

Alexander Bird: Nature's Metaphysics. Laws and properties

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This book is an inspiring investigation of the metaphysical relations between properties and dispositions, and the nature of dispositions. Too many themes and problems are treated by Bird to cover them all in a short review. Instead, this review contains a critical discussion of the six major theses in Bird's book.

Thesis 1 Not all properties, but all fundamental (i.e. non-complex) properties have dispositional essences. Every fundamental property entails with metaphysical necessity (and is even metaphysically equivalent with) a certain disposition which is essentially connected with this property and which in turn is necessarily equivalent with as a nomic-counterfactual relation between a type of stimulus and a type of manifestation or response.

Further explanations of thesis 1: For example, that an object x has positive charge necessarily entails that were x sufficiently close to an object y with negative charge then x would attract y .

It is plausible to hold, says Bird (e.g. p. 43), that a disposition is analytically equivalent with a nomological (counterfactual) conditional, but he is not committed to this view. On the other hand, the implication of a disposition by a fundamental property is metaphysical in nature, which means that the disposition is essential to the property—a position which is also called *dispositional essentialism* (see e.g. p. 149).

As Bird explains (cf. pp. 144, 149f), thesis 1 does not hold for complex properties, on the reason that complex properties may entail a multitude of dispositions which are not essential to them. For example, being *gold* is a complex property that entails having the disposition to melt at a certain temperature, to have a characteristic gloss, to be chemically resistant to hydrochloric acid etc. Thus, being gold entails a characteristic bundle of dispositions, which Bird also calls a multi-track disposition.

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However, none of these dispositions belongs to the essence of gold. The essence of gold is, rather, provided by the structure of gold atoms made up of so-and-so many electrons in the shells, and protons and neutrons in the nucleus.

However, for fundamental properties such as having positive charge (or so-and-so many charge units) or a mass (or so-and-so many mass units) this problem disappears. The essence of a fundamental property is, according to Bird, specified by exactly one (single-track) disposition.

Discussion of thesis 1: Most kinds and properties which are described by scientific theories are complex. I think it is an important insight that for complex properties the thesis of dispositional essentialism does not hold. At the level of complex properties (or kinds) such as being gold or having polarized chemical bonds there is a clear ontological distinction between the categorical properties and the dispositions which they entail. The latter dispositions follow ‘metaphysically’, or by laws of nature (see the discussion of thesis 5), but they do not constitute the essential identity of the categorical property. Bird restricts his thesis 1 to fundamental and primitive properties. Whether thesis 1 can be defended at this level is discussed below.

*Thesis 1** (Clarification and strengthening of thesis 1): All fundamental properties, even ‘structural’ ones such as geometric configurations in space, are dispositional.

Discussion of thesis 1:* This rather strong thesis of Bird (e.g. pp. 129ff) is beset by the regress problem. For given that fundamental dispositions are analyzed (by thesis 1) as necessary conditionals going from a conjunction of stimulus properties to a manifestation property, and given that stimulus and manifestation properties are in turn analyzed as fundamental dispositions, then there will always remain some inexplicable dispositions. Bird replies (in simplified words, see pp. 138f) that his thesis 1* is at least not incoherent, and that he intends to characterize dispositions relationally, namely in terms of their *relations* to other dispositions. Even if this reply is accepted, an important problem remains nevertheless unsolved: namely that within his view no difference can be made between non-realized versus realized dispositions, or between ‘real possibilities’ and ‘actualities’. Rather a fundamental disposition D_1 is analyzed as “if D_2 , then D_3 ”, where D_2 and D_3 are further dispositions. So the only difference between a state in which disposition D_1 is unrealized and one in which D_1 (i.e., its stimulus and manifestation property) is realized is that the underlying individual has some further dispositions which are either unrealized or are subject to the same argument. No actualities can stop the resulting regress of possibilities; the regress either must end with unrealized possibilities or must become infinite or circular. So it seems more reasonable to adopt a mixed view according to which there are both categorical (non-dispositional) and dispositional fundamental properties.

Thesis 2 Bird concludes from theses 1 + 1*, that fundamental properties are not categorical.

Discussion of thesis 2: Bird’s conclusion does only follow if it is assumed that a categorical property *cannot* be dispositional in the sense of being essentially connected with certain dispositions. Bird assumes this because he defines

“categorical” as being metaphysically independent from any dispositions (p. 42). He criticizes the so-called position of “quidditism” which is connected with the possibility of bare categorical properties which do not metaphysically entail any dispositions (pp. 5, 68). I agree with Bird’s criticism of quidditism, but I don’t see why one must accept Bird’s definition of “categorical”. One reason why Bird accepts this definition is that Armstrong does so. However, Armstrong has a different notion of necessity in mind than Bird—Armstrong’s necessity is a sort of conceptual necessity (based combinatorial possibilities) while Bird’s notion of necessity is a metaphysical one. It is not clear why properties could not be categorical in nature, i.e. be actually possessed whenever they are possessed, but nevertheless be metaphysically connected with dispositional properties. The latter notion of “categorical”—call it categorical*—would be no longer disjoint from the “dispositional”: there could be properties which are both categorical* and dispositional.

Thesis 3 Fundamental properties have single-track dispositions, i.e. have just a single kind of disposition, as their essence (139). For example, the dispositional essence of “being positively charged” is “to attract negatively charged object in the vicinity, and to repel positively charged ones”.

Discussion of thesis 3: I don’t think that this thesis is confirmed by contemporary physics. One counterexample which is discussed by Bird himself (p. 206) is the fundamental property of having *mass*. There are (at least) two different dispositions connected with mass, which are called “inertial mass”—viz. the disposition to retain constant velocity in a force-free state—and “gravitational mass”, viz. the disposition to attract other masses. The two dispositions are clearly distinct, and both are essential to the meaning of mass in modern physics. Bird seems to think that this example is just an exception. But the same holds for another example which is mentioned several times by Bird, namely the fundamental property of being electrically charged. Electric charge is characterized by at least three distinct dispositions:

- (1). The disposition to attract (or repel) particles with the same (or the opposite) charge, which connects charge to the *electrostatic force*,
- (2). The disposition to undergo a change of momentum when passing through a magnetic field, which connects charge to the *electrodynamical force*, and finally
- (3). The disposition to propagate electrodynamic oscillations in the form of electromagnetic waves, which connects charge to photons (light).

It seems that even fundamental properties are essentially connected with multiple (instead of single) dispositions, or in other words, with bundles of dispositions. This may be taken as an additional argument in favor of the notion of “categorical*” which was suggested in the above discussion of thesis 2. However, I don’t think this argument is forcing. Rather, we are confronted with a pluralism of possible notions of “categorical” and connected ways of metaphysical talk.

Theses 4 Given the assumption that fundamental properties are essentially equivalent with certain dispositions which are in turn necessarily equivalent with

nomical conditionals, Bird concludes that laws supervene on properties. In other words, the “cement of the universe” consists of properties, not of laws (pp. 189ff).

Discussion of thesis 4: Given that the assumption of thesis 4 is correct, one may indeed legitimately conclude that laws supervene on properties. But also the inverse inferential route would be possible, to conclude that properties supervene on laws—because in the end, dispositional properties and the nomic laws characterizing dispositions are (necessarily) equivalent.

However, the assumption of thesis 4 is in fact not fully true, on two reasons. *First*, we have argued in the discussion of thesis 1* that there must exist at least some categorical (non-dispositional) properties which are not dispositional (in order to distinguish between realized and unrealized possibilities). Fundamental laws which connect categorical properties cannot supervene on dispositional properties.

Second, Bird’s assumption that all fundamental laws follow from certain dispositions seems to be violated in some domains of modern physics, for example, in *elementary particle physics*. The fundamental laws that govern the “cement” of our universe—elementary particles and their interactions—are *conservation laws*. They entail which elementary particle reactions are possible and which aren’t. However, conservation laws do not follow from the dispositions of the individual particles which are involved in a particle reaction. They go beyond these dispositions, but describe possible interactions. Bird himself writes that conservation laws are metaphysically somehow mysterious (pp. 205ff). But given that conservation laws (i.e., laws of symmetry) are the most fundamental kind of laws, a metaphysics for which these laws are “mysterious” is arguably not very adequate—at least not according to Bird’s own dictum: “if there is a contradiction between metaphysics and physics, metaphysics must give way” (p. 8).

Moreover, not all elementary properties of elementary particles can be characterized by bundles of dispositions. Many elementary particles are merely characterized by their behaviour in conservation laws. For example, the property of *strangeness* has no special dispositions apart from discriminating between certain types of particles which otherwise would coincide, and to forbid certain particle reactions which otherwise were allowed.

It seems that it is more reasonable to assume that properties supervene on laws rather than that laws supervene on properties. One may try to save Bird’s thesis by arguing that even conservation laws express some kinds of dispositions. However, the dispositions which entail conservation laws cannot be understood as the dispositions which are possessed by individuals. Rather, they are dispositions of *systems* of (kinds of) individuals to entertain certain particle reactions. In this perspective, the fundamental dispositional properties on which fundamental laws supervene would no longer be monadic properties but relational properties of systems of individuals.

Thesis 5 For Bird, laws are not contingent but metaphysically necessary, though not epistemically necessary (p. 146).

Discussion of thesis 5: I would clearly agree with Bird’s thesis if one assumes that metaphysical necessity is identical with, or at least supervenes on, physical

necessity. Thesis 5 would then assert something that is broadly accepted in contemporary philosophy of science—namely that laws of nature are more than mere Humean conjunctions of individual facts, or in other words, that there is a difference between physically necessary truths and physically contingent truths. However, I fear that under the identification of metaphysical with physical necessity Bird's thesis loses a bit of its bite. On the other hand, if metaphysical necessity is taken to be a sort of necessity which is both different from physical necessity and from conceptual (logical or analytical) necessity, then I doubt that there exists a clear and fruitful (non-trivial and non-circular) explication of such a kind of necessity (see my discussion of thesis 6).

Thesis 6 We need only one notion of necessity—metaphysical necessity (p. 46).

Discussion of thesis 6: Here I disagree. In the history of philosophy, “necessity” was a systematically unclear notion. Also in common sense, “necessity” seems to rest on very variable and subjective intuitions. For example, people raised in a religious culture will think that God's existence is a necessity. Many philosophers thought so, too, based on their own intuitions. Such intuitions are typically a mix of logical-analytic considerations, subjective intuitions of imaginability, and beliefs in laws of nature. Therefore—at least so it seems to me—we cannot simply presuppose an “undefined” notion of “necessity” as philosophically given. We rather have to make the meaning of “necessity” precise—we must *explicate* the meaning of “necessity”.

I see only two (or three) clear notions of necessity:

1. *Analytic* (or conceptual) *necessity* follows from explicit or at least implicit conventions of meaning which govern our concepts.

1.* *Logical necessity* is a special case of analytic necessity: logical necessities follow from the meaning of logical concepts alone.

2. *Physical necessity* follows from the fundamental laws of nature. Note that the restriction to fundamental laws is important. Laws of nature which are only derivable from fundamental laws of nature together with physically contingent boundary conditions do not express physically necessary facts (for example Galileo's law, or biological laws such as “biological reproduction is based on DNA” etc.).

I think philosophy needs both the concept of analytic necessity and that of physical necessity. For the purpose of testing laws we need to fix the analytic core meaning of the properties occurring in these laws. So we need analytic necessities (viz. possibilities). To give an example, mass is by semantic convention something which can be measured by a pair of scales; let's see what other properties are connected to this ‘something’ in a lawlike manner. If we identified the meaning of “mass” with the conjunction of all of the dispositions which are connected with mass by way of physical necessities, then we could not imagine a falsification situation for these physical necessities. Hence, “thick” property conceptions are not useful for theory testing, although they might be useful for our world-understanding.

Different metaphysical positions are often simply the result of different notions of necessity which are presupposed but not explicitly distinguished. One example

are Bird's versus Armstrong's different views about categorical properties (see the discussion of thesis 2). Another example is Bird's critique (pp. 167f) of Hume's dictum, that spatiotemporally separated events cannot be necessarily connected. Different from Bird, Hume had logically or analytically necessary connections in mind.

These considerations show that it is very important to distinguish between analytic and physical necessity. Therefore, we need more than just one concept of "necessity".

However, I cannot see a clear third concept of necessity—so-called "metaphysical necessity"—which is different from both analytic and physical necessity. The argument that metaphysical necessities result from rigid property designators does not help. Even if rigid designations could be achieved by us humans (which I doubt), then rigid designations would still supervene on the relations among the instantiated properties which hold in our world—and therefore, it would still be the case that metaphysical necessities supervene on physical necessities. Note that I do not say that a third and independent concept of metaphysical necessity does not (or even cannot) exist. I think, however, that a philosophical account which relies in its heart on such a conception should give a clear explication of it. This is missing in the present account.