What do powers do when they are not manifested?*

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Abstract

In the present paper, I offer a conceptual argument against the view that all properties are pure powers. I claim that thinking of all properties as pure powers leads to a regress. The regress, I argue, can be solved only if non-powers are admitted. The kernel of my thesis is that any attempt to answer the title question in an informative way will undermine a pure-power view of properties. In particular, I focus my critique on recent arguments in favour of pure powers by the Late George Molnar and Jennifer McKitrick. The lines of defence of the friends of powers converge on what I call 'the ultimate argument for powers', viz., that current physics entails (or supports) the view that the fundamental properties (spin, mass, charge) are ungrounded powers. I take issue with this argument and make a modest suggestion: that the evidence from current physics is inconclusive.

0. Introduction

There has been an increasing interest in the metaphysics of properties and the view that has gained much attention is that properties are powers. The received view, if you wish, is that powers need categorical (non-power) grounds for their existence.[1] Some philosophers (e.g., Armstrong) think that *all* powers need grounding in categorical properties (of the entity that possesses the power). Others (e.g., Ellis and Molnar) accept that some properties are non-powers but take others to be pure powers. Others (e.g., Shoemaker and Mellor) seem to think that all properties are pure powers (*aka*

* Many thanks to Vasilis Livanios, Jennifer McKitrick and Stephen Mumford for many useful comments on an earlier draft. Though I am taking issue with some of the views of the Late George Molnar, I should stress that my criticism does not detract from my admiration for his philosophical acumen, as this is clearly expressed in is posthumously published book "Powers".

[1] For brevity, I take the term "power" as synonymous with "disposition", "capacity" and the like. There may be subtle differences in their philosophical meanings, but nothing hangs on them for the purposes of this paper. I use the term "non-power" for all properties that are not powers.

pandispositionalism). Finally, some philosophers (e.g., Martin and Heil) claim that all properties are two-sided: they are both powers and non-powers.

An increasingly popular claim among philosophers is that at least *some* properties are ungrounded powers. 'Ungrounded' powers means two things: powers that are not grounded in other powers and powers that are not grounded in non-powers. Pure powers may be grounded in other powers (they are pure in the sense that they do not require non-power bases). But if the increasingly popular claim is right, then some pure powers are ungrounded: they are ultimate, irreducible.

Among recent attempts to defend this view, Molnar's (2003) and McKitrick's (2003) stand out. Molnar characterises powers in terms of physical intentionality. McKitrick takes issue with the popular view that, *necessarily*, all powers need grounding in order to play their causal role. Between them, they offer a challenging fresh conception of powers.

In the present paper, I offer a conceptual argument against the view that all properties are pure powers. I claim that thinking of all properties as pure powers leads to a regress. The regress, I argue, can be solved only if non-powers are admitted. The kernel of my thesis is that any attempt to answer the title question in an informative way will undermine a pure-power view of properties. The lines of defence of the friends of powers seem to converge on what I call 'the ultimate argument for powers', viz., that current physics entails (or supports) the view that the fundamental properties (spin, mass, charge) are ungrounded powers. I take issue with this argument and make a modest suggestion: that the evidence from current physics is inconclusive.

An introductory remark. My argument is meant to show that there is no need to accept ungrounded powers, but I will not say anything specific about what non-powers are. I side with many in taking spatio-temporal properties (including stable arrangements of entities in space, e.g., the atomic structure) as paradigmatic cases of non-powers. *In lieu* of an argument I shall present the following intuition about the distinction between powers and non-powers. Take an object that is fragile and spherical. Let us accept that both properties are actual, objective and intrinsic. Still, there is a *difference* between them. Fragility like sphericity is always present. Yet unlike sphericity, fragility has a kind of a dual life: it is (and can be) unmanifested; but it can (and does) manifest itself. But it does *not* make sense to say the same thing of sphericity: it leads no dual life. So it does not make sense to ask the title question

about sphericity. Yet it does make sense to ask it about fragility. The 'excess' life of fragility needs to be accounted for.

1. Directedness

I am ready to concede that a very austere answer to the title question won't do. This is what Molnar (2003, 94) calls "Megaran actualism". Roughly put, the idea is that powers exist as long as they are exercised. I agree that if it is useful at all to talk in terms of powers, it is *not* useful to say that powers are there as long as they are exercised and lost when they are not (and reacquired when they are exercised afresh etc.) But granted the implausibility of this idea, it is *still* a problem to explain what powers do when they are not exercised. There must be an informative (and independent) account of this.

The late George Molnar (2003) makes an impressive case for the thesis that intentionality is not *solely* the mark of the mental. Physical powers too, he argues, are intentional properties: they are *directed* towards their (possibly non-existent) manifestation. Accordingly, the distinctive feature of powers (as opposed to non-powers) is that they possess (or display) physical intentionality: they are directed towards their manifestations. They are so directed even when the power is not manifested or even if it is unmanifestable. As he says: "Having a direction to a particular manifestation is constitutive of the power property" (2003, 60). He takes it that there is a necessary connection between the power and its manifestation: "A physical power is essentially an *executable* property" (2003, 63).

Molnar's appeal to physical intentionality (directedness) can be seen as answer to the title question: when power F is not manifested, it is *directed* to its manifestation. Being directed to its manifestation is a property of a power. Can this property be a power? If all properties are powers, then it has to be. The idea here would be that directedness is a power of powers: it is the power they have to manifest themselves. And it is a power they have when they are unmanifested (or unmanifestable). So to say that, for instance, fragility is directed to its manifestation even when it is *not* manifested is to say that fragility (F) has the power to manifest itself even when it is not manifested. Let's call Q this property (power) of directedness. It seems then that there is an answer to the title question: when unmanifested, F has the *power* Q to manifest itself; that's what it does!

2. Regress

I will now show that this thought leads to regress. To fix our ideas, let us say that object *x* has the power F to φ, e.g., a porcelain vase has the power to break (fragility). F *is* the power to φ. The question I am interested in is what F does when it is *not* manifested, e.g., when the porcelain vase that possesses F is *not* broken. Suppose we grant that when unmanifested, power F has the *power* Q to manifest itself, that is to φ. (As noted above, this would be meant to explain F's directedness to its manifestation.) Since Q is a power, it is also directed to its manifestation, but it may well be (actually) unmanifested (or unmanifestable). So Q must have the *further* power R to manifest itself in a certain way; but being a power, R must have the power S to manifest itself in a certain way, and so on. *Ergo*, if power F has the power Q to manifest itself in a certain way, then an infinite sequence of powers need to be posited to explain what F does when it is not manifested.

Let me use an example to illustrate this regress. Grant that fragility is directed to its manifestation, that is to *breaking*. Note that the directedness of fragility is a property of fragility. It is a property that fragility has irrespective of whether it manifests itself or not. The intuitive idea here is that whereas fragility is the power *of an object* to break, Q is the power *of fragility* to manifest itself. Grant that the directedness of fragility is a *power* Q. If Q is a power, it is directed to its own manifestation. When is Q manifested? Exactly when fragility is manifested. But of course, this does not imply that Q and F (fragility) are one and the same property. To use a parallel (but not identical) case, the property of being red and the property of having colour are co-instantiated by a red rose but they are not the same property. Or, the property of being trilateral and the property of being triangular are co-instantiated by triangles but they are not the same property. Now, since Q is the power of fragility to manifest itself, Q can exist unmanifested. That is, Q is present and directed to its manifestation (F's being manifested) even when F (fragility) is unmanifested. So, Q must have the further power R to be manifested. R is the power of the power Q to manifest itself. When is R manifested? Exactly when Q is manifested. But, as above, this does not imply that Q and R are the same property. Since R is the power of Q to manifest itself, it can exist unmanifested. Hence, there will be another power S of R and so on. We end up with a (regressive) hierarchy of powers: fragility (F) and the power of fragility

to manifest itself (Q) and the power of the power of fragility to manifest itself (R) and so on.

2.1 Two Regress-stopping Strategies

Charges of regress are meant with two kinds of response. The first is that the regress is harmless. The second is to argue that the regress really stops at some point or other. Let us take them in turn.

Is the regress noted above harmless (if any is)? I do not think so.[2] In the regress under discussion, we have lost (conceptual) track of the directedness of an ordinary power. The directedness of F is conceptually connected to the directedness of Q, which is conceptually connected to the directedness of R and so on. Or, equivalently, the directedness of F to its manifestation is mediated by an infinity of other distinct but conceptually connected directednesses. Or, equivalently, the manifestation of power F conceptually presupposes an infinity of distinct powers.

Can the regress stop at some level? There are two options here. One is to try to stop the regress while staying with powers. The other is to appeal to non-powers. Let us take them in turn.

If we stay with powers, I see no motivation for picking *any* higher level in particular. More specifically, I see no reason to stop the regress at the level of Q if one takes Q to be a power. For, what is *so* special about Q (the power of F to manifest itself) that its *own* directedness to its manifestation is enough to ground the directedness of F to its manifestation (when F is not manifested, or when it is not manifestable)?

Perhaps, it might be said, Q (the power of F to manifest itself) is a continuously manifested power. One worry here is that it is odd to say that the non-continuously manifested power F needs a continuously manifested power Q in order to be directed to its manifestation when it is not manifested. But a more serious worry is that it might well be problematic to talk about continuously manifested *powers*. It is arguable that when a property is necessarily continuously manifested, it is a non-power. For, the distinctive feature of powers is that they may be possessed, thought

[2] Stephen Mumford reminded me of a harmless regress: if P is true, then it is true that P is true and it is true that it is true that P is true and so on. I guess this is harmless because each step of the regress is stated in a different meta-language. But there is no analogy here with the regress of *powers* noted in the text.

not manifested. So the power (Q or any other for that matter) should be such that it is *not* necessarily continuously manifested. In other words, it should be logically (or metaphysically) possible that it is not continuously manifested. If so, the original question is just postponed. For what does the power do in the logically or metaphysically possible worlds in which it is not continuously manifested, when it is not manifested? Or, what makes it the case that in the actual world it is continuously manifested? This seems to be taken to be so in the spirit of natural piety.

What if one were to argue that Q is *not* a power. The regress would then stop by admitting non-powers. But this would be an admission of defeat. If Q (the directedness of F) is a categorical property of F (if you don't like the term, let's use 'non-power' instead), then the whole project of explicating what powers do when they are unmanifested is either stalled or based on an entirely different footing. For the very notion of directedness (which is supposed to distinguish powers from non-powers and to show what is special about powers) requires non-powers.

2.2 Powers and more Powers

So far, I have thought of the directedness of powers as a power of powers: the power powers have to manifest themselves. This has generated the regress noted above. Now, Molnar (2003, 32-3) admits that we often speak in terms of first- and second-order powers, such as being magnetised and being magnetisable. But, significantly, he warns us *not* to think of second-order powers along the lines of the determinable-determinate relations. Rather, he (2003, 33) takes it that all powers are "first-order properties", that is properties of objects. He used the idiom of "iterated" powers to refer to "powers to acquire (or to lose) a power" (ibid.). "Iterated" powers capture the following idea: "It may be possible for an object to φ at a time when it does not actually have the power to φ, if it has the power to acquire the power to φ together with other relevant iterated powers" (2003, 101).

Perhaps then we should think of directedness as an "iterated" power. That is to say, it might be that object *x* has the power F to φ and that the same object *x* has the power Q to have its power F directed to its manifestation. Yet, I am not sure how to understand this. It amounts to saying that a porcelain vase has the power F of fragility and the power Q to manifest its fragility (which power Q the object possesses, like its fragility, even when Q is unmanifested or unmanifestable). It's hard to see why nature should work like that. Why are two powers necessary and if they are, how are they

connected to each other? But even if this kind of connection were granted, a regress of the sort encountered above would be in the offing. For the object would then need a further power R by virtue of which the object's power Q (to manifest its fragility F) would be there even though unmanifestable; but since R is a power, the object would need another power S by virtue of which its power R (of the object's power Q to manifest the object's fragility F) would be there even though unmanifestable, and so on. For any power of the object *x* there should then be an infinity of other powers that *x* has. A real congestion! In any case, it's not hard to see that the regress-blocking argumentative pattern described above would apply to this move too.

To sum up. Powers, we are told, can manifest themselves: they are "executable"; but they don't always manifest themselves. One can then ask: What do they do when they don't manifest themselves? They are *being directed towards* their manifestation, we are told. But as shown above, this is either regressive or requires non-powers. The friends of powers are caught in a dilemma. Either they have to take the directedness of powers as a *power* i.e., the power to be directed to their manifestations, even if the latter do not occur, or they have to take it as a non-power. In the former case, the very ascription of powers becomes (almost) incoherent—because ultimately regressive. In the latter case, the very ascription of powers requires that there are non-powers. Both horns undermine the notion of pure power.

2.3 Always Packing, Never Travelling

How is the above regress charge different from the standard argument against powers? Molnar (2003, 173), following Armstrong (1997, 80), has called it the "always packing, never travelling" argument. The idea is this. If properties are nothing but powers, then when a power is manifested, its *effect* (the acquiring of a property by a particular) will also be a *power*. Hence, nothing really happens apart from the shifting around of powers from particular to particular. As Armstrong put it "Given purely dispositionalist accounts of properties, particulars would seem to be always re-packing their bags as they change properties, yet never taking a journey from potency to act" (1997, 80).[3]

Molnar (2003, 173-4) construes this argument as a regress-charge. It's not clear to me that it is. I think it is a powerful *reductio* of the view that powers explain action:

[3] This argument is really C. B. Martin's. See his (1993, 68).

they do not. But even if we think of it as a regress-charge, it is different from the one advanced in the present paper. The "always packing, never travelling" argument concerns the manifestation of powers: it claims that no manifestation is possible if all properties are pure powers. Mine, on the other hand, concerns the non-manifestation of powers: it claims that if we take directedness to their manifestations to be the distinctive feature of powers and if we take *all* properties to be powers, then there is no coherent answer to the question of what powers do when they are *not* manifested (or when they are unmanifestable).

Recall the final lines of the introductory remark in section 0. Powers have a kind of a dual life: they are (and can be) unmanifested; but they can (and do) manifest themselves. Between them, the two arguments seem to pose a double challenge to the dual life of powers (within a pure-power ontology of properties): powers never move from potency to act (the "always packing, never travelling"); and it's not clear (to say the least) what it is for them to be potent to act (my argument).

3. An Answer that Won't Do

A friend of powers might protest that my argument is unfair to powers. She might say that it is wrong to endow powers with further powers to manifest themselves or objects with further powers to manifest their powers. If, she might add, there is no need to do either of the above, then the objection I have presented seems to evaporate.

I am not a friend of (pure) powers, so my argument above is meant to block a certain way in which friends of powers *might* want to explain what powers do when they are not manifested. But suppose I am wrong in what I said (though I think I am not). The present objection does *not* answer the title question. Granted that F is the power to φ, the issue I pose is to explain what F does when it does *not* φ. So the pressure on the friends of powers still remains: an answer is needed.

Brian Ellis (2001, 114-5 & 139-40) has argued that no such answer is needed. He considers the argument from Continuing Existence, as he calls is, according to which non-powers are needed to explain the continuing existence of powers. Against this argument he claims that one of its tenets needs to be rejected, viz., that the fact that powers continue to exist (unmanifested) needs explanation. He notes that it begs the question against the friends of powers to claim that powers are not "capable of enduring" without support from non-powers (cf. 2003, 114). Two things can be said against Ellis's claim. First, we should note the reference to "capability": powers are

capable of enduring. This, I take it, is tantamount to saying that powers have the power to endure. But if so, then the regress noted above applies to Ellis's view no less.[4] Second, Ellis's main positive argument against the call for explaining the endurance of powers is what I called "the ultimate argument for powers", viz., that "many of the most basic properties are evidently both occurrent and dispositional" (2001, 114). The key idea is that if most fundamental properties are "evidently" powers, then we had better accept that they are capable of enduring and supporting other properties. I doubt that these properties are "evidently" powers. But, as I have already said, given the centrality of this argument, I will examine it in section 6.

Suppose a friend of powers says: When a power is *not* exercised it just lies there in the object that has it. Let her add: it does nothing else; it simply *is* (directed towards its manifestation). I think such an answer would simply shift the problem. There would still remain the problem to explain the *modal force* of powers: what does it mean to say that the power *could* be exercised? Don't reply: it has the power to be exercised. This move has already been blocked by the above argument. There are two other options available. The first is to appeal to conditionals (subjunctive and counterfactual): if *so-and-so* were the case, then power F would be exercised. The second option is to claim that the modal strength of powers is a brute (modal) fact. We shall examine the first option in the next two sub-sections and the second in section 4.

3.1 Modal Strength I: Conditional-Based Rescue Operation

Consider the conditional-based rescue operation. Within this, there are two routes available. The first route is to give a causal basis-plus-stimulus-plus-laws account of the *so and so* of the antecedent of the conditional 'if *so-and-so* were the case, then power F would be exercised'. Along with many others (most notably Armstrong), I am very sympathetic to taking this route, but it is blocked for the friends of powers. For, it amounts to a specification of the antecedent in terms of non-powers.[5] The

[4] If endurance is seen as a non-power (a state or a process for instance), then powers will need non-powers to play their (causal, explanatory etc.) role. If endurance is seen as a power (a power of powers), then the regress we discussed above re-appears.

[5] I do not defend any particular conditional account of powers. But it is noteworthy that it is far from established that power-ascription is not amenable to a conditional analysis. For a recent defence of the standard conditional analysis of powers see Gundersen (2002). Some philosophers believe that power-

causal basis will be a categorical property of the object that has the power or a structured whole of such properties. To say the least, the view that properties are 'pure powers' is inconsistent with the foregoing specification of the antecedent of the conditional. If, in the scenario of section 2.1, categorical properties might be needed to constrain (or 'control') powers from above (in that they are necessary for the coherent postulation of unmanifested(able)-but-directed-to-their-manifestation powers), in the scenario of the present section, powers are constrained (or controlled) by non-powers from below (in that they are necessary for grounding their modal strength).

It should be noted that an appeal to *natures* (as in Harré and Madden (1975) will not help. They claim that the proper analysis of ascription of powers should have the following form:

> 'X has the power to A' means 'X (will) (can) do A, in the appropriate conditions, *in virtue of its intrinsic nature* (1975, 86).

Harré and Madden may well be right in claiming that powers are grounded in the intrinsic natures of the things that possess them. But it is an open issue what these natures are. Indeed, Harré and Madden themselves leave it entirely open that the natures of objects that have powers are determined (constituted) by their structural and categorical properties (see 1975, 97-8). They draw a useful distinction between Aristotelian individuals and Parmenidean ones (1975, 96 & 161-2). Aristotelian individuals have variable powers (that is, powers that can change, fade away, die out etc.). This variability is grounded in the natures of these individuals: their nature can remain intact and yet their powers may change. This nature is understood as the atomic structure of the Aristotelian individual. Parmenidean individuals, on the other hand, have constant powers and this constancy is constitutive of their nature. A Parmenidean individual cannot change its powers and remain the same individual. As Harré and Madden (1975, 162) put it, the powers and the nature of Parmenidean individuals are the same. Harré and Madden's example of Parmenidean individuals

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ascription does *not* entail any conditionals. The argument is based on Martin's (1994) "finkish dispositions". For what I take to be the exactly right response to the problem of fiskish dispositions, see Cross (2004, 5-6).

are the elementary particles, such as the electron and its constant power of negative charge. But most (all?) garden-variety powers[6] belong to Aristotelian individuals, such as the aspirin, the photographic plate, the dynamite etc. Suppose we granted for the sake of the argument that there are some 'fundamental powers' which need not (and, as empirically discovered, have not) any further (non-power) causal basis. Even so, most garden-variety powers do, again as empirically discovered, have causal bases in the categorical properties of the structure-plus-components of the objects in which they inhere. So at least for some (*most*?) powers, if we offer a causal basis-plus-stimulus-plus-laws analysis of the *so-and-so* along the foregoing lines, or if we say that the powers are grounded in the *natures* of the individuals that have them, we end up with no distinctive power-theory.

The issue has now shifted to whether or not the properties of the fundamental particles should be seen as ungrounded powers. I shall return to this in section 6.

3.2 Modal Strength II: Something *in* the Power

There is a second route available for the specification of the *so and so* in the conditional 'if *so-and-so* were the case, then power F would be exercised'. This is to argue that it is something *in* the power itself that constitutes (grounds/supports/is the truth-maker of) the *so and so*. But what could this be? I will consider two alternative answers: spontaneous powers and bare powers.

3.2.1 Spontaneous Powers

Recall that we are looking for specifications of the antecedent of the conditional 'if *so-and-so* were the case, then power F would be exercised' that avoid categorical properties as its filament. A plausible thought is based on the view that some powers are spontaneous. According to Molnar (2003, 85), these are powers that need no stimulation. Many examples are controversial, but Molnar takes fundamental physics to provide some uncontroversial examples of powers that need no stimulus and are exercised spontaneously, e.g., in beta-decay. As noted already, I will come back in section 6 to the general issue of what physics says about the properties of fundamental particles. But suppose we do grant that there are spontaneous powers.

[6] By 'garden-variety' powers I mean the usual powers that macroscopic objects are supposed to have, e.g., fragility, solubility, malleability and the like.

I agree that the appeal to spontaneous powers *states* that there is something *in* the power that makes certain conditionals true. Yet, an appeal to spontaneous powers does not explain what is in (the nature of) *non*-spontaneous powers that grounds conditionals of the form 'if *so-and-so* were the case, then power F would be exercised'. Besides, most garden-variety powers are non-spontaneous. So, we are still left with an explanatory problem. But even if we focus on spontaneous powers, we don't have an account of what they do when they are *not* manifested. All we are told is that it is *in* their nature to produce their manifestations spontaneously.[7]

3.2.2 "Bare" Powers

The other way of showing that it is something *in* the power that (grounds (supports/is the truth-maker of) the conditional 'if *so-and-so* were the case, then power F would be exercised' is more promising, since it aims to deal with all powers, including non-spontaneous powers. It is the view that the power *itself* might be the causal basis of its manifestation, defended by McKitrick (2003). In its barest essentials, the view is that some entities are "barely" powerful (e.g., "barely" fragile). McKitrick does consider conditionals such that the above as well as a standard objection to "barely" powerful particulars based on them. The objection is, essentially, the point made above: that the truth-makers of these conditionals are (the properties of distinct) categorical causal bases, along with the laws of nature. But she notes that it is still *open* for the friends of powers to claim that the relevant truth-maker is a "bare" power (disposition), where a "bare" power is a power "with no distinct causal basis" (2003, 364).

Here is an argument why this *cannot* be right. The claim is that the power is (can be) the causal basis of (or, it causally explains) its own manifestation. Actually, some care is needed here. For non-spontaneously firing powers (or non-continuously manifested powers) we also need some external stimulus to have the effect (the manifestation of the power). But McKitrick *is* careful, for she uses the idiom 'the power is causally relevant to its manifestation' and she also notes: "a causal basis is

[7] Isn't the case analogous to radioactive decay? Not really. In the case of a radioactive particle we indeed have a genuine chancy event: its spontaneous decay. But we don't have just this. We have fixed probabilities of decay and we have a whole theory behind this probability which specifies what it is to decay, what mechanisms are at work to specify this probability. These mechanisms fix the power of the particle to decay even if they do not fix *that* it will decay at a certain moment etc. Perhaps this is the best model of spontaneous power ascription. But if it is, it is only *partly* a power-based model.

simply the object's causal contribution to the manifestation" (2003, 361). So she does not argue that the "bare" power constitutes the complete causal antecedent of the manifestation. Her point is that the "bare" power is the object's *own* contribution to the cause. Let this be as it may. The "bare" power is bound to do more than causally contribute to its own manifestation. It also causally contributes to the *absence* of this manifestation (when the power is not manifested, or when it is unmanifestable). For, considering the object that has the "bare" power *in and of itself*, there is nothing else (in McKitrick's view) which causally contributes to the *lack* of the manifestation of the power. There is nothing else precisely because all there is is the "bare" power. The questions then is: how can this be? How does the very *same* power contribute to the (occasional) presence and the (more frequent) absence of an effect?

There is a quandary here, I think. Suppose it is said that the difference between the presence of the effect (the breaking of the porcelain vase) and its absence (the vase's remaining intact) is due to the presence or absence of the stimulus (e.g., the hitting with the hammer). This move seems to neutralise the role of the "bare" power as a causal contributor to the manifestation of the power. For the causal burden is shifted to the external stimulus. When it comes to the vase itself, the very same "bare" power is the causal contributor to its breaking and to its remaining intact. It is the stimulus that makes the difference. Even so, it is unclear what it is in the "bare" power itself that makes it true that 'if the vase were struck with a hammer, it would break'. Whatever that is, it should be the same thing that makes it true that 'if the vase were *not* struck with a hammer, it would not break'. There is, presumably, one single thing (fragility-as-a-"bare"-power) that causally explains the breaking of the vase and its remaining intact when it is not struck. The point here is that there is little (if any) explanatory insight to be gained: a "bare" power causally contributes to its manifestation when it does not causally contribute to its lack.[8] Suppose, on the other

[8] One might wonder here: isn't the case similar when we take it that the causal basis of the power is a non-power (plus laws)? It is analogous, but not quite similar. To say the least, when we think of the molecular structure of the vase as a network of categorical properties of the molecules, we can explain why this structure (the vase) is stable, (that is, it is not fractured spontaneously), and we can also explain what it is in this stable structure that makes it possible to be disrupted under certain circumstances (also explainable in terms of the properties of the stimulus and of its interaction with vase). I do not think a comparable story can be said, in a non-question begging way, when we think of the matter in terms of "bare" powers.

hand, that the vase is also endowed with a different "bare" power: its power to remain intact *unless* hit with a hammer (or whatever the stimulus might be). Leaving aside worries about whether *this* power can be an intrinsic property of the vase, we are faced here with a proliferation of "bare" powers that defies Occam's razor. For, it is not just one extra "bare" power that we need to posit. Apart from the "bare" power to break and the "bare" power to remain intact, we need to posit the "bare" power to remain-intact-even-if-hit, when this hitting is light, the "bare" power to lose its fragility if masked by another power etc. In any case, we are left totally in the dark as to how all these "bare" powers are connected with each other.

4. Brute Modal Properties

I take the above argument to pose a basic conceptual difficulty to the view that there are "bare" powers that constitute the causal bases of their own manifestations. But even if I were wrong, there would still be another hurdle to be overcome. McKitrick's (2003, 366) "biting the bullet" strategy suggests that the "bare" power itself is an irreducibly modal property (2003, 367-8). Hence, we are told, the truth-makers of counterfactuals such that 'if *so-and-so* were the case, then power F would be exercised' are the "bare" powers themselves in virtue of their being "modal properties". As she notes: "If we reject the assumption that we are required to give a reductive analysis of modal statements in terms of non-modal statements, the argument against bare [powers] looks considerably weaker" (2003, 368). This thought ushers in the second option noted at the end of section 3, viz., that the modal strength of powers is a brute (modal) fact.

McKitrick says: "To say there can be bare [powers] is to say that a thing can have a modal property irrespective of its other properties" (2003, 366). This might sound as *deus ex machina*. What is so special about, say, fragility that helps it carry its own modal strength? The question is not rhetorical for two reasons. First, if anything, fragility is a *generic* power. Many disparate things can be fragile (vases, people, ecosystems, economies etc.). Given that they are different (as cheese and chalk) in the rest of their properties, it is odd to say that they are all fragile *in the same sense*. Here ordinary language might mislead us. If anything, all these objects (systems) should be endowed with distinct "bare" powers to break. The result is a huge proliferation of "bare" causal powers. If, on the other hand, we treat them all as instances of the very same power, we should explain how and why objects with radically different

properties can have, alongside them, a common *modal* property: *fragility*. If the most informative thing that can be said is that all these objects have the power to exhibit fragility in certain circumstances, as insinuated by McKitrick (2003, 367), either some question is begged or nothing really interesting has been said. Second, fragility, like all garden-variety powers, is a well-understood property. If we know anything at all, we know that it is determined by other properties that the fragile object has. So we know that it is connected with other properties, most saliently with the molecular structure of the object. So it is unwarranted to say of most (all?) garden-variety powers that they are possessed irrespective of the other properties that their possessors might have. Is this an epistemic argument? It may well be. But I trust that we now live in the age in which we allow our best science to tell us something about the deep structure of the world.[9]

McKitrick's suggestion, I take it, amounts to the claim that we should (or at least that we can) take the modal character of "bare" powers as primitive: we should neither try to reduce it to non-modal features nor to eliminate it altogether. I agree that there is no metaphysics without some primitives, but I would prefer to avoid adding primitives to this already cluttered landscape. So is the modal strength of powers the right sort of primitive? Molnar (2003, 200-2) has suggested three principles that may be used to justify the choice of a concept as primitive. They are: (i) *the historical test*: roughly put, pick as your candidate for primitiveness a central concept and see whether attempts to reduce the candidate for primitiveness have succeeded or fail; (ii) *explanation of irreducibility*: give a strong and satisfactory reason why attempts to reduce (or eliminate) your candidate for primitiveness have failed; and (iii) *the clarity and distinctness test*: the candidate for primitiveness should not be mysterious or opaque to pre-theoretical understanding. I want to claim that taking the modal strength of "bare" powers as primitive meets none of the above criteria. McKitrick (2003, 366) notes that 'having a disposition [power]' is an irreducible modal property. But it is clear, I think, that 'having a power' fails the first two criteria. Most (all?) garden-variety powers are reducible to non-powers and hence their alleged (primitive) modal status is also reducible to the modal status of their reduction-bases. Hence,

[9] I understand that McKitrick uses the case of fragility as an example (indeed a popular example) of a power. She does not mean to imply that fragility is a *good* candidate for a bare power (see 2003, 355). I use *fragility* in a similar fashion. My point about fragility is meant to be illustrative of the general problem that "bare" powers might face.

there is no reason to be given as to why the reduction of garden-variety powers has failed, for it has not. The third criterion is the hardest to meet, anyway. Positing "bare" irreducible garden-variety powers is mysterious and opaque. It is the product, in Mackie's (1977, 366) memorable phrase, of metaphysical double-vision. Far from having a clear and distinct idea of the irreducible modal strength of, say, fragility, its positing really recapitulates the causal processes which it is supposed to causally explain. As Mackie put it, these supposed irreducible powers "just *are* the causal processes which they are supposed to explain seen over again as somehow latent in the things that enter into these processes (ibid.).

We are not done yet. McKitrick's strong case for "bare" modal powers is based on the "contemporary scientific characterisation of the ultimate constituents of matter" in terms of "causal and dispositional notions" (2003, 368). This is a (the?) central argument of all the proponents of powers. Let me leave it for last (as already promised). For the time being, let me conclude that taking the modal strength of powers as primitive fails the tests for primitiveness for garden-variety powers.[10]

5. An Aside

Molnar (2003, 96) challenges us to explain the difference between having an unexercised power and not having the power at all (absent powers). His claim is that positing unactualised uniterated powers explains the difference between "unexercised powers and absent powers" (2003, 97). So, perhaps, we need to posit powers anyway, even if we don't have an answer to the title question. But Molnar's challenge cuts both ways: positing unactualised uniterated powers might explain (or fail to explain) too much. Why isn't there an unactualised uniterated power of object to rise when left unsupported? And why couldn't one say that this power is executable but *blocked* by a contrary power to fall? These are *not* rhetorical questions. There must be a difference between unactualised (unexercised) powers that an object has and powers that it cannot have. Allowing powers to be simply unactualised (unexercised) obscures this difference. A 'brute fact' answer won't do here: something must ground/explain/cause this difference.

[10] Note that there are those (like Molnar) who dissociate powers from conditionals altogether. Suffice it to note that if this dissociation is right, then in the present context at least, it leads to the view that the modal strength of powers is a brute fact. Whatever I said in the main text against this view applies here as well.

Consider, briefly, Molnar's (2003, 96) example: there is a difference between a blind person and a person who, at time *t*, is asleep or in the dark. It is common sense that the blind person does not have the power to see, while the person in the dark does. It is common sense, that is, that there is a difference between these two persons. But while this difference can be described as a difference in their respective powers to see (the blind person lacks this powers while the other person does not), it is not obvious that this difference compels us to posit *sui generis* powers. Philosophers do not need to study anatomy to accept that there is a difference in the non-powers of these two persons which fully explains (causally explains, that is) why one of them can see while the other cannot. You cannot remove the power to see without interfering with the stable anatomical structure of the eye (or something like it) and you cannot add this power without fiddling with this structure.

6. The Ultimate Argument

Friends of powers rest their case with what might be called 'the ultimate argument for powers'. This is that the fundamental properties (the properties of the fundamental particles) *are* powers. This argument is empirical. Physics, it is claimed, posits irreducible powers: mass, charge and spin. The argument is very popular. Versions of it can be found in McKitrick (2003) and Molnar (2003, 135-7 & 178). But the argument has been defended by Harré and Madden (1975, 104 & 154-5), Martin (1993), Holton (1999), Ellis (2001), Harré (2001, 100) and Mumford (forthcoming). The claim is that the fundamental properties are ungrounded ("bare") powers. And the argument for this conclusion is that the fundamental particles are *simple*: they have no internal structure. Hence, they have no parts (components) which can be deemed the bearers of further properties (be they powers or non-powers) which, in turn, ground the properties of the particles.

Note, in passing, a hard-line response that is available. If ascription of powers implies that powers must do something when they are unmanifested, and if attempts to explain what they do lead to regress (see section 2 above), then we cannot really make sense (after reflection) of the fundamental properties being *powers*. The way out, of course, would be to take these fundamental properties to be categorical (see the regress-stopping strategy of section 2.1). This is *not* a non-starter. Though I have qualms about the Martin-Heil view that, necessarily, every property is both categorical and dispositional (see Martin 1993 and Heil 2003), if this view is

defensible on conceptual grounds, then the fundamental properties are *not* purely dispositional. They are *also* categorical.[11] In fact, it is not implausible to argue that the Martin-Heil view gets extra credibility from the fact that it helps stop the regress noted in section 2. It could be argued that the categorical side of the property explains what the property does when its power side is not manifested.

Yet, the hard-line response would be too hard if the empirical evidence showed that the fundamental properties (mass, spin, charge) of elementary particles were powers. So what does fundamental science suggest? What seems beyond (reasonable) doubt is that the fundamental particles (the six quarks and the six leptons) are simple: they have no parts. Hence, if there was hope to reduce their properties to the properties of their parts, this hope evaporates (until further notice, anyway). But I want to claim that it is premature to conclude from this that the fundamental *properties* are ungrounded or "bare" powers. This is because although it is customary to understand these properties in terms of their manifestations (that is, in terms of what they can do), modern physics suggests a different way to identify and individuate fundamental properties: they flow from some fundamental symmetries.

My aim is solely to cast doubt on the view that it is a foregone conclusion that that the properties of elementary particles are pure powers. So I will be brief and sketchy. The (technical) details of my point can be found in any good textbook on modern physics.[12] The elementary particles are the irreducible representations (irreps) of a group, the so-called ISpin(3,1) x G, where, roughly put, the ISpin(3,1) is the Poincare group and G is a Lie group, called the *internal symmetry group*, which, in the Standard Model, is SU(3) x SU(2) x U(1). The ISpin(3,1) group represents geometrical, that is spacetime, symmetries. The three groups SU(3), SU(2), U(1) correspond to the three forces: strong, weak and electromagnetic.

Local internal symmetries such as the above imply the existence of particles whose interactions are the origins of forces. The strong symmetry (SU(3)) leads to gluons, that is particles which mediate the interaction among quarks. There are eight of them (against as specified by symmetries) and are 'felt' by the *colour* of the quarks (which is a kind of charge). A quark of one colour might go into an interaction and come out

[11] For Armstrong's insightful criticism of the Martin-Heil view see his (1997) and (2004).

[12] For philosophically informed accounts of the role of symmetry in individuating elementary particles and their properties, see Morrison (1995) and Schweber (2003).

as a quark of a different colour, though all of its other properties remain intact. Because of internal symmetries, each quark comes in three varieties (colours): red, green and blue. Leptons, on the other hand, do not 'feel' this strong force. The electromagnetic force, which corresponds to U(1), acts on all particles (except neutrinos). The force particle that mediates this interaction is the photon, which is massless. Because these local symmetries are exact, the masses of the corresponding gauge bosons (force particles) vanishes. This explains why gluons and photons have no mass. The mass of the *proton* follows form the dynamics generated by the strong symmetry.

The electric charge is said to be the unitary irrep of U(1). In fact, the concept of *electric charge* is less fundamental than the concepts of *weak isospin* and *hypercharge*. The weak isospin (which comes in three components) of a particle corresponds to its transformations under SU(2), whereas its hypercharge to its transformations under U(1). The concept of isospin was introduced to explain the symmetry between protons and neutrons. These two particles are very similar to each other: they have roughly the same mass, the same spin and they respond identically to nuclear forces. Their only difference is in their charges, which is irrelevant to the strong nuclear force. It was then suggested that the proton and the neutron are states of the same particle, the *nucleon*, which transforms under the spin-1/2 representations of SU(2). The proton was taken to be the up-state, while the neutron was the down-state. This property has nothing to do with ordinary spin (the term was used because the same group SU(2) describes *rotation symmetries*, which gives rise to ordinary spin). So it was called 'isospin'. The same group SU(2) describes the *weak* nuclear force, so it is described as weak isospin. Similarly, the hypercharge is the product of using group U(1) as a symmetry group of the 'electroweak' force. It describes the observable corresponding to this new U(1). So the hypercharge is a unitary irrep of U(1). There are definite rules which show how the charge of each and every particle can be computed out of the weak isospin and the hypercharge.

The weak force corresponds to the internal symmetry SU(2). It acts between quark and lepton doublets, changing one into the other. The force particles of the weak interaction, the W and Z bosons, are known to be very massive. Hence, the weak interaction has a very short range, much less than the diameter of a proton. What explains the fact that the W and Z bosons are *massive*? Before I offer the (well-known) answer, let me note that this question becomes very important within the

unified framework of electroweak forces. SU(2) x U(1) is the symmetry of electroweak interactions. In this unified scheme, electromagnetic and weak interactions become one. The problem is that though photons are massless, the W and Z bosons are massive (all these particles are irreps of SU(2) x U(1)). This discrepancy (the acquisition of mass) is explained by the so-called Spontaneous Symmetry Breaking. The non-zero masses of elementary particles result from the spontaneous breaking of the electro-weak symmetry (if the electro-weak symmetry was unbroken all particles would be massless). The mechanism that is currently posited to explain the masses of particles is based on the Higgs bosons. They are massive particles which explain how all other massive particles acquire masses (including quarks and leptons). The Higgs boson is still a matter of speculation and there are attempts to account for the spontaneous breaking of symmetry by means of new symmetries (called supersymmetries).

The point of the last few paragraphs is just that the empirical situation is much more complicated than the friends of powers typically presume. The fundamental properties of the elementary particles seem to be determined by powerful global and local symmetries that exist in nature. More specifically, they seem to emerge as invariances under sets of (global or local) transformations, which form a group. So: we started with the view that the properties of elementary particles are ungrounded. But, in the end, they *are* (or probably are) grounded in symmetries. I am not sure we yet understand full well the nature of these symmetries. One plausible thought is that they act as meta-laws, that is as laws which dictate what the ordinary laws of nature should look like (see Morrison 1995). But no matter what one thinks on this issue, symmetries do identify fundamental properties in a way that does *not* involve what they can do. That is, they offer identity conditions for fundamental properties that are not (just) given by their manifestations. We can then see fundamental properties as non-powers.[13] Or, to say the least, we can equally well see them as non-powers too.[14]

It might be best if we leave physics alone at this stage to deliver some definite results about the nature of the fundamental properties, before we pass any

[13] It might be ironic that Molnar's categorical properties are identified by means of symmetry operations (see 2003, 160ff & 181).

[14] In thinking about the role of symmetries in the identification of properties I have been helped by my student Vasilis Livanios, who, however, intends to defend the Martin-Heil view.

philosophical judgement as to whether they are pure powers or not (or both). The jury is still out on this matter! So the ultimate argument for powers is inconclusive.[15]

7. What has not been Shown

I have aimed to offer a *conceptual* argument against ungrounded powers. Briefly put, it is that we need to view properties as being more-than-powers. This, I claimed, is necessary if we try to answer the title question: what do powers do when they are not manifested? On the way, I have tried to block the view that there is something *in* the power that answers the title question. I have also argued that it is *premature* to base our hopes for "bare" powers on modern physics. If successful, my argument undermines the view of properties as pure powers (*aka* pandispositionalism).

I have not offered an alternative conception, apart from rejecting, in passing, Megaran Actualism. I have intended to remain neutral on the alternative. Properties might be non-powers *simpliciter*. In that case, the burden for the presence of activity in nature must be carried by the laws of nature. It is a nice question, which I cannot answer at present, whether these laws can be Humean regularities. It seems, to my disappointment, that there is need for a stronger conception of laws. Alternatively, properties might have two sides (like the duck-rabbit gestalt), a power and a non-power. In that case, the power-side can explain activity in nature. The non-power side, on the other hand, can explain what the property does when it is not manifested. But it seems that Armstrong (2004, 6-7) has put his finger on the problem when he says, concerning the Martin-Heil view, that it is mysterious what the link between the two sides is.

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[15] This point is consistent with McKitrick's considered view on the matter. She notes: "It is an empirical question whether, for example, the disposition to repel negatively charged particles has a distinct causal basis. However, if one grants that it is an empirical question, one has granted my thesis that bare dispositions are possible. For all we know, electrons may have bare dispositions, and even if they don't, they might have" (2003, 368). I agree that this is an open empirical possibility. My point is that it is premature for the friends of powers to rest their case for ungrounded power in this empirical possibility. They would need to show that this possibility is actual and this has *not* been shown.

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