

The Dispositional Essentialist View of Properties and Laws*

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Abstract

One view of the nature of properties has been crystallized in recent debate by an identity thesis proposed by Shoemaker. The general idea is that there is nothing more to being a particular causal property than conferring certain dispositions for behaviour. Well-known criticisms of this approach, however, remain unanswered, and the details of its connections to laws of nature and the precise ontology of causal properties stand in need of development. This paper examines and defends a dispositional essentialist account of causal properties, combining a Shoemaker-type identity thesis with a Dretske, Tooley, and Armstrong-type view that laws are relations between properties, and a realism about dispositions. The property identity thesis is defended against standard epistemological and metaphysical objections. The metaphysics of causal properties is then clarified by a consideration of the laws relating them, vacuous laws, and *ceteris paribus* law statements.

Keywords: dispositions; properties; laws; essentialism; vacuous laws; *ceteris paribus* laws

1 The Causal Property Identity Thesis

According to a view proposed by Sydney Shoemaker, the necessity of causal relations follows from a particular understanding of the nature of causal properties.¹ Once this view has been stated, it is clear that the necessity it affords is generalizable. That is, the necessary character of causal relations in the context of singular causation immediately yields an account of general causation – an account in terms of laws. This fits neatly with causal realists' reasons for inferring that there is such a thing as causal necessity in the first place. The existence of certain patterns in nature calls for an explanation. The realist claims that particulars possess features in virtue of which they participate in concrete instances of causation, and that these same features may also be present at other times, in other places, and in different particulars, thus generating regularities. These features are causal properties.

Every case of singular causation is an instance of general causation, because singular causal relata incorporate properties that are subsumable under general laws. The purpose of this paper is to consider and defend some of the details of a proposal for this view of properties and laws.

So what is this understanding of the nature of causal properties that immediately yields conclusions about laws of nature? As a rough opening sketch: to say that an object has a particular causal property is to say that it is disposed to behave in particular ways in particular circumstances, and that all objects having this same property are likewise so disposed. By circumstances I refer to the presence or absence of other causal properties, both of the object in question and of other objects. Some of the interactions elicited by these circumstances are experienced by us in the form of detected regularities. These regularities unfold in accordance with systems of laws which we attempt to map with linguistic expressions, often in the form of mathematical formulae. Causal laws are relations between causal properties.²

That was an opening sketch. Before going further, let us note three crucial assumptions of this approach. First, there is an assumption here about laws. They are not sentences, statements, or any other linguistic entities. They are those aspects of nature that *make* the linguistic devices we employ to describe them true or false. This is what we might call an ontological, as opposed to a linguistic, conception of laws. The importance of this assumption will become clear in section 5 in connection with vacuous laws. Second, there is an assumption here about the nature of causal properties. On the view just sketched, not only are laws composed of relations between causal properties; they distinguish and identify properties as well. A causal property may be identified as the property that it is in virtue of its relations to other properties. The conjunction of all causal laws thus specifies the natures of all causal properties. Perhaps the clearest contemporary statement in the general spirit of this position is made by Shoemaker (1997/1980: p. 253), who argues that 'the identity of a [causal] property is completely determined by its potential for contributing to the causal powers of the things that have it'. I will refer to this view as the causal property identity thesis, or CPIT.³

This is the general idea I will defend, but there is a significant difference between Shoemaker's approach and the one I take here. It is not entirely clear whether Shoemaker is a realist about dispositional properties, or whether he subscribes to a deflationary or linguistic account, according to which saying that an object has a disposition is merely saying something about how it would behave under certain conditions. The latter is a Rylean, 'inference ticket'-type view: one which gives the semantics of dispositional language in terms of manifested behaviours. Conversely, I explicitly adopt a realist account of dispositions: one according to which they are properly viewed as genuine, occurrent properties, regardless of whether any

particular behavioural manifestations are realized. The importance of this third assumption will become clear in section 3 in connection with a particular metaphysical objection to CPIT.

I will not attempt to defend all three of the assumptions made in the above sketch of the relationship between properties, dispositions, and laws. Much of this work has been done already. For example, suspicions about the status of dispositions as properties are often derived from the putative emptiness of explanations citing *virtutes dormitivae*. Citing a disposition can indeed be non-explanatory in some contexts (like that of explaining why opium causes drowsiness by citing the disposition of opium to cause drowsiness), but this tells us something interesting about contexts of explanation, not the existence of dispositions. In other contexts there is nothing empty about affirming the existence of a dispositional property to explain manifested behaviours. This contention is supported by the fact that in such contexts dispositional explanations can be incorrect, which of course entails that they are not empty.⁴

Even granting the legitimacy of dispositional properties, however, one might wonder whether CPIT is warranted. D. M. Armstrong (1999: pp. 26–7) contrasts this dispositional essentialist view with what he refers to as a ‘categoricist’ theory of properties: ‘natural properties have a nature of their own, and it is at least metaphysically possible (logically possible, in the phrase Shoemaker uses) that the same properties are associated with different causes and effects, that different properties are associated with the very same causes and effects, and even that there be epiphenomenal properties, ones that bestow no causal powers at all on the particulars that have them’. There is also the possibility of what Armstrong calls a ‘double-aspect’ theory, due to C. B. Martin, in which property identity depends on *both* hidden, inner natures *and* the conferral of specific dispositions.⁵

Several authors have argued recently against these alternative accounts described by Armstrong.⁶ I will not retrace their arguments here, but instead, leaving aside the possibility of epiphenomenal properties, assume the task of defending CPIT as a starting point for a further investigation of causal properties. Having sketched CPIT, and having acknowledged key assumptions and areas of possible contention, let us turn now to the more specific criticisms that are my primary concern. These criticisms fall into broadly epistemic and metaphysical camps.

2 Epistemological Objections

Consider Alexander Rosenberg’s (1984: p. 82) contention that CPIT holds knowledge of causal properties hostage to a knowledge of the causal laws of nature in which they figure. A generalized version of the argument goes this way. If the identity of a property is determined by the relations of which it is capable, as described by statements of law, citing these law

statements is a necessary precondition for picking out or identifying properties. However, our past, present, and foreseeable future stock of knowledge contains nothing like a complete specification of laws. Furthermore, it seems that we have been, are, and presumably will continue to be capable of identifying causal properties. Given that we have a knowledge of properties despite the lacunae in our knowledge of laws, CPIT must be mistaken.

This argument is premised on a misconception. It is, though, easy to understand its allure, for one of its premises is highly intuitive. The argument's proponent is of course correct to maintain that we fix the reference of causal properties without knowing all of the laws in which they and others might figure. For example, in just the way that one may know an object to be red despite not being able to describe the causal processes according to which light interacts with one's sensory apparatus, causal properties may be identified prior to the specification of laws. One may even know that two properties are the same in the absence of a detailed knowledge of their causal interactions, in just the way that samples of the same colour may be matched together just by looking at them. The premise that we are capable of identifying properties in the absence of a complete knowledge of laws is certainly compelling.

Imagine that two laboratory samples share a property that is detectable only via microscopy. One may determine that these samples share one and the same property without knowing all of the relations of which that property is capable. Judgements of property identity may well require the assumption that causal laws are in effect – for example, the judgement that two samples viewed microscopically share some property may assume the causal functioning of the microscope. A detailed knowledge of the relevant causal laws, however, having to do with causal interactions between the samples and the microscope, and ultimately between the microscope and our senses, is not required for such a judgement. Statements that make reference to the causal efficaciousness of particular properties are rarely backed up by explicit statements of causal laws, and yet causal properties are identified nonetheless. The dispositional essentialist *agrees* with these observations.

The flaw in the objection is the mistaken premise that it is a consequence of CPIT that a complete knowledge of laws is required to pick out or identify properties. Two points should be made here. First, in order to identify particular causal properties, it is sufficient to know that there *are* laws supporting our inferences from detected regularities to the properties in question. Detailed knowledge of the laws that entail these regularities may come later, or not at all. Take the example of detection by microscopy. It is the correct belief that there are causal laws linking the samples to resultant visual images, whatever these laws may be, that permits the correct judgement that two specimens share one and the same property. This is not at all inconsistent with holding that causal properties are

identical in virtue of having identical capacities for roles in causal laws of nature.

Furthermore, it is true that one cannot give an *exhaustive inventory* of the dispositions conferred by a property without knowing the details of all of the causal laws in which it might figure. But there is no contradiction in thinking that we can identify properties without giving exhaustive inventories and simultaneously believing that such inventories ultimately determine the identities of properties. Like anyone else, a dispositional essentialist can measure and thus know the mass of an object, for example, without knowing all of the relations of which that property is capable, and that differentiate it (in a metaphysical sense) from all other properties. A sceptical worry might arise here if it were the case that generally, different properties overlap substantially in the dispositions they confer. But the sciences suggest nothing like this, and even in this case, identifying a property would generally require something much weaker than a complete specification of laws.

A second epistemic argument against CPIT, due to Richard Swinburne (1980), offers the threat of an infinite regress. In the next section, I will consider a close metaphysical cousin of this concern, but for the moment let us focus on the epistemological worry. It is argued that according to CPIT, the attribution of properties to an object will in general require an appeal to causal powers – the dispositions properties confer – since *ex hypothesi* these properties are identified on the basis of the dispositions of objects having them to bring about certain manifestations. Such attribution thus makes reference to the results of causal interactions, but results are properties in their own right, and to attribute these properties, we must recognize their effects, and here we have the makings of a regress.

One might contend that on the assumption that there is more to property identity than the dispositions for causal behaviour that properties confer, or rather more specifically, if we were to say that we can recognize properties independently of causal relations, the regress could be broken. It seems impossible, however, to give any empirical content to this suggestion. If there *were* something more to causal property identity than dispositions conferred – say, as per categoricism or double-aspect theory – how would we recognize the extra somethings? It would appear that we have no option but to ground property attributions on causal interactions that we experience or detect. Granting this, however, is not to concede to Swinburne's difficulty, for the regress cited does not attach to CPIT.

The error of the regress argument lies in the premise that, according to dispositional essentialism, once we have attributed causal properties by appeal to certain effects, properties associated with these effects must invariably be attributed by appeal to further effects. This is not the case, and is not required by CPIT. Regresses of this kind are commonly short-lived, for causal chains originating with the properties we attribute are

connected, in cases where we justifiably claim knowledge of them, to our sensory modalities. To put it another way, every case of warranted causal property attribution is facilitated by some property that is known independently of a knowledge of its further effects. These properties are the direct objects of our perceptions. As an example, take the everyday use of simple measurement devices. We attribute properties such as ambient temperatures and pressures by appealing to effects registered on instruments such as thermometers and barometers. The properties we associate with these effects (specific states or settings of measurement devices) constitute what we might call perceptually direct properties, since the relevant immediate effects of these properties are particular perceptual states on the part of the subject.⁷

The important point for the dispositional essentialist is that there is nothing inconsistent in holding that perceptually direct properties are subject to CPIT, and yet apprehended without appealing to their effects. This is not, of course, to maintain that there are no further effects. Rather, it is to hold that so far as property attribution is concerned, the epistemic buck stops with perception. This resolution to the threat of regress brings into focus something that is strangely overlooked, given that the concern here is epistemological. We are participants in those causal processes that permit the attribution of causal properties to objects. We are participants in the sense that ultimately effects must be registered *in us* for such attribution to take place, and it is here that the relevance of further effects runs out.

The relative coarseness of our sensory modalities distributes causal properties along a spectrum, according to the lengths of the causal chains we must exploit for their attribution. In cases where properties that interest us are ones to which our senses provide little or no direct access, we compensate by making use of longer causal chains – that is, by employing instruments of detection. For most people (those having unremarkable sensory modalities), the attribution of ambient warmth is more direct than the attribution of an ambient temperature of 24°C. In both cases, properties of the relevant sort are attributable, and this is so even if CPIT is true, and even if our perceptual states are themselves causes of further effects, whatever they may be.

3 Metaphysical Objections

Let us now switch tack and consider some important metaphysical challenges to the dispositional essentialist view of properties. We can think of these arguments as comprising the two horns of a dilemma. Thus far I have failed to address an ambiguity with respect to the precise nature of the relation between causal properties and dispositions. This ambiguity is present in the claim that causal properties ‘confer’ dispositions for

behaviour. There are two obvious ways in which one might explain what 'confer' means here. One might hold that dispositions are distinct from, but nonetheless and in some sense attached to, causal properties. This is what some realists about dispositions intend by the claim that causal properties are the categorical bases of the dispositions with which they are associated; some may even think of causal properties as analogous to bare particulars. (In order that this be a dispositional essentialist view, however, 'bare properties' would have no 'natures of their own', as advocated by the categoricist and double-aspect views mentioned in section 1.) On the other hand, one might hold that causal properties just *are* collections of dispositions, being composed of them, as it were (to complete the analogy, we might think of this as a sort of bundle theory). The dilemma suggested is this: presumably, on the dispositional essentialist account, causal properties are related to dispositions in one of these two ways, but neither alternative is tenable.⁸

The first horn is shaped as follows. Assume that causal properties possess or instantiate dispositions, in perhaps much the same way as they are themselves possessed or instantiated by objects. Most properties described by causal law statements seem to have what we might call 'many-faceted' natures. Consider, for example, a particular value of mass; this property figures in many different causal laws, and in each such case, does so in virtue of a different disposition conferred on objects possessing it. To be perfectly accurate, then, we should think of causal properties generally as being many-faceted, in that more than one disposition may be associated with a given property. But, so the argument goes on this horn of the dilemma, dispositions associated with causal properties are *themselves* properties (i.e. higher-order properties), and this leads to an infinite regress. For if according to CPIT dispositions fix the identities of causal properties, then the identities of dispositions, themselves properties, must be fixed by even higher-order properties, and so on and so on.⁹

Closer examination, however, reveals that we are hard pressed to establish a genuine regress here. The challenge demands a response to the following question: if dispositions are properties of categorical bases, what determines the identities of dispositions? But the answer provided by the challenger in order to generate the regress – that an additional order of properties is required to determine the identities of dispositions – is not a good one. The identity of a disposition is fixed, not by further, yet higher-order levels of properties, but by the various causal relations of which objects having are it are capable. One disposition is identical to another if and only if objects possessing them are thereby disposed to behave in the same way in exactly similar circumstances.

To put it another way, it may be reasonable to inquire about the dispositions that determine the identity of a causal property, but to seek an answer to the question of what determines the identity of a *disposition* by

postulating even higher-order layers of properties is to seek for answers in the wrong place entirely. The best strategy we have for identifying a disposition is to investigate the interactions of objects that we believe have the relevant causal property. The success of this strategy is explained by the fact that the causal relations of which objects are capable determine the identities of dispositions.

Let us turn now to the second horn of the dilemma. On this interpretation of CPIT, causal properties just *are* dispositions. That is, causal properties simply consist in capacities of objects to act and to be affected in various ways in particular circumstances. Such properties would comprise anything from a single disposition to a cluster of dispositions, reflecting the many-faceted nature of causal properties generally. According to CPIT, dispositions for behaviour alone identify causal properties as the properties they are. But on this view, what are manifestations of dispositions if not further properties, which are again nothing but powers to bring about yet further causal activity? Once again we are threatened with a regress: the power to bring about the set of causal properties P_1 is really just the power to bring about the power to bring about the further set of causal properties P_2 , and so on *ad infinitum*.¹⁰ Note that on this horn of the dilemma, unlike the first, the properties comprising the additional sets of properties that ostensibly generate a regress are all of the same order.

Closer inspection reveals that the complaint of the second horn trades on an ambiguity. Clarified, the argument cannot do the work for which it is intended. The ambiguity concerns the relation between dispositions and their manifestations. The clarification required is that dispositions are not *constituted* by the various realizations of causal activity they might facilitate. They may be identified by *appealing* to such realizations, but should not be identified *with* them. Dispositions are distinct from and should not be confused with their manifestations. A particular disposition may facilitate the instantiation of another, which then facilitates the instantiation of another, and so on, but this does *not* entail that the original disposition is constituted by the sequence, be it actual or merely hypothetical. Recall: realists about dispositions hold that dispositions are occurrent properties in their own right. The fact that a causal property may stand in relations to others – and that its identity is determined by its *potentials* for such relations – does nothing to compromise its distinct nature. Causal properties are not, then, potentially infinitely extendable things, as suggested by the second horn of the dilemma.

To illustrate the point with an analogy, consider the idea that the big bang is causally related to everything that has and will come after it. Causal ancestors are no doubt in some manner responsible for, but not thereby identical to, the causal chains that originate from them. We can of course give *descriptions* of dispositions in terms of sequences of properties, in much the same way as we can give descriptions of the big bang in terms of its effects,

but dispositions themselves are no less tractable as discrete entities for such descriptions.¹¹ So the power to bring about the set of causal properties P_1 may well be described as the power to bring about the power to bring about the further set of causal properties P_2 , and so on. There is nothing metaphysically problematic in this. And if the concern is shifted to the realm of epistemology – that is, to an uneasiness regarding our ability to attribute causal properties given the worry of regress cited above, the problem collapses into one or some combination of the epistemic worries considered in section 2, but we have already dealt with those.

This attempt to disarm the second horn of the dilemma may yet leave some feeling uncomfortable. The discomfort stems, I think, from the fact that CPIT entails a kind of holism with respect to the natures of causal properties, perhaps best described as an ontological circularity. If the identity of a causal property is determined by dispositions for relations with other properties, the natures of causal properties taken as a whole are constituted by a vast network of potential relations. The natures of individual properties are linked to one another via closed loops of potential relations. One source of unease about this situation may be doubts about internal relations, the repudiation of which played an integral role in turn-of-the-century arguments against idealism during the formative years of analytic philosophy.¹²

If my arguments in this section have been compelling, however, the ontological circularity of properties is not vicious. Furthermore, concerns about internal relations, whatever their merits, are misplaced here. An internal relation is one that is part of the essence of a relatum, whose identity or nature is thus dependent on the relation obtaining. Moore thought that such relations are inherently absurd or contradictory, arguing that in order to assert that a relation obtains at all, we must be able to conceive of the relata independently, and certainly not as dependent on the relation itself.¹³ On the dispositional essentialist view of properties, however, no specific relations need obtain in order for properties to have identities. According to CPIT, it is the *potential* for relations of various sorts that determines property identity. Causal property identity depends on dispositions which, on the realist account, are genuine properties regardless of whether any particular manifestations come to pass. Property identity does not depend on the existence of any particular relations; it is defined rather in terms of dispositions *for* relations. Dispositions on this account are discrete, occurrent properties, prior to and independent of any of the particular relations we might use to individuate them in an epistemic context. The plausibility of internal relations is thus a red herring.

I have argued that recent epistemic and metaphysical challenges do not offer sustained criticisms of CPIT. Let me now move on to spell out some of the benefits of dispositional essentialism. The first is a clarification of linguistic practice concerning property names.

4 Causal Laws and Property Names

It is a common though disputed contention that some sort of necessity is a metaphysical requirement for distinguishing between causal regularities and accidental or coincidental ones. A growing body of recent work has considered the nature of this necessity on dispositional essentialist-type views of properties and laws (see n. 3). This section briefly considers the limitations this view of necessity places on the extensions of property terms, and offers some advice regarding property naming.

That which could not be otherwise, or that which is the same in all possible worlds, is metaphysically necessary. Nomic necessity applies to that which could be otherwise, but never is in a given world for some 'reason'. On the dispositional essentialist account, causal laws may be understood as either metaphysically or nomically necessary. The choice is not substantive as regards necessity; it is terminological. (That is, it depends on whether metaphysical necessity is expressed in unqualified terms, as above, or in qualified terms, which I will specify shortly.) If metaphysical necessity is interpreted as requiring that laws obtain in all worlds *simpliciter*, then causal laws are not necessary in this sense. Nothing precludes the possibility that laws might have been different. On the dispositional essentialist view, the necessity of causal laws stems from CPIT's identification of specific dispositions with particular causal properties. Such properties, however, are not themselves necessary existents. In a world inhabited by different causal properties, the relations we would there describe as causal laws would be, *ipso facto*, different as well.^{14,15} Causal laws are thus ultimately contingent.

The temptation to understand dispositional essentialism in terms of nomic necessity, however, is mitigated by now familiar connotations of the concept. Nomic necessity is often associated with Armstrong's (1983) view that laws are contingent relations of 'nomic necessitation' between universals. Here, properties related by laws in the actual world might have been related by completely different laws, and this possibility is precluded by CPIT. Dispositional essentialists generally view causal laws as metaphysically necessary in a qualified sense. *Given* that the actual world is populated by the causal properties we find here, causal laws could not have been otherwise. Laws are constituted by relations, the potential for which makes these properties the properties they are. Given that specific sets of dispositions uniquely identify each causal property, relations between these properties could not be other than they are. Properties in the actual world could not have entered into laws other than the actual laws.¹⁶

This view of causal necessity is consistent with two quite different linguistic practices regarding the use of property terms. The first is simply to treat property terms as rigid designators. As discussed by Kripke (1980), a rigid designator is any name, general term, or definite description that

designates the same thing in all possible worlds in which that thing exists. An identity statement between rigid designators, if true, is necessarily true. On this approach, the causal properties of our world are rigidly designated both by their names *and* by definite descriptions in terms of the dispositions they confer here. In speaking of names and definite descriptions, however, I do not want to give the mistaken impression that the necessity here is merely necessity *de dicto*. The necessity of causal laws is *de re*. There is no possible world in which properties referred to by these names are related by different laws of nature, for if they were to confer anything other than the particular dispositions with which they are identified in the actual world, they would be different properties altogether.

There is a second approach to property naming that is consistent with the dispositional essentialist account of causal necessity. Here, though causal properties are identified by their places in causal laws, the existence of particular properties does not entail any particular laws. Consider the position of D. H. Mellor (1995: p. 172), who claims that '[t]he property *M* such that $F = MA$ in our world may also exist in worlds where $F \neq MA$ '. One could of course interpret this in the manner of the categoricist or double-aspect theorist, for whom the identity of a property is determined by something other or more than the dispositions it confers. One may also, however, interpret this in a manner consistent with CPIT, but not in this case by appealing to rigid designation. Rather, the suggestion here is that we view property *identity* strictly in terms of CPIT, but apply looser standards to linguistic practice in the context of naming.

This might be described as a trans-world cluster approach to property classification: a causal property is the property that it is solely in virtue of the dispositions it confers, but so long as properties in one world confer sets of dispositions that are sufficiently similar to those conferred by their counterparts in others, we refer to them using the same names. On this approach, properties that confer different dispositions in different worlds are classified under the same heading *despite* differences in the dispositions with which they are associated. They are identified as members of a class of properties on the basis of similarities in the dispositions they confer. A case could be made that this represents an intuitive approach to property terms – properties across worlds that are sufficiently similar should be classified together. It might seem natural, for example, to think of a property that figures in an inverse square law and a nearby possible-world counterpart that figures in an inverse cube law in similar circumstances as closely related.

The choice between the first and second property-naming practices outlined above turns on the question of what is 'properly' regarded as falling within the extension of a property term. It is not by itself, however, metaphysically consequential as regards CPIT or causal necessity. Some

use 'mass' to refer only to properties that confer the same dispositions as mass properties in the actual world; others use the term to pick out properties across worlds whose associated dispositions are sufficiently similar. The former view is, I think, clearly more attractive. On the latter, trans-world cluster scheme, difficult questions are invited with respect to where to draw the line between properties that confer similar enough sets of dispositions (thereby figuring in similar enough laws of nature) to count as part of the extension of a property term, and those that do not. On the former view, however, if *per impossibile* the property we call 'mass' were associated with different dispositions in some possible world, it would clearly *not* be what *we* call 'mass'. Difficult questions concerning the reasonableness of criteria for determining the extensions of property terms are thus avoided. In the following, I adopt the simpler approach.

5 Vacuous Laws and Causal Property Ontology

In section 3 we took note of two views, both consistent with CPIT, concerning the relation of causal properties to dispositions. Properties may instantiate dispositions as higher-order properties (of objects so disposed), or properties may just be bundles of dispositions. Different views are also possible on the question of what sorts of entities these properties are, in the sense contested by realists about universals, nominalists, and trope theorists. Some hold that we are driven to very specific commitments regarding the latter debate in order to resolve the putative difficulty of vacuous laws. In this section, I argue that this difficulty has been overstated given an ontological conception of laws. The dispositional essentialist account, I will suggest, is neutral with respect to finer-grained ontological disputes concerning the nature of properties.

On an ontological conception, laws of nature are not linguistic constructs. We use languages to give expression to laws, but laws themselves are part of the fabric of the natural world. Candidate laws are not things, like sentences, that can be true or false; they are possible relations that do or do not obtain. Relations obtain only if the things they relate exist. Thus, particular laws obtain only in worlds containing the requisite causal properties. A vacuous law is one that is never actually realized – a relation that never comes to pass. There are two ways that vacuity can arise on an ontological conception of laws. First, the relata of relations that would otherwise comprise laws might not, in fact, exist. Let us call this the problem of *missing properties*. Second, in some cases, though the relata exist, objects with these properties might never encounter one another in such a way as to produce a manifestation of the relevant dispositions; the relations in question are thus never realized. Let us refer to this as the problem of *missing relations*. I will consider these problems in turn.

The problem of missing properties generates two categories of ostensibly vacuous causal laws: laws that are vacuous *in principle*; and laws that are vacuous *in practice*. In-principle vacuity occurs when law statements describe relations between causal properties that cannot exist in the actual world. This is not to say that such properties could not have existed if the world had been inhabited by different causal properties. Rather, recalling the qualified nature of causal necessity given CPIT, it is to say that they are not possible members of the network of properties found in the actual world. Idealization is a rich source of in-principle vacuity. Consider, for example, the ideal gas law, which relates properties of pressure, volume, and temperature of gases. Since no gas is ideal, the ideal gas law is vacuous in the sense that it maps properties and relations which, strictly speaking, cannot exist as described.¹⁷ The dispositions conferred by actual causal properties are somewhat different from what is described in our statement of the law.

The ideal gas law provides a nice illustration of both the putative difficulty of vacuous laws in principle and its dissolution. On CPIT, the identities of causal properties are determined solely by the dispositions they confer, but the dispositions we describe in this case are toy versions of actual dispositions. Many law statements are idealizations of this sort. Does this compromise the notion that we are dealing here with a *bona fide* law of nature? An ontological conception of laws diffuses this concern. In common parlance we use the term 'law' to refer both to relations between causal properties *and* to linguistic devices employed to represent them. In-principle vacuity attaches, where it does, to expressions representing laws, not to laws themselves. Causal laws are never vacuous in principle, given that they are relations between causal properties. Descriptions of laws, however, generally imperfect, often intentionally idealized for practical purposes, are naturally vulnerable to potential vacuity. But vacuous law statements in principle have no implications for the ontology of causal properties or laws.

Another good example of in-principle vacuity is cited by Mellor (1991/1980: p. 140) in a discussion of the law governing the vapour pressure of water. The mathematical formula that we use to represent this law relates vapour pressure to the temperature of water, but is vacuous in principle over some temperature ranges, since water is liquid at some temperatures but not others. (We might of course make this expression more accurate by including temperature ranges over which it applies, but we are not always in a position to specify such details.) The law itself – or more precisely, the laws, for countless relations between determinate properties are described by the law statement – are not vacuous. The relevant relations simply do not obtain between determinate properties that are ruled out as a matter of principle, given the natures of properties in the world.

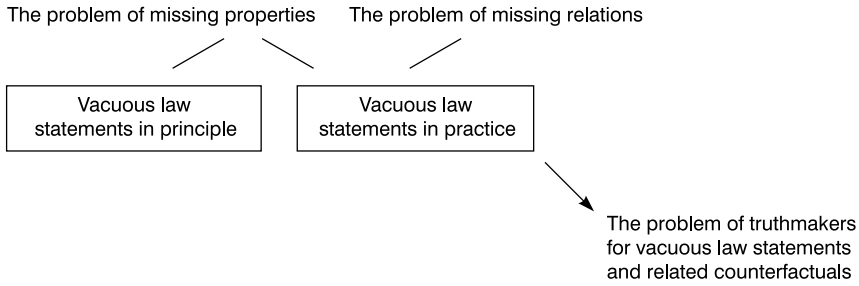


Figure 1. Analysis of Vacuous Law Statements

In-practice vacuity, the second category generated by the problem of missing properties, is also generated by the problem of missing relations. In the case of missing properties, vacuous law statements in principle refer to causal properties that cannot exist, but vacuous law statements in practice make reference to properties that do not exist for more accidental reasons. Imagine that no object has ever had a mass of *exactly* 1,000 kg. Nothing in the nature of the dispositions conferred by mass or any other property precludes this possibility; it has just never come to pass. If the expression ' $F = ma$ ' represents a family of laws, it is, in this imagined scenario, vacuous for the particular value $m = 1,000$ kg. None of the relations that could be described by the expression involving this particular determinate property have ever been realized. The same sort of situation is produced by the problem of missing relations. A hypothetical scenario suggested by Michael Tooley illustrates this case.¹⁸ Imagine that we have compelling grounds for believing, despite not knowing what they are, that there would be (under appropriate circumstances) causal laws governing the interactions of two fundamental particles that have never and will never encounter one another. Here the requisite properties exist, but some of the dispositions they confer are never manifested (see Figure 1).

The central concern elicited by in-practice vacuity is the need for truthmakers for law statements, or for counterfactuals about law statements, that would or do correctly describe absent yet possible circumstances. In cases where we have reason to believe that certain never before manifested behaviours are possible (in the qualified sense of section 4), such possible phenomena are in principle describable by statements of laws. The problem is especially acute in the case of in-practice vacuity generated by missing properties, where if we have already formulated a general law expression for a family of relations, like ' $F = ma$ ', it is a simple matter to formulate law statements that would apply to specific counterfactual instances. In the absence of the relevant relations, what makes these statements, or assertions of counterfactuals about the correctness of these statements, true?

Perhaps the most obvious strategy for supplying the required truth-makers is to appeal to the existence of transcendent universals. One might hold that the property of mass 1,000 kg and all of the relations of which it is capable exist quite independently of bodies which may or may not instantiate them. This is Tooley's (1977; 1987) strategy: the relations obtain, if not in the world of concrete particulars, then in Plato's heaven. A different approach is championed by Armstrong (1983), who believes that all universals must be instantiated, or immanent. In cases of vacuous laws in practice, Armstrong claims that counterfactual statements about what laws would obtain if certain properties were instantiated are true in virtue of higher-order laws, themselves somewhere instantiated. These higher-order laws give the general form of the lower-order uninstantiated 'laws' by relating properties of the types cited in the relevant counterfactuals.

Variations on Tooley's and Armstrong's strategies for providing truth-makers, incorporating a commitment to transcendent or immanent universals, respectively, are open to the proponent of CPIT (though I am sceptical about the latter¹⁹). Another approach, however, is uniquely available to the dispositional essentialist. This alternative proposal supplies truthmakers for counterfactuals about law statements that would describe absent yet possible circumstances, if not for the law statements themselves, in such a way as to leave the matter of whether properties are transcendent universals, immanent universals, or tropes an open question.

What we want is to be able to affirm the truth of certain counterfactuals pertaining to laws that do not obtain because the relevant relations are not instantiated – either because one or more of the properties involved are themselves nowhere instantiated, or because objects instantiating these properties never encounter one another in an appropriate way. According to CPIT, there is nothing more to the nature of a property than the dispositions it confers; natures are exhausted by dispositions for relations with other properties. The *mere existence* of a given property thus serves as a truthmaker for any counterfactuals whose consequents correctly describe its possible relations. Thus, if any one party to a possible relation exists, a truthmaker for a counterfactual claim regarding circumstances under which that relation would obtain exists also.

In fact, the dispositional essentialist solution to the putative difficulty posed by vacuous law statements in practice goes even further than this. The role of truthmaker may be served, not only by any one of the properties potentially involved in the relevant relation, but by *any* property *whatsoever*. Recall that it is a consequence of CPIT that networks of causal properties have a holistic nature. This furnishes a more radical solution to the problem of truthmaking than is generally appreciated. The existence of any *one* causal property is a sufficient truthmaker for counterfactuals about all possible relations applicable to

the world in which that property is found. This is because, as clarified in section 3, the identity of a causal property is determined by its dispositions for relations with other properties. A complete specification of these potential relations constitutes an exhaustive set of the possible links between all causal properties. Given that these links map the various ways in which properties by their very natures can be related, this network of properties and potential relations comes as a package, or not at all. The existence of any one property, then, is sufficient to determine (ontologically) the natures of all possible properties and relations in the network to which that property belongs.

Speaking metaphorically, all of the relations of which causal properties are capable are 'encoded' in the dispositions they confer. Properties and laws are thus flip sides of the same coin. Some will be tempted here to claim that properties are ontologically prior to laws.²⁰ If laws are relations between properties, and the natures of properties determine what relations are possible, it would seem that laws are dependent on the natures of properties. Granting this, however, one might yet hold that uninstantiated, would-be laws have a kind of reality, even without recourse to the existence of transcendent universals. If one accepts that dispositions are genuine properties whether or not they are manifested, it is tempting to say that laws are (in a sense) actual, whether or not they are actualized. On this view, uninstantiated but possible relations exist, in potential form, ready under appropriate circumstances for actualization.

6 Causal Laws and *Ceteris Paribus* Laws Statements

Earlier, in connection with the notion of in-principle vacuity, I cited idealization as a common source of expressions that describe relations between causal properties that cannot exist as described. Properties conferring such dispositions are not possible members of the network of properties found in the actual world. This, however, though an apt description of many cases of idealization, is too severe a diagnosis of many others. It is true that we often produce idealized descriptions of the natures of properties, intentionally or otherwise, in order to render them sufficiently tractable (for example, mathematically). However, it is also the case that we sometimes use descriptions of relations between causal properties that are strictly speaking correct, but that apply to *different* circumstances. This latter situation constitutes a different form of idealization, and requires clarification.

Many law statements come with an implicit disclaimer: *ceteris paribus*, all things being equal. In many cases, we use descriptions of laws to make predictions whose accuracy will vary from one circumstance to another. This is because other factors, of which no mention is made in our

expressions of laws, often interfere to produce outcomes that differ from those predicted. Nancy Cartwright (1989) argues that this predicament is commonly found outside the strict experimental confines within which law statements are generally formulated. In order to work out the details of some specific relation(s) targeted for investigation, it is often necessary to shield experimental set-ups from interfering factors so as to study the desired relation(s) in isolation. Outside the experimental arena interfering factors abound, so we say that the law statements established are true, at best *ceteris paribus*.

Many have thought it natural to interpret *ceteris paribus* expressions as claims about dispositions. These statements describe what happens so long as factors not taken into account do not interfere.²¹ This idea folds neatly into dispositional essentialism. *Ceteris paribus* law statements, if correct, describe relations that obtain in circumstances where no causally relevant properties other than those described are present. If objects with other potentially relevant properties *are* present, the dispositions manifested are *different* from those whose manifestations are accurately described by *ceteris paribus* law statements. Recall that causal properties are generally many-faceted; they confer not one, but collections of dispositions. Which dispositions are manifested in a given situation will depend on the assortment of causal properties involved. Thus, whether *ceteris paribus* expressions are useful in different contexts will in each case depend on how closely they approximate the relations that obtain. Thus, we often use law statements *as* idealizations – we apply expressions to situations that are, in fact, more complex than those they properly describe. Though not strictly accurate in their characterizations of the dispositions presently manifesting, such expressions are often ‘good enough’ for predictive or explanatory purposes.

CPIT provides an analysis of what we achieve when we successfully formulate *ceteris paribus* expressions to represent causal laws. These expressions are partial maps of property relations. For this reason they hold only partially, or *ceteris paribus*, since we do not generally specify all of the potentially relevant dispositions that comprise the set properly associated with a given causal property. If correct, *ceteris paribus* law statements are accurate representations of possible relations between specific causal properties. The presence or absence of objects with other causal properties will determine whether the outcomes predicted by law statements for concrete cases of causation are manifested, but such occurrences are irrelevant to the question of whether *ceteris paribus* expressions correctly map *some* possible relations. The relations they describe may be laws of nature regardless.

The idea that causal properties are many-faceted might easily be confused with the idea that properties confer different dispositions in different circumstances. Some appear to adopt the latter view, holding that

the dispositions with which properties are associated may vary from one circumstance to another.²² If CPIT is correct, however, the dispositions associated with causal properties are invariant. It is important to distinguish between an epistemic and an ontological sense of 'association' here. In the epistemic context, we do of course associate particular and often different dispositions with one and the same property in different circumstances. We say, for example, that the molecular structure of a compound (assuming that this is a causal property) confers a disposition to dissolve in some situations, but not in others. But ontologically speaking, causal properties are uniquely identified in *all* situations with the *same* dispositions; to think otherwise is to confuse dispositions with manifestations. Whether a particular disposition is manifested depends on the presence and absence of other properties. Possible manifestations are thus tied to circumstances. Possible dispositions depend only on the natures of properties.

For the realist about dispositions, CPIT gives a rich account of the nature of properties and laws. Further issues, however, require attention. One might question whether the sorts of causal laws described here are the only sorts of laws. Putative identity laws such as that expressed by 'water is H₂O', for example, have no obvious causal content. Are these better understood as naming conventions, as opposed to genuine laws of nature? Many of what are commonly taken to be law statements describing causal regularities do not wear their causal content sufficiently close to the surface, as it were, to qualify as law statements in the sense outlined here. 'All planets in solar systems move in approximately elliptical orbits', if a true generalization, does not appear to make reference to properties that are causally related in the appropriate manner. Perhaps in such cases one could argue that there are in fact causal laws which entail these regularities, regardless of whether we are presently able to supply the relevant law statements; perhaps the same could be said about putative conservation laws. But these tasks exceed my present goals. These and other questions remain to be articulated by the dispositional essentialist.

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Notes

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- 1 Restricting the present discussion to 'causal' properties, I will not here consider putative, non-causally efficacious ones such as logical, mathematical, or epiphenomenal properties.

- 2 The view of laws sketched here is thus in the same family as those pressed by Dretske (1977), Tooley (1977, 1987), and Armstrong (1983). The important differences are considered in sections 4 and 5.
- 3 For recent developments on this and closely related matters, see Swoyer (1982), Ellis and Lierse (1994), Elder (1994), Mumford (1995), Ellis (2000), and Bird (forthcoming 2003).
- 4 For arguments suggesting that dispositions are *bona fide* properties, see Mellor (1991/1974), Ellis and Lierse (1994), and Mumford (1998).
- 5 For Martin's views, see Armstrong, Martin, and Place (1996).
- 6 In addition to Shoemaker (1997/1980), see Bird (forthcoming 2003), and on quiddity, Black (2000).
- 7 Thanks to Simon Bostock for pressing this point. Fales (1990: p. 222) argues that however one characterizes the contents of sense perception (for example, as mental, physical, sense data, or otherwise), one's acquaintance with it does not depend on a knowledge of further effects. See also Swoyer (1982: p. 214).
- 8 Mumford (1998) argues that the distinction between categorical and dispositional properties is conceptual, not ontological. If this means that causal properties are both categorical and dispositional, this account would support arguments to follow here. (It is difficult to imagine what else it could mean, since the concepts 'categorical' and 'dispositional' are correctly applied only to categorical and dispositional things, respectively, and Mumford holds that categorical and dispositional predicates can denote one and the same property.)
- 9 The idea here that a disposition may be a higher-order property must be understood in a certain way: it does not entail that the 'bare property' itself has the disposition (though this may be true for some cases in trope theory). Rather, causal properties simply 'carry' dispositions of the relevant particulars.
- 10 This is a metaphysical analogue to the second epistemological objection considered in section 2; both can be traced to Swinburne (1980). Armstrong (1983: p. 123) also argues along these lines.
- 11 The analogy is familiar from Davidson's (1980) work on actions and events. An event may be redescribed in terms of its consequences, but this is not to equate the event with the consequences.
- 12 This was suggested to me by Paul Teller. For an account of this period, see Hylton (1990).
- 13 Hylton (1990: p. 55).
- 14 Cf. Shoemaker (1997/1980: p. 248).
- 15 This assumes that we do not adopt the (fanciful) view that all possible networks of properties and relations exist in all worlds. Such mutually exclusive sets of laws would be causally insulated from one another.
- 16 Cf. Elder's (1994: p. 651) definition of 'full-strength' necessity, and Ellis' (2000: p. 335) definition of metaphysical necessity.
- 17 I will argue in section 6 that some such descriptions are merely incomplete, as opposed to incorrect.
- 18 Tooley (1977: pp. 668–9; 1987: pp. 47–8). I redescribe the example here so as not to beg the question in favour of Tooley's position regarding property ontology.
- 19 I sympathize with Carroll's (1987: pp. 271–2) criticism that this proposal is inadequate, for Armstrong's higher-order laws will not in general have sufficient content to support his counterfactuals. In order that higher-order laws relate the relevant properties *and* be somewhere instantiated, some lower-order law(s)

must both contain the same kinds of properties and have the same form as the counterfactually specified 'laws', but this cannot be guaranteed (consider, for example, Tooley's case).

20 For example, Mumford (1998: Ch. 10: 'Laws of Nature Outlawed').

21 See Lipton (1999) for a discussion of this approach.

22 See Woodward (1992: p. 205), and cf. Cartwright (1989: pp. 190–1) on stable capacities.

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