Active Powers and Passive Powers – Do Causal Interactions Require Both?

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Abstract

Many powers metaphysicians postulate both active and passive powers, understood as distinct kinds of intrinsic causal properties of objects. I argue that the category of passive power is superfluous. I also offer a diagnosis of how philosophers are misled to postulate passive powers.

Keywords Powers · Causation · Active · Passive · Dispositions

Philosophers working in the non-Humean powers metaphysical framework often postulate active and passive powers. They take both to be real (i.e. ontic, non-nominalistic), intrinsic causal properties or features of objects. And they generally regard an effect, such as an object undergoing a change, as an output of an interaction between active and passive powers inhering in distinct objects – a view of causation which arguably can be traced back at least to Aristotle. In *The Metaphysics*, Aristotle maintained that:

(i) the one potentiality¹ resides in the thing affected. For it is affected through containing a certain principle, and through its matter's containing a certain principle, such that different things are affected by different agents. For instance, an oily thing is inflammable and a thing with such-and-such a proclivity to subside is compressible and so on.

(ii) the other potentiality is in the agent. Examples are warmth and architecture, the one in the calorific agent, the other in the builder.

¹The Greek term *dynamis* is sometimes translated as power, sometimes as potentiality. In the modern literature alternative names for casual powers include “dispositional properties”, “capacities”, “tendencies”, “potencies”, and – in indeterministic contexts – “propensities” (see e.g. Bhaskar 1978/2008, Cartwright 1989, Ellis 2001 and Bird 2007).

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[...] whenever the potential active and the potentially affected items are associated in conditions propitious to the potentiality, the former must of necessity act and the latter must of necessity be affected. (*Metaphysics*, Book Theta, Chapter I, 1046a, and Chapter 5, 1048a, trans. Lawson-Tancred).

A similar view of causation is presented by Locke in the opening paragraphs of his chapter “Of Power” in *An Essay Concerning Human Understanding* (although later in the chapter he modifies his view on where the active powers reside, locating them in God and entities equipped with the faculty of volition, i.e. agents):

Thus we say, fire has a *power* to melt gold, *i.e.* to destroy the consistency of its sensible parts, and consequently its hardness, and make it fluid; and gold has a *power* to be melted: that the Sun has a *power* to blanch wax, and wax a *power* to be blanched by the Sun, whereby the yellowness is destroyed, and whiteness made to exist in its room. [...] Power thus considered, is twofold, viz. able to make, or able to receive any change: the one may be called active, and the other passive power. (Locke 1689/2004: 220, emphasis original)

Modern powers metaphysicians have taken over this dual view of causation pretty much wholesale, although they sometimes use alternative terminology. Thus, for example, Rom Harré and Edward H. Madden’s modern classic from 1975:

We shall generally use the term ‘liability’ for a ‘passive power’ [...] Even the most active things and materials have liabilities as well as powers. The analysis of the concept of liability has to be given in terms of possible behaviour and actual natures, like the above analysis of the concept of power. But now a thing’s or material’s liabilities are its dispositions to suffer change in virtue of its essential nature. The stimulus which produces the change to which something is liable is part of the extrinsic circumstances. [...] Many properties of substances are strictly speaking liabilities and not powers, though their analysans is formally alike; e.g. all those favourites like ‘solubility’, ‘inflammability’, ‘brittleness’, etc. (Harré and Madden 1975: 89)

Similarly, Brian Ellis (2001):

The real world is essentially active and interactive. It is not passive, as the old mechanists and the neo-mechanists of today believe. It is dynamic. And its dynamism stems from the existence of genuine causal powers in things, both active and passive. [...] For every passive causal power – the power to receive change, which is ever exercised by anything – there must be an active causal power – the power to make change, to which it is responding. (Ellis 2001: 109–110)

And Jonathan Lowe (2006):

We can truly say of any particular instance of aqua regia that it has the causal *power* to dissolve gold and every instance of gold that it has the causal *liability* to

be dissolved by aqua regia. (Lowe 2006: 160, emphasis original; see also pp. 129, 135)

In this paper, I want to raise the following issue: assuming for the sake of the argument that objects do have active powers – and possibly also categorical properties,² but this assumption is not necessary – why do we *also* have to endow them with passive powers, i.e. powers to be changed? What do the passive powers add once we have postulated the active ones that bring about change?

It seems to me that passive powers or liabilities are redundant entities that the powers metaphysicians can do without. Consider water-solubility. Once it is agreed that the water in the glass in front of me has an active casual power to dissolve the sugar cube just put in the glass, is it not idle to postulate an additional, passive causal power – water-solubility – inhering in the sugar cube? Why not simply say that the active power of the water is able to produce the manifestation effect *singly*?³

I expect the following response. The active power inhering in the water should obviously not be taken to be capable of manifesting itself *spontaneously* in the way that *being radioactive* manifests itself in a decaying atomic nucleus (cf. Lowe 2006: 160, Mumford and Anjum 2011: 35–36, 121, Marmodoro 2017: 68). The power in the water has to *react* or *respond* to something in the sugar cube when the water and the sugar cube are in contact: it has to “detect”, as it were, that it is time to get its job of disintegrating the sugar cube started.

Reasonable enough: it does seem plausible to assume that the active power has to respond to a feature of the sugar cube. But note that this feature can be neutrally described – as in fact is commonly done in the literature – as a “stimulus condition” (cf. Harré and Madden 1975: 88, Bhaskar 1978/2008: 231, Mumford 1998: 6, Ellis 2001: 137, Molnar 2003: 84, and Bird 2007: 19). I see no reason to insist that the stimulus condition in this context is a passive power or liability. For example, if we already accept categorical properties, it seems we are perfectly free to hold that the active power of the water responds to a categorical property of the sugar cube. Although itself intrinsically causally inert, a categorical property can nevertheless be causally *relevant* – i.e. a causal difference maker – by being an entity to which active powers react (cf. Ellis 2001: 137–138, Molnar 2003: 166–167, Hansson Wahlberg [forthcoming](#)). Again, if we reject categorical properties – perhaps as pan-dispositionalists holding that *all* properties are powers or dispositional properties, even *prima facie* categorical ones, such as shapes and structural properties (see e.g. Mellor 1974) – we can explain that the active power of the water responds to some active power of the sugar cube which is inherently directed towards possible manifestation effects *other* than the cube dissolving in water. A third possibility would be that the active power of the water is triggered by an active power of the sugar cube whose job (whose characteristic manifestation effect) precisely is to activate the power of the water – something a *passive* power

² Categorical properties are properties that have their causal abilities (if any) *imposed* on them – for example, by contingent laws of nature. They are so-called quiddities: properties whose identity is not tied to what they can do. Powers, on the other hand, are supposed to *be* certain causal abilities. See Armstrong (1997, Ch. 5), Mumford (2004, Ch. 6), and Bird (2007, Ch. 1) for discussion of the contrast.

³ Such a theory would in fact be in line with Aristotle’s discussion of the third (kind of) cause, i.e. efficient cause, where an emphasis is put on the *external* source of change (see *Physics* Book II, Ch. 3, and *Metaphysics*, Book Delta, Ch. 2).

obviously could not do, on pain of becoming an active power. On this last view, the active power of the water does not really itself *react* to some property of the sugar cube; it is *activated* by an active power of the sugar cube.⁴

It is not clear, then, that passive powers are needed in a powers metaphysics. The postulation of a distinct kind of power in addition to the active ones seems unnecessary and hence uneconomical.⁵

An anonymous reviewer for *Philosophia* proposes that passive powers might be needed to account for why distinct kinds of objects change in different ways when encountering an active power which is, in some sense, already “activated”: “Water will dissolve a sugar cube, but it will not dissolve a dice. Why is that? Is it because the dice lacks the power to trigger the dissolving powers of the water, or because it lacks the ability to be affected by the water, or possesses a power to resist the active power of the water?” The reviewer maintains that the relevant active power of water is “arguably always ‘activated’” (although not *by* something)⁶; and the reviewer goes on to suggest that a defender of passive powers will hold that a die (made of plastic, say) lacks a corresponding passive power to be affected by the active power of water (or to be affected to such a high degree that it dissolves), although sugar cubes instantiate such passive powers, and that it is this asymmetry of instantiation of passive power which explains why a sugar cube but not a plastic die dissolves in water.

⁴ However, this idea suggests a regress of activating powers: for it seems we should then need to postulate an active power of the water whose job it is to activate the activating power of the sugar cube, whose job is to activate the power of the water to dissolve sugar cubes... and so on. To avoid such an activation regress, I suppose it is better to stick to the two alternatives mentioned above: that the active power of the water itself reacts to (acts upon “detecting”) some categorical property or active power of the sugar cube. Of course, one may worry about exactly *how* an active power “detects” a categorical property or an active power. What is the relevant mechanism here? This issue, however, does not arise only in connection with the proposal at issue; it is a *general* difficulty afflicting the powers metaphysics as such. How does an active power “detect” a putative passive power? How does a passive power “detect” an active power? How do interacting or co-acting powers – discussed in the paper below – detect each other? (They can hardly be said to have little sense organs, but do they have higher-order detection powers? If yes, how do *they* work?) Moreover, how do powers “act” upon the relevant detections? What are the cogs and wheels, so to speak, in the powers that take them from detection to action? Modern powers theorists are generally silent on these issues, taking the notion of a power as primitive and simply postulating that they can, somehow, do the job. For illustrative examples, consider the discussion of “mutual manifestation partners” in Mumford and Anjum (2011, Ch. 2); and Marmodoro’s recent account of “interacting” active and passive powers: “The power fulfilling the active causal role is activated, while the power fulfilling the passive causal role is activated [...]. There is no exchange between them, no transmission of anything, and no relation bridging the two” (2017: 70).

⁵ Clarification: The claim is that the postulation of active and passive powers would be *qualitatively* uneconomical because it would involve the postulation of a redundant *kind* of property: passive power in addition to active power (alternatively, in addition to active power and categorical property). Possibly, it would also be *quantitatively* uneconomical: this would be the case if it involves the postulation of additional property *instances* compared with an ontology consisting of only active powers (or of active powers and categorical properties). However, since it is unclear how to count property instances, I shall not press the latter objection. For the quantitative/qualitative parsimony distinction, see Lewis (1973: 87).

⁶ The idea is that the relevant power consists in polarisation of water molecules. I note, however, that such a micro-account of the macro-power arguably renders the macro-power causally redundant (cf. the much-discussed exclusion problem, e.g. Kim 2005, Merricks 2001, Bird 2008), so that the putative macro-power turns out to be a mere “abundant property” expressed by a dispositional predicate (see below for further discussion of the distinction between abundant and sparse properties). In this part of the paper, I assume for the sake of the argument that there really are irreducible, causally non-redundant macro-powers, for the purpose of illustrating the general problem (elsewhere I express scepticism of macro-powers, see e.g. Hansson Wahlberg forthcoming). The same kind of issue regarding the role of active and passive powers will simply reappear if we descend to some lower level of reality and consider properties such as being charged.

Response: the different effects of the relevant active power of water can be explained without invoking passive powers, even if the active power is in some sense always activated and one wants to avoid postulating the suggested resistance or counteracting powers (these latter powers seem in any case to form a special class of active powers). The relevant active power of water might simply be a power to dissolve-sugar-cubes-but-not-plastic-dice: that is, one and the same kind of active power might manifest itself differently (or even fail to manifest itself) in the presence of various kinds of categorical properties or active powers (i.e., in the presence of what are normally called various stimulus conditions).⁷ This manifestation profile could very well be built into the active power itself, so that the ability to dissolve-sugar-cubes-but-not-plastic-dice is truly intrinsic to water.

At this point I anticipate the following objections. Although stimulus conditions have been allowed to enter the picture in the form of categorical properties or active powers, the view canvassed above seems to involve an uneven-handed causal process in which the active power of the water is doing all the causal work of dissolving the sugar cube. We do not want to give up the idea that causation involves *interaction*, in some variety or another, between distinct objects with powers.⁸ Moreover, a completely uni-directional view would seem to be in conflict with Newton's third law of motion, which states that:

To every action there is always opposed an equal reaction: or the mutual actions of two bodies upon each other are always equal, and directed to contrary parts. (Newton 1687/1995: 19; cf. Aristotle, *Physics*, Book III, Ch. 1, 201^a19)

Two responses: first, the “reaction” in the third law does not refer to an activity of a passive power, but rather to an activity of same kind as the first “action”, occurring simultaneously with the first but oppositely directed. Newton is discussing physical *forces*, and, needless to say, he does not distinguish between active and passive forces. Thus, in a collision between two objects, there is no basis for saying that one object is active and the other passive: *both* objects experience an “active” force of a certain magnitude, although the relevant forces on the objects are oppositely directed (see Hansson Wahlberg 2017 for further discussion). (See also Bunge (1959/2009: 170–171) who argues that the third law entails that the “polarization of interacting objects into agents and patients is ontologically inadequate”; and Ingthorsson (2002: 99) who claims that “the existence of a reaction [...] shows that there are no strictly passive substances”. It should be noted, though, that Bunge and Ingthorsson are not explicitly arguing against the existence of passive powers (and forces). Rather, they are claiming that the third law entails that there are no passive *substances* or *objects*, i.e. objects which do not *act back*, a claim which as such does not rule out that there are passive powers (see below).)

Secondly, the account I have suggested above can easily be modified so that interactions and even co-actions – i.e. *joint* actions – are allowed. I will focus on joint

⁷ Powers with highly complex manifestation profiles are often called “multi-track”, a notion which can be traced back to Ryle (1949/2002: 43–44).

⁸ For relevant discussion, see e.g. Williams (2010), Mumford and Anjum (2011, Ch. 2), Heil (2012: 118), and Marmodoro (2017).

action, which is, I think, what many powers metaphysicians are fundamentally interested in.

(Thus, strictly speaking, I think one should distinguish between *genuine* or *strict* interactions between entities (such as those referred to in Newton's third law), which involve *distinct effects* in the distinct entities, and entities *co-acting* or *acting jointly* to produce a certain effect, for example in one of the entities, or in some additional entity (cf. classical vector addition). This distinction is not always clearly made in the relevant literature: both phenomena are referred to under the term "interaction". Marmodoro, for example, says "All there is to their 'interaction' is their mutual and simultaneous manifestation (e.g. heating and being heated)" (2017: 70), referring to the *joint action* of an active and a passive power. In principle, causal encounters may involve both strict interactions and co-actions simultaneously. For example, an individual action or reaction within a strict interaction may consist of a co-action: and traditional Aristotelians are likely to regard such a co-action (making up an action or a reaction within a strict interaction) as the joint work of an active and a passive power inhering in the distinct, interacting entities. I claim, however, that (alleged) co-actions are better understood (irrespective of whether or not they occur within strict interactions) if they are taken to be joint actions of only *active* powers. Below, I focus on co-actions as such, leaving the complication of strict interactions to one side. But as I say, strict interactions can be added to the story. (For further discussion of strict interactions, see Bunge (1959/2009:114, 149–150) and Ingthorsson (2002).))

Return to the sugar cube in the glass of water. I suggested that powers theorists could postulate an active power inhering in the cube – directed towards manifestation effects other than the cube dissolving in water – to which the sugar-disintegrating power in the water reacts. The powers theorists could modify this suggestion and maintain that there is an active power in the sugar cube with which the power in the water "joins forces" so that they *jointly*, actively, cause the cube to dissolve (Williams 2010 argues for a view along these lines). In this eventuality we have (at least) two active powers, one inhering in the water and one in the sugar, working in tandem.⁹ Moreover, to avoid systematic over-determination (see Hansson Wahlberg 2006 for worries about over-determined manifestation effects), it might be proposed (somewhat ad hoc-ly) that the relevant powers are perfectly fine-tuned: each active power contributes with just enough causal *oomph* for their joint effect to happen (absent intervening factors) – there is no excessive oomph involved.¹⁰

Perhaps something like this view is in fact all that is intended by powers theorists ostensibly postulating active and passive powers. Perhaps they merely wanted to say that *ontologically speaking* there is only one kind, or category, of power: active causal power, i.e. power to bring about change. In a causal encounter, active causal powers of the objects involved come together in such a way that they cooperate to produce the

⁹ However, it then becomes problematic to say that the ability to dissolve sugar-cubes is (fully) intrinsic to water. Arguably, though, it is still true to say that the ability (understood as a mere, abundant disposition) *involves* – or an ascription of it is *partly made true by* – an intrinsic causal power of water. See Hansson Wahlberg (2006) for related discussion. See also below.

¹⁰ The putative joint action of a passive power and an active power might also involve causal over-determination of the manifestation effect (e.g., the dissolving of a sugar cube). That depends on what exactly the positive causal contribution of passive powers (i.e. powers to *be* changed) is supposed to be – an issue that typically is not explicitly addressed in the literature.

manifestation effect. Linguistically, and conventionally, we *call* those active causal powers that happen to be situated in the object that undergoes intrinsic change (or the most intrinsic change) “passive powers” or “liabilities” (cf. the discussion of the active/passive distinction in Mill 1843/2012: 406–409).

The problem with this interpretation is that it relies on *qualifications and clarifications that are not explicitly laid down by powers theorists*.¹¹ Worse still, most powers theorists represent themselves, explicitly or implicitly, as engaging in metaphysical and ontological issues: taken at face value, they are presenting a *substantive ontological distinction* between different kinds of powers. (Aristotle, for example, states in the *Categories*, Ch. iv and Ch. ix, that the active and the passive belong to distinct categories of being.¹²) If this is not what they are doing, I would say that the value of the present paper is that it explicates what is really going on behind the confusing terminology.

In the remainder of the paper I will assume that the relevant powers theorists have indeed been attempting to make a genuine ontological distinction and speculate as to why they (or some of them) were drawn to the idea that there are both active and passive powers. My main suggestion is that there has been a failure to keep ontological and semantic-grammatical issues apart: powers theorists have been misled in their metaphysical theorizing by linguistic characteristics of power/disposition ascriptions.¹³

If power and disposition ascriptions in ordinary language express mere conditionals of the following form,

*if such and such were to happen, then such and such would happen,*¹⁴

¹¹ An exception here might be Marmodoro (2017). After a long ontological discussion of active and passive powers, she clarifies that “active and passive powers are not by nature such” and that “powers ‘take on’ active or passive role when engaged in a causal interaction” (2017: 74). She also says: “A power is a doer when it is described as doing something on something else; and a sufferer when it is described as suffering the causal activity of another power” (ibid.). Hence, whether a power is active or passive depends on extrinsic circumstances: on the functional role the power “takes on”, how the power is described. In the end, such a view does not, I think, involve a postulation of distinct kinds or categories of power.

¹² A caveat: Cooke (1938: 2) maintains that one should read the *Categories* as being primarily about classifications of linguistic entities (although it is often read as being fundamentally about ontic categories, see e.g. Lowe 2002: 13–14, 2006: 5, Loux 2006: 11–12). On the linguistic reading, Aristotle is merely saying that there are active and passive *predicates*. If that is indeed all he is saying (in spite of what he says elsewhere, for example, in *The Metaphysics*), then I have no qualms; see below for further discussion. See also Martin (2008: 48), Mumford and Anjum (2011:34–38), and Cartwright and Pemberton (2013:98) for formulations, within the context of ontological discussions, which appear on their face to involve the postulation of distinct kinds of powers, active and passive. See also the statements quoted in the introductory section of this paper.

¹³ Ingthorsson (2002: 107–109) seeks to account for the agent/patient distinction (as applied to objects) in terms of human agency and our own anthropocentric explanatory interests. See also Bunge (1959/2009: 150–153).

¹⁴ This is the classical conditional analysis of such ascriptions. It can be found in Ryle (1949/2002: 43, 123), Mackie (1973: 126–128) and Lewis (1973: 38). It is often assumed that the conditional analysis has been refuted by putative counterexamples involving finks, masks and antidotes (e.g. Martin 1994; Bird 1998). I think this is an overreaction. If we take the relevant conditionals to be implicitly or tacitly qualified by some *ceteris paribus*, in ideal conditions, or absent-finks-masks-or antidotes clause, I think these counterexamples can be handled (see Hansson Wahlberg 2006, forthcoming). Moreover, the conditional analysis has virtues that the powers semantics lacks. For one thing, the conditional analysis can explain (as per above) why people have been inclined to postulate active and passive powers in pairwise groups (for other virtues, see Hansson Wahlberg forthcoming).

then we have a straightforward explanation of why we (philosophers included) are inclined to say things such as:

If the Sun has a power to blanch wax then wax has a power to be blanched by the Sun.

On a conditional analysis of power ascriptions, such conditionals come out as *necessary* – because *analytic* – truths: the antecedent and the consequent simply express the same conditional, and thus they have the same truth condition. (By contrast, on a non-reductive powers-semantics, the consequent is *not* analytically entailed by the antecedent. On such a semantics, to say that the Sun has a power to blanch wax and to say that wax has a power to be blanched by the Sun is to say distinct things, involving distinct powers inhering in distinct objects. The antecedent may be true although the consequent is not, and vice versa.)

Consider the conditional stated above (adapted from Locke). On a conditional analysis of power ascriptions, its antecedent, “the Sun has a power to blanch wax”, would be analysed along the following lines:

if the Sun were to shine on some wax, the wax would change colour (from being yellow to being white)

As would its consequent, “wax has a power to be blanched by the Sun”:

if the Sun were to shine on some wax, the wax would change colour (from being yellow to being white)

Thus, on a conditional analysis of power ascriptions, to say “If the Sun has a power to blanch wax then wax has a power to be blanched by the Sun” (or the converse) is to state a trivial tautology.

Note that a conditional analysis of ordinary power/disposition talk is compatible with there being powers in the ontic, technical sense. Ontic powers (intrinsic causal properties) can serve as *truth-makers* for such ascriptions – as can other phenomena. Thus, the truth-makers for such conditionals may be a variety of things: they may be events in possible worlds (Lewis 1973), categorical properties + laws of nature (Armstrong 1997), or ontic powers at the macro- or micro-level (Ellis 2001; Lowe 2006; Chakravarty 2007; Heil 2012; Hansson Wahlberg forthcoming). I do not think ordinary language is committed to any of these, but it is compatible with all of them. Thus, I do not think the conditional analysis is a threat to ontic powers, in opposition to what is sometimes assumed in the literature. It is simply an analysis of ordinary power/disposition-talk. We must therefore distinguish carefully between powers or dispositional properties as they are understood in the ontic, technical sense (so-called *sparse* properties) and powers or dispositions as they are understood in the loose ordinary language sense merely importing true dispositional predications (expressing so-called *abundant* “properties” – in this case: conditional relationships).¹⁵

¹⁵ Compare Lewis (1986: 59–60), Ellis (2001: 127), Bird (2007, Ch. 2.1).

Now, a philosopher who believes in powers in the ontic sense, but who does not always self-consciously distinguish between powers in the sparse and abundant senses (i.e. who tends to oscillate between a technical and an ordinary language understanding of powers), may be led to postulate active and passive ontic powers as a consequence. How? Well, *prima facie* abundant powers come in pairs – an active power and a passive power – because, grammatically, they can be expressed using the active or the passive voice (switching the grammatical subject for the grammatical object: the Sun has a power to blanch wax, and wax has a power to be blanched by the Sun). But as we saw above, on the conditional analysis, the active and passive versions are merely different linguistic formulations of the same underlying conditional – *a fact which explains why the active and passive (abundant) powers always seem to go together*.¹⁶ Sparse/ontic powers, as I have argued, should *not* be assumed to come in active/passive pairs: such an assumption would be qualitatively uneconomical and involve an unclear ontology. But, if one does not always clearly uphold the distinction between sparse and abundant powers, one may be led to conclude – especially if one tends to rely, when doing metaphysics, on common-sense intuitions and on what sounds right to say – that powers in general (sparse powers included) come in active/passive pairs.

The extent to which this diagnosis applies to the powers metaphysicians referred to in this paper I will have to leave to specialist scholars to judge. My aim here has been merely to describe a semantics and a process of thought which could (mis)lead philosophers with certain interests and methodological inclinations to postulate passive powers.

Let me conclude the paper by addressing the following concern about my line of reasoning: Would not an ontology containing only passive (sparse) powers be as qualitatively economical as an ontology consisting of only active powers? Yes, it would, but it would seem that a world of only passive powers or “liabilities” would be one in which nothing happens (apart, perhaps, from the continuation of inertial motions): nothing would be *doing* or *changing* anything. Such an ontology would be incompatible with how the world appears to us and explanatorily useless. I have simply assumed in this paper that *this* kind of sparse ontology would not be seriously entertained by anyone, certainly not by someone with anti-Humean inclinations.

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¹⁶ Incidentally, this kind of analysis could help to make some sense of Aristotle's interesting but puzzling occasional remarks about active and passive potentialities being – in spite of what he says elsewhere – *one and the same* potentiality, although I do not claim that the analysis is in fact what he is after. See *Physics* Book III, Ch. 3, and *The Metaphysics*, Book Theta, Ch. 1.

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