Walter Ott – wo5n@virgina.edu

University of Virginia

The Case Against Powers[1]

It is, unfortunately, our destiny that, because of a certain aversion toward light, people love to be returned to darkness.

-Leibniz, 'Against Barbaric Physics: Toward a Philosophy of What There Actually Is and Against the Revival of the Qualities of the Scholastics and Chimerical Intelligences'[2]

Reading the contemporary literature on powers would be profoundly dispiriting for the moderns. If there is one thing they agree on, it's the rejection of Aristotelian powers.[3] In their eyes, to attribute such powers to bodies would be to slide back into the Scholastic slime from which they helped philosophy crawl. We've had this argument before, they might say, and powers lost. If we hope to resurrect something like the Aristotelian position, we had better be sure we can answer the charges leveled by the moderns.

[2] Leibniz (1989, 312).
[3] The antecedent might be false; Spinoza and even at times Leibniz himself might be exceptions to the general hostility to Aristotelian powers. By 'Aristotelian' I mean any view that construes powers as intrinsic properties of the objects that possess them.

I don't propose to canvas every argument made in the modern period.[4] Some of them, as we'll see, depend on views peculiar to the modern period and so have lost their force. But one of them – Descartes's 'little souls' argument – points to a genuine and, I think persisting, defect in powers theories. The problem is that an Aristotelian power is intrinsic to whatever has it. Once this move is accepted, it becomes very hard to see how humble matter could have such a thing. It is as if each empowered object were possessed of a little soul that directs it toward non-actual states of affairs and governs its behavior in actual ones.

When twentieth century philosophers decided to resurrect the powers view, it was this original, Aristotelian theory they took as their inspiration.[5] I shall argue that this was a mistake. For in the early modern period we find not only profound arguments against Aristotelian powers but a way to preserve powers in the face of those same arguments. On the views of Robert Boyle and John Locke, powers are internal relations, not monadic properties intrinsic to their bearers. This move drains away the mysterious '*esse-ad*' or directedness of Aristotelian powers. And it solves what I'll suggest is the contemporary version of the little souls argument, Neil Williams's 'problem of fit.'

1. The moderns' war on powers

Although hostility to Aristotelian powers will come to be associated with British empiricism, particularly in the person of David Hume, the first clear statements of the case against

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[4] I set aside, for example, Malebranche's explicitly theological arguments (e.g., that attributing powers to bodies is tantamount to paganism and should result in the worship of leeks and onions), as well as arguments that depend on God's relation to the world (e.g., the divine concursus argument). For Malebranche's complete slate of arguments, see my (2009).Contemporary objections to powers theories that have no clear connection to the modern period also fall outside my purview. Perhaps the best treatment of such objections is that of Stathis Psillos (2002).
[5] As a case in point, consider Rom Harré and E.H. Madden's formulation: "'X has the power to A' means 'X (will) (can) do A, in the appropriate conditions, *in virtue of its intrinsic nature*'" (1975, 86; their emphasis).

powers come from René Descartes and Nicolas Malebranche. Some of these arguments seem very easy to bat away. Consider the charge that power attributions are explanatorily otiose: to say that opium puts people to sleep because of its *virtus dormitiva* is to contribute nothing by way of explanation. But as others have pointed out, power attributions do exclude other explanations (it was the opium that did it, not watching TV). Nor are such attributions predictively vacuous: if the dormitive power brought about sleep, then taking opium again under similar circumstances will have the same result.[6]

These replies only take us so far, since they leave open that power attributions are temporary stopping places on the way to full explanation. What really undermines the vacuity charge is the progress of science, not conceptual analysis. For the early moderns, power attributions are obviously superfluous because there is a much better explanation on offer. When Descartes argues against powers in *Le Monde*, he does so only indirectly, by displaying the competing explanation in terms of the mechanical qualities: size, shape, and motion.[7] Power explanations might point you to the right actor on the scene (it was the opium and not the TV that did it), but they can hardly be the end of the matter when we have perfectly intelligible mechanical qualities to appeal to.

Unfortunately, the golden era of mechanism was short-lived.[8] Newton found himself obligated to postulate forces that could neither be explained by, nor reduced to, the mechanical properties of bodies. Although he is among the targets of Leibniz's 'Against Barbaric Physics,' Newton was no friend of Scholastic powers and occult qualities.[9] Newton's solution is simply to

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[6] Others who make these points include Nelson Goodman (1983), Stephen Mumford (1998, 136), and Brian Ellis (2002).

[7] See CSM I 83.

[8] In the *Principles*, for example, Descartes appeals to God's immutability to ground the laws of nature. Even Descartes, then, is not a *pure* mechanist, if that means that the only explanans in natural science are the size, shape, and motion of bodies.

[9] See, e.g., Newton's correspondence with Bentley (2004, 103), as well as John Henry's (1994) and my (2009, 7 f.)

bracket all question of the 'physical causes' and focus instead on the mathematics.[10] The moderns' confidence that explanation in terms of size, shape, and motion trumps power explanations was misplaced.

In fact, it seems that many of the properties now postulated by fundamental physics are dispositional. It would be a mistake, I think, to conclude that there are no non-dispositional properties. The mere fact (if it is one) that physics finds no need to mention categorical properties is no evidence against their existence.[11] And even if it were, pan-dispositionalism would still be a hasty conclusion to draw. For it follows, I think, only on assumption of a very strong reductivism. The fact that tables and chairs are made up of tiny bits doesn't on its own show that there are no tables and chairs. Similarly, even if the physics of very, very small things finds no need to invoke categorical properties, there might nevertheless be such properties at a higher level. Although science doesn't provide good reasons for going pan-dispositionalist, it does, I think, make it very hard to deny that there are dispositions. At a minimum, the moderns' quick declaration of victory was premature.

Alongside the arguments from explanatory and predictive impotence, we find a consistent line of thought that connects such Descartes, Malebranche, and Hume: the argument from nonsense. Malebranche puts it well:

> [T]his opinion [that objects have powers] does not even seem conceivable to me. Whatever effort I make in order to understand it, I cannot find in me any idea representing to me what might be the force or the power that they attribute to creatures. And I do not even think it a temerarious judgment to assert that those

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[10] Newton (2004, 63 f.)
[11] I owe this point to John Heil (2012, 64).

who maintain that creatures have a force or power in themselves advance what they

do not clearly conceive.[12]

The point cannot be that we are unable to form an image of a power, as we can of a key and a lock: that would be an odd argument for a rationalist like Malebranche to make. Instead, the point is that our conceptual resources do not suffice for the representation of powers. Although it's difficult to articulate, there does seem to be something fundamentally mysterious about powers. Once again, it is important to see Malebranche's argument in its intellectual context: when the standards of intelligibility are those of geometry, it is hard to deny that Malebranche has a point.

The moderns lodge a further charge against powers that has force even outside that context. This 'little souls' argument is best regarded as an extension of the argument from nonsense; unlike that argument, this one does not tacitly rely on a contrast with the perspicuous concepts of geometry.

In his Sixth Replies, Descartes describes his own youthful opinion of heaviness: 'I thought that heaviness bore bodies toward the center of the Earth as if it contained in itself some knowledge of it.'[13] This notion of heaviness as a kind of knowledge-directed striving, aiming at a goal outside of itself, is derived from the idea of the mind. It's minds, and minds alone, that act, strive, and know.

Picking up the same theme, Nicolas Malebranche offers this argument against the powers view:

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[12] Elucidations to the *Search After Truth* in Malebranche (1997, 658). For Descartes, see *Le Monde* (CSM I 83).
[13] (AT VII 441-2/CSM II 297)

Well, then, let us suppose that this chair can move itself: which way will it go? With what velocity? At what time will it take it into its head to move? You would have to give the chair an intellect and a will capable of determining itself. You would have, in short, to make a man out of your armchair.[14]

With an update in style, Malebranche might well have been the author of these words, written by Stephen Mumford in 1999:

Does a soluble substance in any way strive to be dissolved? Does a fragile object aim to be broken? There is little reason to think that a material object without a mind is capable of having *aims* and *strivings* for events of a certain kind, because to do so would be for it to act, and attributions of action we reserve for things with minds.[15]

Mumford's remarks occur in the context of the debate over physical intentionality. Like minds, powers seem to have the ability to point to non-actual states of affairs: powers are directed toward their possible (even if never actual) manifestations. George Molnar and Ullin Place argue that such 'being toward' deserves to be counted as intentionality. Mumford, for his part, sees physical intentionality as bringing panpsychism in its wake: just like Descartes and Malebranche, Mumford thinks his opponents are making men out of armchairs.

In one way, the debate is something of a distraction from the real issue. The charge of panpsychism sticks only if intentionality is the mark of the mental. Since Place explicitly denies

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[14] *Dialogue* VII, in Malebranche (1992, 227).
[15] Mumford (1999, 221). See also D.M. Armstrong's exchange with Brian Ellis in Armstrong (1999, 35).

Brentano's thesis, he cannot be accused of imbuing the physical world with mental attributes.[16] As it turns out, the parties to this particular debate end up reconciling in an unexpected way: Place demands to know just how Mumford's own theory avoids physical intentionality, and Mumford 'leaves open' whether his functionalist theory of dispositions is 'really at odds' with Place's.[17]

The real issue, I think, is not whether realism about powers requires animism. Instead, the question is how to understand the directedness that all powers seem to have. Even those who deny that this directedness is a form of intentionality seem to accept this feature of powers. Whether or not one wants to call it 'intentionality,' part of the contemporary notion of a power, just like its Scholastic antecedent, is its directedness to actual and possible manifestations.

The problem of directedness is a direct result of another feature of this concept of power. Nearly all parties accept that powers are intrinsic to the objects that have them. Roughly, the idea is that an object has the powers it does regardless of what else is going on around it. Fire has the power to burn paper, char flesh, evaporate fluid, change the color of some kinds of materials, use oxygen, and on and on. Each power, all on its own, is poised to contribute its manifestation to all these events and more. Although part of the current orthodoxy, that feature of powers should strike us as prima facie very odd. It's as if fire knows just what to do whenever it comes across these things. And they, in turn, know just how to respond. Since the power is an intrinsic feature of the object that possesses it, it must come complete with a set of instructions, as it were, that tell it how to behave under every circumstance.

Prima facie oddity proves nothing, of course. I shall argue that the seventeenth century 'little souls' objection becomes, in modern terms, what Neil Williams calls the 'problem of fit.'

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[16] Molnar (2003, 70-1) defends himself against the panpsychism charge in just the same way.
[17] See Place (1999, 231) and Mumford's preface to the 2008 paperback edition of his 1998.

The real source of the problem is the Aristotelian's insistence on the intrinsicality of powers. We need, then, a tighter grip on just what that thesis amounts to.

2. Independence and Intrinsicality

Powers are independent of their manifestations. It is tempting to put the point by saying that a glass of water, for example, has the power to dissolve salt even if it never gets a chance to do so, indeed, even if there is no salt in the world to dissolve. To cash out independence in that way is to run it together with intrinsicality.[18] The two should be kept separate: the fact that a power can exist independently of its manifestations in no way shows that that power is intrinsic to the object that has it. I suspect that intrinsicality's claim to intuitive obviousness is entirely due to its tendency to masquerade as independence.

A commonly cited elucidation of the intrinsicality thesis comes from David Lewis: '[i]f two things (actual or merely possible) are exact intrinsic duplicates (and if they are subject to the same laws of nature) then they are disposed alike.'[19] I think the proponent of intrinsicality should reject this formulation. By building in his parenthetical clause, Lewis has made powers extrinsic, by any reasonable definition. If the laws of nature vary, then salt that is water soluble in the actual world is not so disposed in worlds that differ in the relevant laws. But that picture of laws is precisely what the powers view aims to undermine. For the powers theorist, laws are not 'top-down' features of the world that govern events. What 'governs' the course of nature is the powers. So there is no sense to be made of intrinsic duplicates that are not disposed alike in virtue of being

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[18] Molnar (2003) is one of the few writers who distinguish the two; Williams (2010, 85-6) seems to conflate them.
[19] Lewis (1997, 148).

governed otherwise. The powers theorist, then, should prefer a simpler formulation: any intrinsic duplicates are dispositional duplicates.[20]

There is a final problem worth mentioning. As it stands, the intrinsicality thesis comes out as trivially true for pan-dispositionalism. If there is no such thing as a 'quiddity,' or non-dispositional property, then to say that intrinsic duplicates are dispositional duplicates is just to say that any dispositional duplicates are dispositional duplicates. I am unsure how the pan-dispositionalist should refine the definition of intrinsicality.[21] In what follows, I will stick with the above formulation of the intrinsicality thesis, with the caveat that pan-dispositionalists will need to modify it.

The current orthodoxy, just like its Scholastic counterpart, holds that all dispositions are intrinsic. The only major dissenter from that thesis is Jennifer McKitrick, and even she argues only that *some* dispositions are extrinsic.[22] McKitrick unearths only one argument for the intrinsicality of dispositions, and it is less than impressive.[23] Later, we will examine an argument of Molnar's that, in spite of his intentions, points us in the right direction.

3. The problem of fit

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[20] There is of course a debate over how to define 'intrinsic'; see, e.g., Langton and Lewis (1998). Molnar (2003, 39 f.) has a very useful discussion of that issue. How that debate plays out will not, I think, affect the arguments of this paper.

[21] An appealing, equally Lewis-inspired, definition is this: to say that object O has a power P intrinsically is to say that O would have P regardless of the other objects and powers in its world; indeed, O would have P even if there were no other objects in its universe. That sounds promising but notice that it's in danger of collapsing into the claim that O has P necessarily. And that would be a bad result, since an object's powers can come and go. Since I find pan-dispositionalism less than coherent, I am happy to plead the privilege of a skeptic.

[22] See McKitrick (2003).

[23] The argument comes from Armstrong (1973, 11); see McKitrick (2003, 81) for criticism.

Neil Williams's 'problem of fit' threatens the whole project of reviving the moribund world of Aristotle.[24] It is, if not just the little souls argument over again, clearly its contemporary descendant. The argument requires only a handful of assumptions. First, we have independence and intrinsicality. To this we add essentialism: the claim that the set of possible manifestations of a power is essential to it. In case it's not intuitively obvious, we can give a quick argument for it. Suppose there's some power P whose possible manifestations differ from one world to the next. It has one set of dispositions, call it Gamma, in this world, and another, Mu, in another world. But now it's open to us to take Gamma and Mu as subsets of P's total set of possible manifestations. So there is no interesting sense in which the set of possible manifestations varies from one world to the next. If this argument goes through, I suspect it's because the essentialist thesis is an analytic consequence of the concept of a power.[25]

We need only one more ingredient: reciprocity. Powers come in pairs or bundles, not on their own. Most philosophers recognize the superficiality of distinctions like 'active' and 'passive'; the salt has to be able to cooperate in the dissolving every bit as much as the water has to be there to do the dissolving. The salt is not a mere background condition. As C.B. Martin puts it,

> I have been talking as if a disposition exists unmanifested until a set of background conditions is met, resulting in the manifestation. This picture is misleading, however, because so-called background conditions are every bit as operative as the identified dispositional entity. A more accurate view is one of a huge group of

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[24] See Williams (2010). I have not been able to find any direct engagements with Williams's argument.
[25] I suppose someone with a governing concept of laws might deny this: the possible manifestations of a single power can vary with the laws of nature. But such a view is clearly antithetical to the powers theory, which is resolutely 'bottom-up.'

dispositional entities or properties which, when they come together, mutually manifests the property in question; talk of background conditions ceases.[26]

Let's start with a simple example just to fix our ideas, abstracting from most members of this 'huge group': fire has the power to burn paper and paper has the power to be burned by fire. Since we have bought intrinsicality, we cannot treat these claims as merely two ways of saying the same thing. We have to be attributing two very different powers to the fire and the paper: the power to burn and the power to be burned.

But as Williams argues, we don't get this for free. Why should it be the case that paper's power is to be burned by fire, rather than to turn into a chicken when touched by fire, or to produce the sound of C#, or to pass along the flame to the next nearest object, or whatever you like? Powers come at least in pairs. Once we add in what we used to think of as background conditions, per Martin's instructions, we find that the situation becomes all the more puzzling. For it is not just *two* powers that have to co-occur; now there's an indefinitely large number of powers in play, all perfectly – and perfectly mysteriously – suited to their roles. Oxygen has the power to be consumed by flame and to enable it to do its work. It does not have the power, upon encountering the flame, to glow iridescent pink. And on and on.

Many, I assume, will react with incredulity: how can *this* possibly be a problem? Isn't it just obvious that powers 'cohere' with each other the way they do? I have some sympathy with this reaction. Indeed, my own preferred alternative will be to dissolve, rather than solve, the problem: at least one of the assumptions Williams made in generating the argument must be jettisoned. I do think that Williams is right in one respect: if you make those assumptions, you

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[26] Martin 2008, 50, quoted in Williams 2010, 87.

have to give a positive solution to the problem of fit. It is no good insisting that the powers obviously *do* fit. The question is, in virtue of what?

To that question, the power realist has no obvious answer. That powers 'fit' in the way they do looks very much like a miracle. A theist coming across the problem of fit would have new ammunition for a design argument: how else could it just happen to be the case that every power in our world is perfectly proportioned to all the others?

In fact, that way of putting the problem is a bit misleading. For it's at least plausible that the fit of powers is not a contingent matter. That seems to be Williams's position: 'the powers of the objects involved must cohere'; 'to fail to have the correct fit is to describe an impossible situation.'[27] If anything, the necessity of fit makes the puzzle that much more pressing. The comparison with theism can be illuminating here. A design argument that appeals to the Earth's distance from the sun (a little bit further away, and it's too cold for life; a little bit closer, and it's too hot) is unconvincing for the obvious reason: the presence of life guarantees that the Earth is suitably situated to sustain life. But now suppose that the Earth's position were not contingent but necessary: in every possible world in which it exists at all, the Earth is just where it is. That really *would* call for a supernatural explanation.

So we have two problems: why powers fit together as they do, and what makes it impossible for them to fail to do so. Although there are non-supernatural answers available, all of them either fail to solve these problems, or are enormously implausible, or both. The only way out, I shall argue, is to reject intrinsicality and so opt for the Boylean, not the Aristotelian, picture of powers.

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[27] 2010, 87, 89.

4. Power holism

The little souls objection points out the unappealing consequence of traditional powers ontologies: somehow, each power must have within it the means of pointing to all its possible manifestations. Whether powers so construed require us to be panpsychists is a side issue, or so I've argued. The real problem is that there's no way to stock each power with all the information it needs in order to behave appropriately.

The problem of fit is at bottom just the same problem, applied to pairs or n-tuples of powers rather than a power on its own. If we accept the presuppositions, we are, I think, stuck with a dramatically implausible conception of powers: what Williams calls 'power holism.' Here is Williams's statement of power holism:

> In order to provide the fit of powers, we must set up the powers so that they always
> match. How can this be done? One way is to cram all the information about every
> other property into the power, thereby 'building' powers according to a plan – a
> plan that includes what kind of manifestation would result from each and every
> possible set of reciprocal partners…[E]ach property contains within it a blueprint
> for the entire universe.[28]

Given our assumptions, the only way to account for fit is to attribute to powers not just a directedness at some vaguely specified states of affairs but a full-blown and fully detailed recipe for every situation in which it might find itself. Fire doesn't *just* have the power to burn anything

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[28] Williams 2010, 95.

combustible; that is a superficial description of the power. Writing out the full specification of a power isn't even possible, since it has to include how it is to behave in the presence of every other possible power, whether that power is ever instantiated in its environment or not. Similarly, every other power has to include a description of how that power is to behave in the presence of the power(s) of fire.

Far from being unique to Williams, holism might be the default view among powers theorists. As Williams points out, Mumford seems committed to something like the view: for Mumford, '[t]he properties that are real in a world must...form an interconnected web.'[29] In the work of other writers, it sometimes seems as if the problem of fit is being used to motivate holism, lurking just beneath the surface. When John Bigelow, Brian Ellis, and Caroline Lierse argue that all laws of nature are due to the world's falling into the natural kind that it does, they do so partly because 'it is implausible that [the natures of the fundamental particles] should turn out to be independent of each other.'[30] Surely one possible reason for thinking such independence implausible is the problem of fit.

We'll return in a moment to power holism. First we should note that, even if it were defensible, it would not be a complete solution to the problem of fit. For the second question asks, in virtue of what do powers *necessarily* fit? It's not enough to say that each power is stocked with the appropriate information. There has to be some further reason why the powers that fit are the only ones that can get instantiated.

Williams opts for monism. Powers must fit together 'in virtue of their all being properties of the same particular.'[31] The power to burn and the power to be burned are not properties had by

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[29] Mumford (2004, 182).
[30] Bigelow, Ellis, and Lierse (2004, 158).
[31] 2010, 100.

discrete objects. If they were, it would be a mystery why they were instantiated in the same world. Instead, there is only a single object – the 'blobject' – that instantiates the whole set of properties, powers among them.

For my part, I cannot see how monism helps with this second question.[32] Why should being possessed by a single object explain the necessity of fit? Well, it might be the case that, if the powers did not fit, it would be impossible for them to be co-instantiated. That sounds right. But remember that the goal is to explain *why* it is impossible for non-cohering powers to occur in the same world. The explanation cannot merely be that they then would be conflicting powers had by the same object. For if it isn't impossible for such powers to be instantiated in the same world, then neither should it be impossible for them to be instantiated in the same object.

Here it is vital to keep in mind that, on the present view, the existence of conflicting powers is not prohibited by logical necessity. Given intrinsicality, there is no logical contradiction in a world that contains fire (with the power to burn paper) and paper (with the power to turn into a chicken on encountering fire).[33] That assumption is precisely what opens up the necessity gap: in virtue of what is such a state of affairs impossible? That gap cannot be closed by appealing to monism. More carefully: monism closes the gap only if one already assumes that conflicting powers cannot co-exist in the same object. But there is no reason to think that, apart from the idea that such powers cannot populate the same possible world. And that idea is exactly what stood in

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[32] I owe this point to Will Harris.

[33] It's not obvious how power holism purports to be consistent with intrinsicality. It seems that the holist has to deny that any monadic duplicate is going to be a dispositional duplicate. Here's one way around the problem: suppose that monism were indeed capable of securing the necessary agreement of the powers. Then there would be no possible world that duplicated an object from our world, for example, and yet failed to duplicate all of the powers instantiated in our world, on pain of violating the necessity of reciprocity. So intrinsicality follows in the wake of the necessity of reciprocity, simply because you cannot duplicate one object with its powers without duplicating all of the powers in a world. Monism would then be the inevitable consequence of holism, not an optional add-on.

need of justification. Monism does nothing to get us the necessity of the fit. The most pressing question, however, is the first: how is fit to be accomplished in the first place?

So we should set aside the question of necessity and simply ask how power holism achieves fit and at what cost. As Mumford and Williams recognize, holism entails that if any one power were different, every other power would be different, too.[34] This is a well-known problem for semantic holism, and it seems no more palatable in this context. Even prima facie unrelated powers are linked in a highly improbable fashion. Suppose Earth in world w1 contains water, with the power to dissolve salt. Earth in w2 is exactly like Earth in w1 - it has salt, water, and so on - but w2 also has, in some unimaginably distant region of space, a single x-particle, with its own powers not instantiated anywhere in w1. Does w2 instantiate the power to dissolve salt? The holist has to say no. But this seems a very high price to pay. For salt, water, and everything else is just as it is on earth and throughout the Milky Way.

The powers theorist can of course say that water in w2 still has *some* power or other, among whose possible manifestations is the dissolving of salt. But whatever that power is, it is not the very same power that is instantiated in our world. There must be, in the space of possibilia, an infinite number of waters, each with its own distinct power-to-dissolve-salt, since all you have to do to generate new power is vary one other power, not matter how distant in time or space, no matter how causally isolated.

Williams isn't exaggerating when he says that every power has to contain 'a blueprint for the entire universe.'[35] In this sense, powers are like Leibnizian monads: each one goes its own way under its own steam, and yet each one unfolds in accordance with all the others. Leibniz can tolerate this miracle because he has God in the picture to set up this pre-established harmony. Such

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[34] 2004, 215-6.
[35] 2010, 95.

an explanation for the fit of powers would be absurd, at least in the present context. And we have already seem that monism is no help in explaining this harmony: the same question arises whether the powers that be are instantiated in one object or many.

The comparison with semantic holism, which Williams himself draws, helps reveal other problems. It's natural to think that the meaning of a sentence is a function of the words that make it up (and what order they're in). The semantic holist cannot agree: on her view, no word has meaning in isolation. The same problem afflicts the powers holist: no power has a fixed nature apart from its co-instantiation with all other powers. How, then, are powers getting individuated? Power P's nature depends on those of powers Q and R, and so on, the buck always getting passed. That is at best unsatisfying and at worst question begging.

But the chief weakness in power holism is, at bottom, just the little souls objection all over again. In its spirit, we should ask how exactly all the 'information' Williams speaks of is going to get 'crammed' into each power. 'Information' is ambiguous. Sometimes information means symbols with semantic content, in the sense that those symbols exist in a context of a convention that imbues them with meaning. In this sense, the phone book does, but grass does not, contain information. Presumably that cannot be what is meant. In other contexts, 'information' can mean anything that *could* be interpreted by someone as evidence of something. In this sense, grass contains information about recent weather patterns, the moisture in the ground, and so on. But this kind of 'information' is everywhere: every state of affairs can be grounds for *some* kind of inference. So that cannot be quite is what meant either.

Finally, one might think that the information required is something like a computer program, a set of if-thens that tell the power what to do in every possible state of affairs. (That powers contain information in this sense is, presumably, a consequence of Mumford's functionalist

theory.) Programs in the literal sense require realizers: the 1's and 0's of your computer. Powers, however, are not themselves objects that admit of that sort of structure. So once again, we have failed to cash out the relevant sense of 'information.'

One needn't be Malebranche, and still less Hume, to wonder whether power holism is intelligible. Another way to approach the same problem is in terms of a dilemma. Either a power is identical with its categorical base or it isn't.[36] Suppose that for a glass to be fragile is just for its particles to be arranged thus-and-so, and with such and such bonds among them. If so, then there is simply no way to cram all the necessary information into the available sack. Alternatively, suppose that the power is not identical with its base. So construed, being a power is a primitive notion in just the way that being a categorical property is. But now I have even a still dimmer idea of what it could possibly mean to say that the power contains all the information it needs to behave itself appropriately.

5. Locks and keys

If power holism is the cure, one might be forgiven for wanting the disease back. Although the assumptions that drive the problem of fit are commonly accepted today, one of them was much disputed in the seventeenth century: intrinsicality. For Boyle and Locke, among others, the Scholastics' signal mistake was to treat powers as monadic properties of their bearers. I shall argue that this long-neglected path ought to be cleared of debris and followed.

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[36] In the latter class, I include views like those of Heil and Martin according to which categorical and dispositional qualities are different aspects of a single property. And of course pan-dispositionalists reject the demand for a categorical base at all, and so fall, trivially, into the class of views that do not identify a power with its base.

Before beginning, it is worth thinking about what *kind* of solution the problem calls for. To settle that, one needs to decide what kind of necessity mandates the fitness of powers. Williams treats it as a kind of metaphysical necessity and then looks to monism to ground it. Something, I think, has gone wrong right at the start. It ought to come out as analytically true that any world contains all and only powers that fit.

It is only the artificial division among powers that generates the problem in the first place. We are invited to think of *the power of flame to burn paper* and *the power of paper to be burned by flame* as distinct properties, intrinsic to the things that have them. And of course once one accepts this invitation, one has to explain why paper and fire instantiate just these and not any of the competing, incompatible powers we can think up. But surely at this stage one begins to suspect that there is something amiss with the problem. The distinction among these powers is an artificial one. Although it is perfectly fine to go on talking about *the* power to burn paper, what makes such statements true will not be an isolated property in the fire. Instead, it will be the whole complex of properties relevant to the event.

Making powers relational rather than intrinsic is a key step in the moderns' attempt to de-mystify them. Robert Boyle presents his case in terms of locks and keys:

> We may consider, then, that when Tubal Cain, or whoever else were the smith that invented *locks* and *keys*, had made his first lock…that was only a piece of iron contrived into such a shape; and when afterwards he made a key to that lock, that also in itself considered was nothing but a piece of iron of such a determinate figure. But in regard that these two pieces of iron might now be applied to one another after a certain manner…the lock and the key did each of them obtain a new

capacity; and it became a main part of the notion and description of a *lock* that it was capable of being made to lock or unlock by that other piece of iron we call a *key*, and it was looked upon as a peculiar faculty and power in the key that it was fitted to open and shut the lock: *and yet by these attributes there was not added any real or physical entity* either to the lock or to the key, each of them remaining indeed nothing but the same piece of iron, just so shaped as it was before (last emphasis mine).[37]

If powers were intrinsic to their owners, then each time a lock was made that could be opened by a given key, the key would acquire a new, intrinsic property. But that is a mistake: what has happened to the key is a mere Cambridge change. The proposition 'the key has a new power' is surely true; but what makes it true is not a change in the key.

 In fact, George Molnar unwittingly directs us back to Boyle's view in his very argument for intrinsicality.[38] Responding to Boyle's argument, Molnar points out that what we might call the congruence of the lock and key is 'a comparative. Comparatives are founded relations that supervene on the properties of the relata…these properties have to include some that are part of the nature of the key and the lock respectively, and are therefore intrinsic to their bearers.'[39] Molnar is of course right: the congruence of lock and key is a function of their intrinsic properties. Like internal resemblance – that is, resemblance in respect of intrinsic properties – congruence is a relation that one gets for free, as it were: fix the relevant properties of lock and key and congruence

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[37] 'The Origin of Forms and Qualities according to the Corpuscular Philosophy,' in Boyle (1991, 23).
[38] Molnar (2003, 103-5). At first Molnar seems to grant Boyle's point about locks and keys, and insists that Boyle's claim cannot be generalized. But two pages later he attacks Boyle's example on its own merits. I focus on that argument, since I cannot make out why Molnar thinks the claim cannot be generalized.
[39] 2003, 105.

will ride in their train. That does nothing to show that the key's power to open the lock *is intrinsic to the key*, and that is what's in question. If it turns out that the power is founded on intrinsic properties of both the lock and the key, Boyle's withers will remain unwrung, for that is exactly what he is claiming.

6. The positive view

The Boylean view claims that powers are not intrinsic to things that have them. 'The power to open locks of type-L' does not refer to a single property had by a given key, or even a given kind of key. It is at best a slightly misleading way of stating the facts of the case: this key, and others like it in relevant respects, are such that, when they are applied with sufficient force to this lock, and others like it in relevant respects, the lock is opened. It is no surprise that ordinary language has found ways to abbreviate this claim. But those linguistic shortcuts can't change the facts of the case.

The best way to develop this view is by considering objections. First, one might worry that it has Megaric consequences. Relations, after all, depend on the existence of the relata. So when all of the locks a given key fits are destroyed, the key loses its capacity to open these locks, even though it does not change in itself. The result is unappetizing: powers become 'mere Cambridge' properties, as Sydney Shoemaker puts it.[40]

But here it's vital to keep in mind that the power in question was never a power *of the key alone*. That's just what it means to deny intrinsicality. To be sure, if we insist on construing the power as belonging to the key alone, then the key gains and loses it depending on what locks there

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[40] See Shoemaker (1980, 123).

are. But that's not the view. The position claims that the power is a relation among all the relevant relata, however many there turn out to be. To make it the case that a power comes or goes, you have to alter or destroy at least one of the relata that make up the power relation. That's no more a mere Cambridge change than anything else. Consider an analogous worry: I can change the number of pages in a given book by ripping one or more of them out. The number of pages changes just in virtue of changing one of the pages, leaving the rest untouched. But the number of pages is not a mere Cambridge property for all that.

It remains the case, however, that an aggregate of relata can lose its congruence when one of those relata is destroyed. To take the sting out of this point, we have to deploy a distinction Shoemaker draws. He in effect distinguishes between powers as token-distinguished and as type-distinguished. What the key-lock aggregate loses when the lock is destroyed is the power P1 whose manifestation is the opening of lock 1 by key 1. That's the token version. By contrast, the type-identified power P2, defined as the power whose manifestation is the opening of locks of type-L by keys of type K, can still obtain in virtue of the relations in which those types stand. It's just this type/token confusion that allows Locke to say that porphyry in the dark has no color, and Boyle to say that the key's capacity comes and goes.[41]

Second, one might worry that the view invites a regress. If a power is a relation among, say, two objects or properties, in virtue of what does that relation obtain? Must there not be some further relation to guarantee the presence of this one? But as will already be clear, the regress has to assume that the relation in question is external. The Boylean view ought instead to maintain that powers are internal relations: they obtain, if and when they do, in virtue of the intrinsic properties

[41] See *Essay* II.viii.19: 139.

of the relata. What secures the presence of the relation is not some further relation but the properties of the things related.

This response invites a third objection: what exactly are the relata? They cannot themselves be powers, on pain of regress. But if they are not powers, they are, by definition, not capable of making a causal contribution to events. In short, we seem to have arrived at a view of powers that, paradoxically, deprives them of their 'oomph' (to use the technical term).

I think this objection begs the question against the relational view. Note that it has to assume without argument that anything that is not a power is causally irrelevant. There are general grounds to challenge this: as Brian Ellis has argued, spatiotemporal location clearly seems relevant to the exercise of powers but is not itself a power.[42] But we don't need anything as sophisticated as that. On the present view, the power just is the relation: it is not reducible to any *one* of its relata. So one cannot then complain that each relatum on its own is not itself powerful: that's just what the view claims.

But, the objector might insist, these relations are supposed to be internal. And internal relations are no addition to one's ontology. Compare internal resemblance: that *a* and *b* are similar in respect F just amounts to F*a* and F*b*. Whatever the relata turn out to be, the relation, and hence the power, will be nothing over and above them. To my ears, this objection sounds like a compliment, for it is this feature of the relational view that promises to remove the air of mystery.

Here a further clarification is in order. I have been talking as if the only intrinsic properties necessary for a power's exercise belong to the objects locally present when the event takes place. This is clearly false. At a minimum, some of those properties themselves will owe their existence to the exercise of other powers. (Gravity is a case in point.) As Locke puts it, 'Things, however

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[42] See Ellis (2010).

absolute and entire they seem in themselves, are but Retainers to other parts of Nature.'[43] Is the true subject of all power attributions, then, a single thing, namely, the world as a whole?[44]

To my ear, this question asks for a decision rather than a discovery. If the dependence of some causally relevant property P on the exercise of some further power P' is enough to make one want to count P' as one of the truthmakers for propositions about P, that's perfectly fine. If one instead wants to count only the locally relevant properties (as defined by whatever scientific theory one is currently deploying), that's fine, too. The decision is a pragmatic one.

What more can be said about the intrinsic properties that together will make up the power? Not much, I think. That seems to be where philosophy ends and science begins. A host of other questions obtrude themselves: are there powers at the macro level, the level at which Boyle and many other powers theorists work, that are not preserved at the micro level? If so, are those macro level powers deprived of their ontological credentials? Are the relata that need to be included in any complete statement of a power so complex as to make a recurrence of that very same power extremely unlikely? These are questions I hope others persuaded of the merits of the relational view will take up.[45]

7. Conclusion

By way of summing up, we can ask, how does the Boylean view help with the problem of fit and the little souls problem generally? Recall that the problem of fit presupposes that we are dealing with powers intrinsic to a single actor. Why does the power of fire to burn paper never run

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[43] Essay (IV.vi.11: 587).
[44] For a view of this kind, see Bigelow, Ellis and Lierse (2004).
[45] It isn't clear that the Boylean view is as rare as I have made out. John Heil (2012, 148) takes causings, if not causal powers, to be internal relations. And Mumford himself (2004, 197) claims that 'causal powers' are internal relations. But as I read him, Mumford thinks that causal powers themselves are relations among further 'powerful properties.'

across paper with the power to turn into a chicken when encountering fire? The Boylean view has a simple answer: there just is no such thing as *paper*'s having the power to be burned or to turn into a chicken. Nor does a flame have the power to burn anything. What powers there are, are internal relations among intrinsic properties of things (or, for all I know, regions of space). We have given up on the whole project of somehow stocking each individual power with 'information' about its co-instantiates. And we have, as a result, gotten rid of the last remaining thorn of the little souls argument.

If the above arguments have any force, they suggest that the attempt to revive powers in contemporary philosophy made a mistake when it tried to go 'back to Aristotle.' To do so is to leap over the early moderns and their formidable case against powers. If there has indeed been some progress in philosophy since Aristotle, the natural point to which we should return is the early modern period, just before Hume's anti-realism about causation became all but inescapable.

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