

Humean Dispositionalism

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Abstract

Humean metaphysics is characterised by a rejection of necessary connections between distinct existences. Dispositionalists claim that there are basic causal powers. The existence of such properties is widely held to be incompatible with the Humean rejection of necessary connections. In this paper I present a novel theory of causal powers that vindicates the dispositionalist claim that causal powers are basic, without embracing brute necessary connections. The key assumptions of the theory are that there are natural types of causal processes, and that manifestations of powers are identified with certain kinds of causal processes. From these assumptions, the modal features of powers are explained in terms of internal relations between powers themselves and the process-types in which powers are manifested.

1 Basic causal powers

A number of philosophers claim there are properties which might be characterised as *basic causal powers*. In particular, those philosophers identifying themselves as “dispositional essentialists”, or simply “dispositionalists” appear to be committed to this idea.¹

Causal powers have distinctive modal features. Frequently, such features are explicated by appeal to a necessary connection, perhaps between the instantiation of a power and the truth of a conditional sentence. If P is a power to yield response R to stimulus S , then whenever something x instantiates P , a conditional roughly of the form ‘If it were that Sx , then it would be that Rx ’ will be true. Giving a precise account of the required conditional has proven difficult, but there is reasonably widespread agreement that the instantiation of a power necessitates the truth of a non-trivial modal proposition – typically a non-material conditional.²

1. Recent examples: Ellis 2001; Molnar 2003; Mumford 2004.

The assertion that causal powers are “basic” is somewhat equivocal. It could suggest that the modal aspect of these properties is irreducible and primitive. It might also suggest, however, that the properties themselves are ontologically fundamental: that they might be among the elite, natural properties – those which carve nature at the joints. Obviously, neither of these interpretations excludes the other.

No matter how the details are finally articulated, however, the existence of basic causal powers is widely thought to be incompatible with the Humean rejection of necessary connections between distinct existences. To demonstrate this incompatibility is difficult, given the lack of any widely agreed articulation. The general thought is that if some natural properties are essentially powers, or are essentially such as to confer certain powers, then it appears to follow that certain lawlike propositions about how the natural properties behave will be necessary truths.³ And if there are necessary laws or lawlike propositions, they clearly call for the very notion of necessary connection that a Humean takes herself to abjure.⁴

I take it, however, that the rejection of necessary laws is not an essential feature of the Humean view. Rather, the Humean is opposed to modal facts that are in some sense brute or primitive. The Humean is not, for instance, opposed to the idea that there could be *a posteriori* necessities, such as the identity of water and H₂O. Necessities such as these, susceptible of explanation in terms of identity and rigid designation, are perfectly acceptable.

It could turn out, then, that this is how laws are. Indeed, Alexander Bird [2001] has argued precisely this way with respect to the law that salt dissolves in water. Assuming that the fundamental laws are contingent, and using modally innocent claims about the meaning of “salt” and “water”, Bird has shown the plausibility of the view that such a law holds necessarily. For if we are to imagine a world where, in virtue of the fundamental laws being different, we would be tempted to assert that salt does not dissolve in water, then it is better to say that we are talking about a world without salt or a world without water.

2. Seminal papers on the analysis of dispositions in terms of modal conditionals include Bird 1998; Choi 2003; Gundersen 2002; Lewis 1997; Martin 1994. More recently, Michael Fara has suggested that conditionals are not appropriate for analysis of dispositions, but he does not thereby deny the modal nature of powers and dispositions [Fara 2005].
3. E.g. Bird 2005; Ellis 2001: 52–3. Stephen Mumford [2004] suggests that the dispositionalist ought to be eliminativist about laws, but he still embraces necessary, lawlike truths, which appears to be enough for these purposes.
4. E.g. Lewis 1986b: 91.

In this paper, I shall argue on similar grounds that Humeanism is compatible with there being such properties as basic causal powers.

The theory of causal powers I shall sketch will almost certainly not satisfy red-blooded dispositionalists, for it will not have all of the primitive modal force that such theorists have typically insisted on. I shall, however, argue that there may exist causal powers which are both *local* and *intrinsic* properties. Moreover, I shall suggest that causal powers have modal features which are essential to them – or at least necessary features of them – without requiring that those features be primitive or brute. I shall hold that causal powers are natural in the sense of carving nature at the joints, but I shall remain agnostic as to whether they are in any interesting sense fundamental.⁵ While such causal powers, as I say, may not be immediately appealing to dispositionalists, they are nonetheless of intrinsic interest, precisely because they show how it may be possible to obtain some of the benefits of dispositionalism without adopting such a drastically anti-Humean position as has been thought obligatory.

Note that, in arguing for the compatibility of Humeanism and the existence of basic causal powers, I shall be focusing only on the Humean rejection of necessary connections. I shall not be attempting to reconcile dispositionalism with Humean Supervenience. In its stricter characterisations, Humean Supervenience is simply the view that the only perfectly natural external relations are spatiotemporal (Lewis 1986c: ix–x; 1994). Whether or not this is true is a point on which the current theory remains largely uncommitted. Nevertheless, I take Humean Supervenience in this form to be a relatively uninteresting principle: one which Lewis was only ever concerned to defend as *a priori* tenable, not as actually true. The rejection of necessary connections, however, is philosophical bedrock for the Humean, and certainly not regarded as open to any conceivable empirical refutation.⁶

The paper proceeds as follows. In the next section, I identify some alleged necessary connections between causal powers and causal *processes*. I show that, given a reasonably uncontroversial account of how processes might possess structure, it is possible to explain these necessary connections between powers and processes in a modally innocent fashion: without admitting any modal facts that are objectionable to the Humean. I also show that the suggested struc-

5. They are therefore natural in the sense proposed by Schaffer [2004]. These properties are the grounds of similarity, but they do not necessarily constitute a *minimal* set of properties on which all other facts supervene.

6. Lewis's commitment to this idea is best captured in his principle of Recombination [1986b: 87–92].

tural account can explain the allegedly “Meinongian” or intentional character of causal powers. In section three, I then attempt to develop the structural theory of causal processes into a full-fledged analysis of what it is to be a causal power. I also indicate how such an account generates non-trivial modal conditionals that are necessitated by the instantiation of a causal power. Finally, in section four, I attempt to draw some morals from the theory that has been offered, for the broader dialectic between Humeans and anti-Humeans.

2 Causal Processes

Consider two quotations from dispositionalists, each adverting to a necessary connection between causal powers (or natural dispositions) and causal processes:

We suppose the natural dispositions to be simply the real essences of the natural kinds of processes they ground. That is, we suppose that an object cannot participate in a process of a given natural kind . . . unless it has the requisite dispositional property . . . [Ellis 2001: 125]

[T]he relation between a power and the event that manifests its exercise is *process-specific* to some degree. For an object to have a power to respond in a certain way, it is *not enough* that the response should occur conditional on the occurrence of the definitionally appropriate stimulus.

[Molnar 2003: 91]

The first of these quotations suggests that particular processes essentially involve the manifestation of particular powers. The second makes the converse suggestion: any particular power is essentially such that it can only be manifested in a process of one particular type (or perhaps types). I shall suggest that both claims are correct, but unlike Ellis and Molnar, I shall suggest that these claims can be vindicated in a manner compatible with Humeanism.

Processes have been discussed in some recent literature on causation, notably by Phil Dowe [2000] and before that by Wesley Salmon [1984]. These theories of processes are attempts to give an “empirical analysis” of causation. Rather than essaying an account of our *a priori* concept of causation, Dowe and Salmon attempt to elucidate what happens to fulfil the causal role in the actual world. For Dowe, a necessary (though not a sufficient) condition for being an instance of actual causation is that the cause and effect be connected by a causal process. A causal process, as opposed to a pseudo-process, is distinguished by its possession of a quantity governed by a conservation law.

I shall not address the question of the correct *a posteriori* analysis of causal processes, nor of how to explicate the relation between such processes and the causal relation. I make only two assumptions about the nature of processes:

- a. Some process-types are natural. Processes of the same natural type are similar in an important, objective, fashion.
- b. Processes possess physical structure, and processes can be of different types in virtue of structural differences.

By the claim that processes have physical structure, I mean that they have spatiotemporal parts, that the parts can instantiate different properties, and that the parts can stand in different external relations. A relatively strict account of structure would say that it consists only in the relations between the parts. I shall endorse a richer conception of structure, according to which the properties of its parts, as well as the relations *between* its parts, are constitutive of the structure of a process.^{7,8}

2.1 Processes and parts

Given these minimal claims about processes and their structure, we may observe that for any given structure there exist relations between the property of being that sort of structure and the properties of the constituent parts of that structure. In particular, consider the relation that obtains between two properties whenever, necessarily, for anything x instantiating the first property, the second property is instantiated by some part of x . Consider, for example, the relation between the structural property «is a triangle» and the property «is an angle». Necessarily, anything triangular has a part which has the property «is

7. I take this account to be largely in sympathy with comments Ellis makes about natural kinds of processes [2001]. For instance, when talking about chemical processes, he suggests that having a given structure “is both a necessary and sufficient condition for anything’s being a reaction of this kind” (161). On the other hand, Ellis sometimes manifests a wariness about reducing process-kinds to something else, while I remain open to such reduction being possible. For instance, he says that “dynamic universals” (such as process-types) cannot be reduced to relations between events (75). Prima facie, this is in tension with the thought that it is necessary and sufficient for something’s being a chemical process of a given kind that it have a certain structure.
8. Could the external relations between the parts of a process be exclusively spatiotemporal? On Dowe’s account, for instance, this appears to be the case [2000: 109]. Other accounts, such as David Fair’s [1979], appear to require additional relations of energy transfer that are not themselves spatiotemporal. Here, then, is the point where the account may come into conflict with Humean Supervenience, depending upon what is required to give an adequate account of causal processes. I leave the matter open.

an angle». Or consider the relation between «is H₂O» and «is hydrogen». Necessarily, anything which has the property «being H₂O» has a part which has the property «being hydrogen».

Such relations are *internal* and *essential* to the properties involved. They are internal because they supervene upon the intrinsic nature of the relata taken separately [Lewis 1986b: 61–2]. (That is not to say that one the intrinsic nature of one relatum is enough to ground the relation. It is simply to say that over and above the “sum” of the intrinsic properties of each of the two relata, there is nothing else that is involved in grounding the relation.) These relations are essential because the properties involved would not be the properties they are if they failed to stand in such relations.

Moreover, these “necessary connections” are not the sort of connections that upset Humeans.⁹ We do not need to take any controversial stance on *why* these necessary connections are acceptable – that would take us too far into the subtleties of “Humean” doctrine. It is simply overwhelmingly plausible that a Humean would have no complaint to make about them. If a Humean *were* to complain, she would presumably have to deny outright the existence of structural properties: a high price to pay for one’s modal scruples.

(It would not be merely structural *natural* properties that the Humean would have to deny the existence of. It would be the existence of a structural property of any kind whatever!)

Call these relations, “relations of *accommodation*”. We then can say e.g. «is a triangle» accommodates «is an angle», and conversely «is an angle» is accommodated by «is a triangle».

The opposite of accommodation relations are relations of *eviction*. The property of «being NaCl», for instance, evicts «is hydrogen», because necessarily, anything which is NaCl *lacks* any part which is hydrogen.¹⁰

9. At least, provided we do not treat structural properties as universals, these connections should not upset Humeans. See Lewis 1986a for a suitably Humean condemnation of structural universals, as opposed to other theories of structural properties. The reason Lewis objects to structural universals is that they would have to be composed in a non-mereological fashion from simpler universals.
10. A referee has remarked that, in a sense, sodium chloride does have parts which instantiate «is hydrogen». We may adapt the point this way: Setting aside certain isotopic complications, a nucleus of an element of atomic number n has as parts nuclei of all elements with atomic number less than n . Since nuclei are arguably what strictly speaking instantiate «is hydrogen», «is sodium», etc., hydrogen is a part of sodium in a respectable sense – and there are corresponding relations between «is sodium» and «is hydrogen». The suggestion is ingenious, but it does not tell against the present analysis. I could, after all, simply give this as my example: «is NaCl» evicts «is plutonium».

Given this account of processes and relations between structural properties and constituent properties, it is easy enough to vindicate Ellis's claim about the relation between powers and processes. If process-types are structural properties, then they will accommodate some properties and evict others. If a process-type accommodates some powers P_i , and evicts all other (natural) properties, then it follows that an object cannot participate in a process of that type unless it instantiates one of P_i .

This explanation relies only upon a suitably sparse ontology of process-types and powers, plus the modally innocent relations of accommodation and eviction. I shall defer discussion of the sparseness of the ontology of processes and powers till later.

In order to account for the second type of necessary connection, that powers can only be manifest in certain types of processes, I suggest we simply identify the manifestation of a power as a certain kind of natural causal process. Such an identification would be *a posteriori* and necessary, in much the same way as the identification of water and H_2O . Consider, for example, the dissolution of salt in water, as it occurs in a laboratory. Some salt is in a beaker. Some water is added and the mixture stirred. The salt dissolves. This type of process is the way salt manifests its power to dissolve. Although we can envisage deviant ways in which the same end state could be achieved – perhaps with the assistance of a sorcerer, or nanomachines – and we might for convenience call all the various ways of producing such a state “processes of dissolution”, we would be reluctant to say that the salt's power to dissolve is being manifested in such deviant cases. Instead, what is being manifested is a different power of the salt – a power to be put into solution by sorcerers or nanomachines. So not every process in which salt ends up in aqueous solution is a manifestation of salt's power to dissolve in water: only processes of the correct type qualify.

If this conjecture about the nature of power-manifestation is correct, then it follows trivially that powers can only be manifest in certain process-types. I call those types *manifestation-types* for a given power.

More importantly, however, given a manifestation-type ϕ for a power to α , we may say that a necessary condition of a property P 's conferring the power to α is that P be accommodated by ϕ . This condition is not sufficient for conferring a power to α , but it is a good beginning on an analysis.

For those who like to talk of a property's “dispositional aspects”, I suggest that these simply be identified with that property's accommodation by various manifestation-types.¹¹ Note, moreover, that these accommodation proper-

11. C. B. Martin and John Heil are sometimes characterised by critics as “dual-aspect theorists” of

ties are *essential* properties, thus vindicating at least part of the dispositionalist programme.

Further, introducing the apparatus of accommodation and eviction enables us to explain how a property might *fail* to confer certain powers. «Is polythene» does not confer the power to dissolve in water, because no suitable manifestation-type accommodates «is polythene». All dissolution manifestation-types evict «is polythene».

2.2 Meinongianism and Intrinsicity

Previous critics of dispositionalism have thought it implausible that causal powers could be constituted by relations to their possible manifestations [Armstrong 1997: 79]. Apart from adverting to the seemingly “Meinongian” character of a relation to a sometimes unrealised, merely possible manifestation, this critique suggests that powers are in some worrying sense relational, and therefore could not be intrinsic, and so could not be basic or natural.¹²

The view I advance here does show how powers are related to possible manifestations, without attracting such objections. In the first place, the relation between a power and its manifestation is a relation involving a possible process-type.¹³ Provided one allows the existence of uninstantiated natural process-types, this should not be problematic. Moreover, given that process-types might be reducible to relations between events – *pace* Ellis – there is some reason to hope that all the required process-types can be constructed from actually instantiated simpler relations between events.

The relation between a power and its possible manifestation-type is an internal relation between properties, in the sense given earlier. Therefore there is no threat that a power’s inherent relation to a possible manifestation renders it extrinsic, or *constitutively* relational. Consider: the paradigmatically intrinsic property of being square is necessarily related to the property of being a cube in much the same way. «Being a cube» accommodates squareness; but it does not

properties, or as holding a “two-sided” theory [Armstrong 1997: 83–4, 250]. Both appear to reject this way of formulating their view, however (Martin 1993: 184; Martin and Heil 1999: 46–7; Heil 2003: §11.5).

12. Indeed, I argue elsewhere [forthcoming] that basic powers are indeed extrinsic properties – in one popular sense of the term “extrinsic”. But while it does appear coherent to maintain that powers are both natural and extrinsic, this is a significant disadvantage of dispositionalism, in my opinion.
13. This method of explaining the Meinongian character of dispositional properties has recently been championed by Aisling Crean [2005]. See also Mumford [2004: 194].

follow that squareness (or «being a cube», for that matter) is extrinsic. Nor, if squareness is instantiated in a world devoid of cubes, does it follow that squareness is Meinongian.

Admittedly, from what has been said, it does not follow that powers *must* be intrinsic. But it is sufficient for my purposes to show how they might be intrinsic, while being essentially connected to a possible manifestation.

3 Refining the account

Suppose we took the necessary condition of conferring a power, given above, and suggested that it was also sufficient. This would yield an attractively simple account:

- T₁. A property *P* confers the power to α iff *P* is accommodated by a possible process-type ϕ , where ϕ is a manifestation-type for the power to α .

This idea is too simple, however, for a number of reasons.

3.1 Different roles within manifestation processes

In any given process that instantiates a manifestation-type, we may identify events which exemplify different roles. Consider some salt dissolving in water. The salt initially instantiates both the intrinsic, power-conferring property «is NaCl» and also the extrinsic property «being wet». Both of these properties are accommodated by the manifestation process. If T₁ were correct the property «being wet» must also confer the power to dissolve when wet; but this is surely not right.

Typically, we call a property such as «being wet» a “stimulus”, rather than a power or a disposition. Quite generally, we can expect T₁ to conflate the distinction between stimuli and powers.

A similar problem occurs at the other end of the manifestation process. At the conclusion of a process of dissolution, the sodium and the chloride instantiate the property «is dissolved». So «is dissolved» is accommodated by a manifestation-type for the power to dissolve in water. Applying T₁ to the present case, therefore, what might be called the “manifestation-property” «being dissolved» confers the power to dissolve in water.

Clearly, then, a successful analysis will need to distinguish between the roles of power-conferring properties on the one hand, and the roles of stimulus properties and manifestation-properties on the other. In addition to these latter, there may be various miscellaneous roles to which we rarely give any

attention, and they too ought to be excluded from our analysis of what it is to confer a power.

To that end, we may first restrict the range of properties over which the variable P ranges. In order to be a power-conferring property, we might argue, P must be *intrinsic*. Typically, being exposed to stimulus conditions involves the instantiation of an extrinsic property, such as «being wet», and this restriction to intrinsic properties should go much of the way to undoing the stimulus–power conflation.¹⁴

A further restriction is required, however, if we are to distinguish powers from manifestations. For instance, some of the intrinsic properties of sodium ions at the *end* of a dissolution process are presumably accommodated by the manifestation process. But we do not necessarily wish to say that those properties of the ions confer the power to dissolve in water. The crucial difference is presumably one of causal order within the process. A manifestation-property is accommodated as an *effect* in the causal process, where a power-property is accommodated as a *cause*.

We can then suggest:

T₂. A property P confers the power to α iff P is intrinsic and is accommodated in a cause-role by a possible process-type ϕ , where ϕ is a manifestation-type for the power to α .

What distinguishes a cause-role from an effect-role? We can at least say what sort of answer will not be adequate: a counterfactual answer, to the effect that effects depend on causes, and not vice versa. To use counterfactuals at this point, without further analysis, would insert a modal element into our account, and that is precisely what I am trying to avoid.¹⁵

Moreover, it is not clear that process theorists are able to explain causal direction without appeal to counterfactuals, or similarly suspect devices.¹⁶ To

14. It has recently been argued that there may be extrinsic dispositional properties [Fara 2005; McKittrick 2003]. This is no threat to the current proposal, however, since I am merely attempting to vindicate the dispositionalist claim that there are intrinsic properties which are essentially such as to confer certain powers.

15. Could counterfactuals analysed in a Humean-friendly fashion do the trick? No, for the Humean has counterfactuals dependent upon contingent laws of nature [Lewis 1973]. And the account to be developed here aims to remain consistent with the *necessitarian* aspect of dispositionalism. If a property is power-conferring, it must be essentially so, not merely contingently so. So the counterfactual dependence of the effect-role upon the cause-role would have to be necessary, and it is not possible to achieve such necessary counterfactual truths on a Humean account. Thanks to Paul Noordhof for pressing me on this point.

some extent, then, the fortunes of this part of the account are tied to the fortunes of a process theory. If process theorists can distinguish the direction of causation without appeal to counterfactuals, the analysis goes through. If not, then the distinction between power and manifestation will be jeopardized.

However, even if there is no purely process-derived difference between the roles of cause and effect, I do not think the theory would be entirely undermined. Dispositionalists should be open to the suggestion that there is no interesting ontological distinction between a power and a manifestation-property, except for a contingent difference in temporal ordering, or a difference in apparent causal priority. Some of our folk-conception of a power would wither, but many of the interesting modal features would remain.

3.2 The scarcity of manifestation processes

Crucial to this account is that there not be an *abundance* of possible manifestation processes for any given power. If, for instance, every process which instantiates a stimulus property *S* at the beginning and a property *R* at the end is deemed a manifestation of the power to *R* when *S*, then every property will confer an absurdly large range of powers. The reason for this is that the range of possible causal processes is surely very great. While it is almost certainly false that «being lead» confers the power to transmute into gold when exposed to sodium chloride, it is presumably the case that there *is* a possible causal process-type which accommodates these three properties. One, for instance, where a clever nuclear scientist renders some lead radioactive, such that it decays to become gold. Due to a quirk of the scientist's psychology, what caused her to begin the transmutation was the depositing of some sodium chloride upon the lump of lead. There exists a causal process, then, parts of which instantiate «is lead», «is exposed to sodium chloride», and «is gold», in a suitable sequence capable of satisfying the analysis T_2 .¹⁷

As we have already seen in passing, Ellis suggests that there are natural

16. Dowe, for example, offers an answer in terms of conjunctive forks [2000: 204–6]. A conjunctive fork is the relationship between two events which are not probabilistically independent and a third event which screens off the probabilistic correlation between the first two events. His theory is not only implausible because of its disjunctive nature, but also unacceptable to me for the same reason that a counterfactual account is unacceptable: it requires modal facts – facts about chance in this instance – to play a primitive role.
17. This process might be thought to be the manifestation of *some* power of the gold: the power to transmute into lead in the presence of quirky scientists with salt, perhaps. But that is not the power we are aiming to explicate, so the possibility of this process-type is not relevant to the existence of the salient power.

kinds of processes [Ellis 2001: 162–4]. This ontological posit gives him the resources to make the appropriate restriction, then, by requiring that a manifestation process be a member of a natural kind, or a member of one of a specified set of the natural kinds. Presumably, the process involving the eccentric scientist would not be a member of one of the relevant kinds.

While my suggestion is similar in spirit to Ellis’s use of natural kinds, I wish to offer further elucidation of what *makes* a process a manifestation process for a given power. Without further comment, an appeal to facts about natural kinds looks suspiciously like an attempt to dispatch the problem by fiat, rather than by any real metaphysical theory.

In saying that the chemical elements are natural kinds, for instance, we can readily grasp the structural features of these kinds in virtue of which they are natural. It is straightforward to see from these structural considerations, for instance, why there cannot be any elements with 17.5 protons. It is also relatively easy to understand what it would take for a merely possible arrangement of subatomic particles to count as a natural kind.

For processes, however, we have a much less clear grasp of what makes a possible process an instance of any natural kind. While I do not have a complete account of manifestation processes to offer, I conjecture that the following conditions define a narrow class of possible processes – what I call the “pure causal processes” – from which an adequate idea of manifestation processes can be derived. If one wishes, following Ellis, to call these manifestation processes natural kinds, I see no objection to doing so.

The relevant processes might be those which satisfy an ideal sought after in certain experimental apparatus. Scientists have occasion to talk of interactions in “closed systems”. Suppose we have such a closed system, each of whose interacting constituents is either one of the initial entities, which bear the power-conferring property *P* and the stimulus property *S*, or one of the entities resulting from their interactions. In a system like this we have a paradigm case of a pure causal process.

One might attempt to characterise such a pure causal process precisely, as follows:

1. Call any causal process *closed* if and only if neither *x* itself nor any part of *x* is connected causally to any entity which is not itself a part of *x*. The entire world, for example, is often thought of as a closed causal process.¹⁸

18. For a particularly strong breed of dualist, presumably, the world contains at least *two* closed causal processes: the mental and the physical.

2. Call an event *primordial* if it is not caused by any other event.
3. We may then define a pure causal process which manifests the power associated with P to yield response R on exposure to stimulus S . It is a process which: (i) has at least one part which instantiates R ; (ii) is closed; and (iii) has among its primordial events only events which instantiate P or S , or are parts of composite events which instantiate P or S . So defined, such a process is a closed system whose only causal “inputs” are instances of the power-conferring property and instances of the stimulus-property.

The appeal to pure processes looks promising because if P -things can be caused to manifest R under these minimal conditions, then that seems like a much better test for whether or not P truly confers the power, or whether it is merely a case where we are inclined to say that the display of R is actually due to certain remarkable external circumstances. (Such as the lead–gold case mentioned above.)

So we arrive at the following analysis:

- T₃. A property P confers the power to α iff P is intrinsic and is accommodated in a cause-role by a possible pure process-type ϕ , where ϕ is a manifestation-type for the power to α .

Note that the pure manifestation processes are only a subset of the possible manifestation processes. If we counted only pure processes as manifestations, then we would presumably have to conclude that we never see an actual manifestation of a power, except perhaps any cosmic-scale powers instantiated by the entire world at the causal origin of the universe. Rather, we should include among the manifestation processes those which resemble in various ways the ideal of a pure process.

This will make it true that we actually observe a wide variety of manifestations of powers, without the absurd consequence that each property *confers* all manner of powers. For instance, I conjecture that there is *no* possible pure process by which lead transmutes into gold upon exposure to sodium chloride, so the impure process involving the nuclear scientist cannot resemble a pure manifestation-type for this power – no such pure manifestation-type exists. The analysis therefore does not allow that «being lead» confers such a power.

Can we say anything less vague about the way in which manifestation processes resemble their pure manifestation paradigms? In the first place, it should be stressed that we need not be embarrassed by vagueness on this point. It might be a vague matter whether or not a given process is a manifestation of a given power. I don't see that we require an analysis that is devoid of vague-

ness, provided we have the precisely delimited class of pure processes by which we define what it is to confer a power.

That said, I can hazard a few comments about the nature of the resemblance. Clearly the key sort of resemblance has to be causal: the relevant processes are those where the instantiations of the power and of the stimulus alone cause the manifestation, rather than something else being a decisive causal influence. This is not a satisfactory analysis, of course, since it appeals directly to powers and manifestations. Perhaps a naturalistic reduction of this idea could be developed, however, by appeal to the conserved quantities involved. Consider the quantities of mass, charge, momentum, and perhaps other magnitudes that are possessed by the candidate power-bearer and stimulus conditions in a putative manifestation process. If the relative contribution to the overall economy of these features in the process is similar to that in a pure manifestation process, then the process might have the right sort of causal resemblance to constitute a genuine manifestation process.

One might remain unconvinced that this proposal remedies the problem. Why should it be that there is no pure causal process in which lead transmutes into gold? To stipulate that there are only a limited number of pure causal processes appears to be a brute modal claim, thus defeating the claim of modal innocence.

It must be remembered, however, that the structure of causal processes is to a large extent opaque to us. If we were in a similar position of ignorance with respect to geometrical structure, we might wonder when we shall encounter a Euclidean three-sided figure whose internal angles do not sum to 180 degrees. In actuality, we know that this is an impossibility, and recognise that the absence of 190 degree triangles is not a “gap” in logical space. With the natural manifestation processes, being structural properties, there may be similar restrictions on the range of possibilities, but owing to our inadequate access to the structure involved, we are currently unable to do more than conjecture what is and is not possible.

A die-hard Humean might insist that any necessity appealed to in an acceptable account of powers must be logical necessity, and that the impossibility of various types of pure process is not merely logical. I am not entirely sure what such Humeans make of *a posteriori* necessities such as the claim that water is H₂O. Presumably they either believe that it is a logical necessity or that it is in fact contingent. I shall set aside as beyond the pale those who take the second disjunct. For those who take the first disjunct, though, I think they should be happy to accept that the impossibility of a pure lead–salt–gold process is also a logical impossibility. While I don’t find this particularly plausible myself and

am happy to accept that there are many metaphysical necessities that are not logical necessities, I think that those who co-opt *a posteriori* necessities as being “logical” should have no principled reason to reject modal facts about pure processes, accommodation, and eviction as similarly “logical”.

3.3 Conditionals

The foregoing account connects powers and processes, but it does not fully address the connection between powers and conditionals.

Effectively, what has been explained is that, for a property *P* which confers powers, some manifestations will be *possible* and others will not. Suppose *P* is accommodated in a cause-role by a possible pure process-type ϕ , such that ϕ also accommodates *S* and *R* in appropriate roles. The account entails that it is *possible* that, when exposed to stimulus *S*, things instantiating *P* manifest response *R*.

It has been shown, then, that the essential nature of *P* and the essential nature of the manifestation-type for the power to *R* when exposed to *S* together necessitate the truth of a *might*-counterfactual:

Necessarily, for every *x* that instantiates *P*, if *x* were exposed to stimulus *S*, it might manifest response *R*.

This is not trivial, because there will be some cases of properties for which such might conditionals are necessarily *false*. Given the impossibility of suitable lead–gold processes-types, for instance, the conditional: “were some lead exposed to sodium chloride, it might manifest a response whereby it transmutes into gold” is necessarily false.¹⁹ A complete theory of powers, however, would do more. It would show how there are stronger conditionals, such as would-counterfactuals, necessitated by the instantiation of a power. In order to get from the weak might-counterfactual to something stronger, we require an account of the *probability* of a given manifestation.

Ideally, the probability of a given manifestation would be necessarily associated with a given power. So the probability would require some objective reading, rather than a subjective one, which relativises probabilities to available evidence. Alternatively, if no such objective account can be given of the

19. I am hoping that this sort of conditional is not susceptible to finks [Martin 1994] and antidotes [Bird 1998], both because it is a mere might-conditional, and because it uses implicitly dispositional terms such as “manifest a response” in the consequent. So it is not suitable for a reductive analysis of dispositions, but is suitable for tracking the presence or absence of a causal power. If it turns out that such a conditional fails, then that is a problem for any attempt to explicate the nature of powers; it is not a particular problem for this account.

probabilities associated with a power, then this theory will end up defending a conception of powers some way removed from the dispositionalist's. It still remains the case, however, that it has given an account of the connection between powers and processes which is very close to that defended by dispositionalists, and has shown that non-trivial modal conditionals are necessarily associated with causal powers.

4 Morals

That concludes my presentation of a structuralist, essentialist, process-based theory of causal powers. Assuming the existence of causal processes with intrinsic structure, and assuming the permissibility of identifying manifestations with particular process-types, it has been shown how an account can be given of intrinsic and relatively natural properties which possess disposition-like modal features *essentially*. This has been done, moreover, without invoking any brute or primitive modality that is not already acceptable to those Humeans prepared to accept that there are *a posteriori* necessities.

Given that this theory is incomplete, however, I cannot expect that many will wish to embrace it just now. In particular, I strongly suspect that full-blooded dispositionalists will not be at all satisfied with the anaemic account of causal powers that I have offered here.

However, such dispositionalists might at least see the argument in this paper as helpful in the wider dispute with Humeans about the correct metaphysics of properties. Such Humeans frequently asseverate that their view of the contingency of the laws of nature is in some sense more intuitive than the necessitarian view. This paper shows that, even granted Humean assumptions about fundamental ontology, we cannot take the contingency of the connection between a property and the powers it confers for granted. Consequently, it cannot be taken for granted that the laws of nature are contingent. Thus the alleged intuitive appeal of Humeanism is a less compelling consideration than might have been thought.²⁰

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