As a consequence, they argue, 'biodiversity' is treated both as *aim* of conservation and as *mechanism* of conservation. While evolutionary biology is interested in the mechanisms that cause diversity, conservation biology is interested in its effects. An appropriate definition of biodiversity, thus, needs to address these different interests properly.

According to Maclaurin and Sterelny, ecologists started using the term 'biodiversity' in 1985 because conservation biology had problems identifying a clear aim. While it was hard to identify 'wilderness' or 'pristine nature', the identification of species and their extinction seemed to be an easier and more objective task. However, the problem of ranking remained: with regard to limited resources we have to know what makes a particular biota more valuable than another. To answer this question, the authors argue, the parameter of species richness needs to be supplemented in various ways for various purposes.

Maclaurin and Sterelny explicitly discuss biodiversity as 'a natural feature of biological systems' (7), thus distinguishing their approach from those who wish to determine 'biodiversity' according to social or cultural valuations of biological systems. Equally,