

Book Review

Nature's Metaphysics — Laws and Properties, by Alexander Bird.
Oxford: Clarendon Press, 2007. Pp. 231. H/b £32.00. P/b £18.99.

In his new book, Alexander Bird brings together many of his important contributions to the recent debate on the metaphysical status of natural properties and laws of nature. The result is a powerful and detailed theory according to which the fundamental natural properties are 'potencies': they have a dispositional essence, in the sense that what has such a property is necessarily disposed to evolve in certain ways. It follows from this account that the laws of nature are necessary. Laws are relations among properties that flow from their dispositional essences; if it is essential to the property of being electrically charged that charged objects are attracted by charges of the opposite sign according to Coulomb's law, then it is impossible for something to be electrically charged without being subject to Coulomb's law.

The book has ten chapters. Chapter one introduces the three most important accounts of laws. According to Humean or regularity conceptions, such as David Lewis's, laws supervene on categorical local properties. 'Semi-Humean' accounts such as Armstrong's construe laws as relations among properties, which, although themselves contingent, introduce necessary relations among the substances and events that exemplify these properties. Finally, Bird's own position is a version of Dispositional Essentialism. He defends Dispositional Monism, which takes all (fundamental natural — I shall henceforth let this qualifier be understood tacitly) properties to have a dispositional essence, against both Categorical Monism, according to which all properties are essentially categorical, and the Mixed View, according to which there are both categorical and dispositional fundamental properties. The chapter ends with an overview of the book.

Chapter two introduces the notions of natural properties and dispositions. Dispositions are closely related to counterfactual conditionals. Bird's thorough and subtle discussion shows that antidotes present a much more stubborn obstacle to the analysis of dispositions in terms of counterfactuals than finks. A fink is a condition in which a disposition does not manifest itself because the triggering stimulus takes away the disposition (or its basis): Martin's electro-fink causes a live wire to become dead each time the disposition is triggered by the fact that someone touches the wire. An antidote is a condition that prevents the manifestation of a disposition by interacting with

the causal processes that would otherwise bring about the manifestation: Dimercaprol is an antidote to arsenic by interfering with the process leading from the ingestion of arsenic to fatal effects on the body. While Lewis has provided a conditional analysis of dispositions that is compatible with finks, Bird shows that antidotes make it impossible to analyse non-fundamental and covertly identified dispositions, such as being poisonous, in counterfactual terms.

The third chapter shows how laws of nature may be derived from the attribution of dispositional essences to natural properties. While all versions of Dispositional Essentialism take laws to be necessary, Bird devotes much attention to the question of whether laws are necessary in the strong sense of holding in *all* worlds, or only in the weak sense that a law $L(P)$ bearing on property P holds in all and only those worlds where P exists. Bird shows that not only is the strong view coherent, and that the intuitions opposing it are of the same kind as the intuition of the contingency of laws, but that it has the advantage of avoiding unanswered quests for explaining fundamental laws. By virtue of the existence of finks and antidotes, the laws derived from dispositional essences are *ceteris paribus* laws. However, Bird argues that it is probable that all fundamental laws are strict, because there are no finks, and probably also no antidotes, for fundamental properties.

Chapter four argues against the categoricist view that it is contingent that an electrically charged body attracts other charged bodies (of the opposite sign). Considering possible worlds in which a property obeys different laws requires such properties to have an essence (a 'quiddity') that is independent of its lawful relations to other properties. The postulate of quiddities has two implausible consequences: first, some possible worlds differ only in that two properties have their lawful relations 'swapped', in the sense that property P_1 has in world w_2 exactly the same lawful relations to other properties that P_2 has in world w_1 , and vice versa. The difference between such worlds does not seem to be a real difference. Second, it makes worlds possible in which different properties (with different quiddities) share their nomic role. Such properties would be different without making any difference. Next, Bird argues against the two main categoricist accounts of laws. The regularity theory makes laws too dependent on particular matters of fact and fails to account for the explanatory power of laws. Furthermore, Bird shows that Armstrong's 'contingent necessitation' theory cannot reconcile its denial of both necessary relations between distinct properties and other possible worlds, with the claim that laws somehow account for regularities: the modal force of laws can only stem from the dispositional essence of the properties the laws bear on.

The potency theorist takes non-actual manifestations to be part of the being of a natural property. Chapter five defends potencies against two objections: that they have too little actuality and too much potentiality. In reply, Bird shows that properties have in fact more reality according to a potency

conception than according to the categoricist. Furthermore, he points out that the categoricist conception also entails that there are merely possible manifestations, and that both conceptions can be defended by pointing out that merely possible manifestations are grounded in actuality. One of his arguments for the existence of unrealized possibilities is that the possible breaking of the vase can both be a cause (of my treating it with care), and have effects: by causally contributing to becoming realized, it is an indirect cause of the noise caused by the breaking.

The answer Bird deploys in chapter six against the regress objection to potencies is one of the most important parts of the book. If the essence of all natural properties depends on different properties, where those other properties are themselves potencies whose essence depends on still other properties, the identity of each property seems to remain indeterminate: those dependencies seem to lead either to a vicious circle or to an infinite regress. Drawing on results from graph theory, Bird shows that it is possible, and in the case of natural properties also plausible, that their identity supervenes on the pattern of their manifestation relations if that pattern has the appropriate asymmetry.

Chapter seven examines the challenge raised by structural properties. Bird analyses the debate on whether geometrical properties such as triangularity may be considered to be dispositional. He argues that the issue depends on the future of physics: contemporary physical theories seek to do without presupposing the structure of space–time as an inert background. In General Relativity, the geometrical properties of space–time points are both causes and effects, which makes it possible to conceive of them as potencies.

Chapter eight addresses what is probably the main objection against dispositionalism. Bird shows that the intuition that laws are contingent is unreliable and rests on a confusion between imaginability and possibility.

Chapter nine defends the existence of laws against Mumford. It shows that the thesis that powers play a fundamental role in scientific explanation is compatible with laws also playing an explanatory role, in so far as laws supervene on powers.

The last chapter begins with a useful overview and then indicates some issues that await more attention: Bird suggests that natural kinds are no fundamental metaphysical category because they may be accounted for in terms of laws, using Boyd's notion of a homeostatic property cluster. Furthermore, he suggests how the dispositionalist might deal with types of law that do not seem to flow from the essence of a property, such as fundamental constants, conservation and symmetry laws, least-action principles, and mass as a fundamental multi-track disposition. In most cases, Bird argues that future developments of physics may show these problematic types of law to be non-fundamental, and thus to be grounded on potencies.

Here are some critical remarks. It might be worth stressing more explicitly the similarity of problems (and possible solutions) encountered in studying

the counterfactual analysis of dispositions and the structure of *ceteris paribus* laws. One problem for power metaphysics is that, even if a disposition is appropriately triggered, it manifests itself only in the absence of antidotes. This seems to make the attribution of dispositions almost vacuous. We seem to have ‘to admit the disposition of a glass to break in response to far-off sneezes’ (p. 35). Indeed, almost anything has the disposition to give rise to almost any manifestation; it is just that most of the time some antidote is present that prevents the manifestation coming about. It would be useful to note that this problem has the same structure as the problem Earman and Roberts have raised against Pietrosky and Rey’s account of *ceteris paribus* laws, which makes any property related to any other property by a *ceteris paribus* law. It makes it, for example, a *ceteris paribus* law that all spherical objects attract electric charges. Spherical objects that do not are exceptions, just as, thanks to antidotes, most glasses do not break following far-off sneezes. In the light of that analogy, Bird’s answer does not appear compelling: he allows all these apparently empty dispositions to exist, but takes them to be as harmless as grue-like abundant properties. His suggestion that the problem does not arise for fundamental properties seems wrong: a massive body m_1 has the disposition to undergo acceleration *away from* any other massive body m_2 . It is just that this disposition is rarely manifested, as when m_1 is immersed in a liquid with higher density, so that Archimedes’ drive pushes it away from m_2 . Most of the time the manifestation is prevented by an antidote: the fact that the volume surrounding m_1 is filled with some medium with lower density than m_1 .

A similar worry arises in the context of Bird’s deduction of laws from dispositional essences in chapter three. Given the careful analysis of finks and antidotes in chapter two, it is surprising to read that ‘ x is disposed to manifest M in response to stimulus S ’ is equivalent, even necessarily, to the counterfactual ‘if x were triggered by S , then x would manifest M ’ (p. 43). Bird himself tells us (p. 44) that given finks and antidotes, this equivalence is in fact false. The subsequent development is useful only if there are strict laws. Indeed, Bird holds that there are no finks at the level of fundamental physical properties, and suggests that fundamental dispositions might ‘suffer from relatively few antidotes’ (p. 63). However, even if they are few, the existence of antidotes makes the equivalence of the potency with the counterfactual relating it to its triggering and manifestation conditions incorrect. One might put the problem thus: Bird claims that dispositions with antidotes allow him to explain *ceteris paribus* laws. The other side of the coin is that the analysis of dispositions with antidotes in terms of counterfactuals raises exactly the same problems as the analysis of the form of *ceteris paribus* laws (such as the problem of ‘vacuous’ dispositions and *ceteris paribus* laws), rather than helping to overcome them.

Here is another problem in the same context: as Bird himself stresses, it is essential for a potency to be related to potentiality and unrealized

possibilities. But then there seems to be a tension in the hypothesis of fundamental powers without any finks or antidotes, in case their triggering conditions are always present, as is the case for the disposition of masses to be subject to an attractive force, in the presence of a gravitational field. Such dispositions seem to be always manifested and thus lack the characteristic potentiality of dispositions.

The book is very clearly structured and focused on dispositional essences and necessary laws. I have found one exception: it is not clear why Bird goes to considerable length in (inconclusively) evaluating Mellor's thesis that even geometrical properties such as triangularity have a dispositional essence, only to state at the end that the issue is not relevant because triangularity is no fundamental property.

The position developed in this book is not entirely original; indeed, Bird shows that it shares its basic thesis with Shoemaker's account of properties and several recent defences of fundamental powers; also, several authors have argued that a dispositional conception of properties entails that laws are necessary. However, no one has yet elaborated and defended with so much subtlety, rigour, and depth the exciting new metaphysics of nature that replaces both versions of the traditional categoricist picture of nature: the Humean account of laws as regularities and the realist account in terms of laws as contingent relations among universals.

Reading Bird is highly rewarding: he sheds new light on many problems by analysing them in a new way, such as when he distinguishes two steps in the analysis of dispositional locutions into counterfactuals, or when he shows that dispositions share some but not all features of intentionality. At many points, following the consequences of his hypotheses with tenacity and patience, he arrives at original conclusions, such as: that there are no fundamental multi-track dispositions; that laws are necessary in the strong sense in which there are no worlds in which the properties they relate do not exist; that unrealized possibilities can be causes and effects; or that no vicious regress follows from the thesis that potencies are essentially related to other properties. Bird's book holds promise to become the authoritative statement of the new dispositionalist metaphysics.

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