fact I think it's rather interesting that Anscombe should have found it unexceptionable.

There are so many good things in this book. The editors have done a fine job; and there is a very interesting Introduction by Mary Geach (Anscombe's daughter), and an informative Preface by Luke Gormally (her son-in-law). Some readers will be shocked by Anscombe's characteristic pungency, as by her un-modern views. To them I would say: 'If you can't stand the heat, get out of the kitchen. But you'll miss a very nutritious meal if you do.'

Roger Teichmann

Nature's Metaphysics: Laws and Properties
By Alexander Bird
Clarendon Press, Oxford, 2007. pp. xiv+231. £35
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There was a time when it was generally accepted that the laws of nature are contingent and no more than certain (propositions concerning) regularities. Work over the last few decades has changed that, to the point where the view that laws are necessary, and more than regularities, is now being taken seriously, and within this 'Necessitarian' picture, a view of laws as derived from the dispositional natures of properties has been steadily gaining credibility. This monograph is an important contribution to the case for the latter – 'Dispositionalist' – conception of laws.

Bird defends Dispositional Essentialism (DE), a view he describes as the disjunction of two other positions: Dispositional Monism (DM), according to which all sparse, fundamental properties have dispositional essences, and the Mixed View (MV), according to which some such properties have dispositional essences and some do not (218). By *sparse* he means *natural* properties: the sorts of properties that will be referred to in the true theories of natural science. By fundamental he has in mind specifically the most basic properties of physics (though he thinks natural non-fundamental properties may also have dispositional essences (5)). DE is the cautious claim that *at least some* fundamental natural properties have dispositional essences (45).

Bird takes fundamental natural properties to be universals, because universals provide a more unified account of laws than tropes. However, nothing much hangs on this preference, and talk of universals can for the most part be replaced by talk of sets of exactly

resembling tropes. He calls properties with dispositional essences *potencies*, preferring to adopt a new term rather than one, such as 'powers' or 'dispositions', which is widely used outside this debate (45).

He offers a conditional analysis of a potency's essential dispositions. According to a simple conditional analysis, any particular, *x*, with the potency P, *is disposed to M if S* iff if *x* were to have S (stimulus), then *x* would have M (manifestation). Bird agrees that *in general* problems with so-called 'finks' and antidotes show a conditional analysis of dispositions to be inadequate. Finkish dispositions are dispositions that are lost after the stimulus and before the manifestation, as a result of a disturbance in the normal causal chain between stimulus and manifestation; in the standard example of *being live*, an 'electro-fink' attached to a live wire ensures that as soon as the wire is touched, the current is stopped and there is no electric shock. With an antidote, the conditions under which the stimulus leads to the manifestation are affected in such a way that the manifestation does not occur but, crucially, the object retains the disposition. For example, suppose I take a poisonous liquid, and then take an antidote. The normal conditions in which the stimulus (ingestion) leads to the manifestation (illness/death) may be disrupted as a result of the antidote being taken, such that there is no manifestation, but at no point does the liquid lose its disposition to poison. With both finks and antidotes, we have a situation where an object has a disposition but the conditional analysis offered is false. Bird shows that all attempts to amend the analysis are problematic.

Bird argues, however, that the dispositions of *fundamental* physical properties – the subject matter of DE – can still be given a conditional analysis. First, with a fundamental physical property there is no time gap between stimulus and manifestation that might allow the operation of a fink. Second, non-strict – 'ceteris paribus' – laws are those laws involving properties that are susceptible to finks and antidotes, but the developmental history of fundamental physics, involving fewer and fewer fundamental properties and forces, indicates that laws are likely to be 'strict' – exceptionless – at the fundamental level (63).

Bird takes natural laws to be entities that supervene on potencies. Given either MV or DM, there will be sufficient potencies to underpin any law: each law involves one or more potencies even if it also involves spatial or temporal properties that could be seen as non-dispositional. Stephen Mumford has recently claimed that real laws 'govern' and that laws cannot do this if they supervene on potencies. Bird's response is that real laws must simply stand as *explainers* of

regularity – and laws can be taken to explain regularity because the potencies they supervene on explain regularity (197). He also argues that Mumford is wrong to claim that there is no consistent use of the term 'law' as used by scientists (199).

As laws supervene on potencies, and the dispositions of any particular potency are essential to it, so the laws are necessary. If it is necessary that if any *x* has potency P it is disposed to M if S, then it is a law that *necessarily* if any *x* has P&S, then *x* has M (46–48). One might accept immanent realism about universals and claim that a law only exists in those possible worlds containing the potency it supervenes on. Alternatively, one might endorse transcendent realism about universals and, taking there to be one 'platonic realm' for all possible worlds (rather than one for each subset of worlds, as Michael Tooley has posited in his account of contingent laws[1]), claim that a law, if it exists in one possible world, exists in all possible worlds (64). Bird is noncommittal, but inclined towards the latter view.

Bird also thinks we should endorse the existence, in the actual world, of a potency's unrealised manifestations in order to adequately explain how a potency P can have, as part of its 'being' (defined as those facts entailed by the fact that P exists, in virtue of the nature of P (100)), relations to possible yet unrealised manifestations. I would question whether we have to say that, just because there are *truths* about P and unrealised manifestations, P must be related to existent yet unrealised manifestations. Fortunately, Bird's claim here is detachable from his defence of DE.

A major part of Bird's defence is devoted to highlighting the inadequacies of Categorical Monism (CM), the rival view that all sparse, fundamental properties are categorical (i.e. non-dispositional). Advocates of CM have tended to adopt either a regularity theory of laws – such as the Ramsey-Lewis view, according to which laws are those regularities (or the propositions thereof) with the best combination of strength and simplicity – or a view in which laws are relations of 'nomic necessitation' between universals. Bird argues that both are inadequate. With the former, laws cannot adequately explain their instances, since each instance of a regularity is (ontologically) part of that regularity. With the latter, the posited 'nomic necessitation' relation, N, in the law N(F, G), which is supposed to ensure that all Fs are also G, is problematic. Bird claims that for universal N to be categorical, it must have no essential or non-trivial

[1] See Tooley, Michael, *Causation: A Realist Approach* (Oxford: Clarendon Press, 1987).

modal character. This entails, he says, that in various possible worlds N has a different nomic role to the one it actually has. But then N(F, G) cannot *entail* the regularity that all Fs are G, and though it might *materially imply* the regularity, this is not a strong enough relation for laws to explain regularities (91–94). To avoid this difficulty, one might accept N as the only potency. But once you allow one potency, why not others?

If the above argument were confined to a contingency theory of laws, or an immanent view of properties, then it would be persuasive. But Bird seems to think that any Necessitarian position must deny CM, and this is incorrect. Evan Fales has argued[2] that laws are relations of nomic necessitation between universals that hold necessarily. The necessity arises, not through dispositional essences, but because the laws are platonic entities and there is only one platonic realm; in any possible world in which *x* is F, the existence of the law that N(F, G) in the platonic realm necessitates that *x* is also G. If this means the properties have a 'non-trivial modal character', which Bird claims categorical properties by definition cannot have (67), then I would argue Bird's definition of categorical is wrong. Fales's universals do not have a dispositional nature. The instantiation of F does not, in itself, ensure the instantiation of G. The contrast between categorical and dispositional properties is that of properties which, by themselves, ensure their bearers behave in (or are) a certain way, and those that do not.

Bird later turns to arguments against DM and finds them wanting. Perhaps the most important objection to DM is the Ontological Regress Argument, and Bird does a great service here by untangling various ways this argument might go. He claims that the argument's core idea, or at least its strongest version, is that, since identity is determined by essence, and for DM what makes the property the property it is are its relations to other properties, and their identities in turn are determined by reference to other properties, and so on, then no property can get its *identity* fixed. There is no determinate identity if the regress is infinite, and in a network there is nothing to distinguish one property from another. Hence there is no determinate identity for potencies (137). Bird shows in impressive detail how, on the contrary, the manifestation relations between properties are such that each property, we can be confident, has its own unique pattern of relations marking it off from other properties and serving to fix its identity.

[2] See Fales, Evan, *Causation & Universals* (London: Routledge, 1990).

CM is taken to be free of this regress because it accords each property a primitive essence, a 'quiddity', which fixes its identity across possible worlds and is separate from its nomic role. According to DM properties have essential powers, and Bird admits this in itself does not rule out two distinct properties having the same powers. He recommends a stronger claim about a property's identity: that the set of powers a property has make it the property it is (72–73). However, if DM does not entail the strong identity claim, then it must be compatible with properties having quiddities, and this raises the possibility of another response to the regress objection: endorse DM but not the strong identity claim; say that properties have a primitive identity, but that each also has essential powers. Laws would still be necessary, and grounded in the natures of properties, on this conception of properties. It is also not clear that properties would have to be construed as ontologically distinct from their powers (or, to put it another way, why a property having a quiddity, and when instantiated by x making – as a matter of brute fact – certain counterfactuals true of x, is enough to show that the property is at least 'part' categorical).

Bird raises two sceptical worries regarding identification for CM and quiddities – first, the possibility of seemingly indistinguishable worlds containing the same properties with totally different nomic roles (73), and second, of different properties, in the same possible world, having the same nomic role (76) – and DM without the strong identity claim faces the second. But it is not clear why theoretical simplicity does not come to the rescue here, given that these additional properties will not be posited by natural science at the theoretical end of enquiry. Bird raises a further sceptical problem for CM that also affects 'weak identity' DM. A theoretical term refers to whatever uniquely satisfies a particular description, but if there are quiddities, we can never be sure that any of our scientific theoretical terms uniquely refer. Bird regards this consequence as unacceptable (78). But again, why accept such profligacy?

Weighing up MV and DM, Bird's conclusion is that DM is 'a serious contender' for best theory of laws (218). Whether it is the best theory will depend in part, he says, on what future physics has to say about the nature of spatial and temporal properties. But he is optimistic: current physics, in the shape of General Relativity, takes each spacetime point to be 'characterised by its dynamical properties, i.e. its disposition to affect the kinetic properties of an object at that point, captured in the gravitational field tensor at that point' (166). Thus seemingly categorical 'structural properties' might have dispositional essences after all.

The role of physics may be more limited here than Bird would like to allow. Does physics really make claims about the dispositionality – or otherwise – of properties? CM will take talk of dispositions and powers (and 'dynamical properties') to be *made true* by objects with categorical properties and their relations to laws involving categorical properties. It will say that characterising a property dispositionally says nothing about its ultimate nature. But if so, how great a role can physics play when choosing between CM, MV and DM? Fortunately Bird has already shown DE to be a better theory than CM. As for the choice between MV and DM, perhaps all that can be said is that inasmuch as DM takes *all* fundamental properties to be potencies, it is *simpler* and so – if all else is equal – the theory to be preferred.

Bird's exploration and defence of Dispositionalism is impressive. It is detailed, meticulously constructed and insightful, and should do a great deal to persuade philosophers of the position's plausibility. The book is a demanding but very illuminating read.

Simon Bostock

Newton as Philosopher
By Andrew Janiak
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Newton's philosophy of natural science has been at the very heart of an important literature in history and philosophy of science, going back to A. Koyré's *Newtonian Studies* in 1968, R. Westfall's and I. Bernard Cohen's monographs in the 70s and 80s (among many other authoritative studies, including Henry Guerlac, Hélène Metzger, and more recently George Smith, Howard Stein, and Robert DiSalle). This is an overcrowded field, where finding a new historical angle or developing a new philosophical analysis – while standing on the shoulders of such giants – may prove a daunting task. Andrew Janiak's new book *Newton as Philosopher* fulfils the task successfully, and proves the good that can come from combining a historically accurate account with a philosophically compelling analysis. In the space of 178pp. Janiak masterfully steers his interpretive analysis through an extraordinarily rich historical material, while the philosophically rigorous narrative takes the reader from one chapter to the next in a compelling way. The final result is a brilliant book