# Is There a Metaphysically Robust Distinction Between Natural and Artificial Dispositions?

Joaquim Giannotti

*Universidad de Chile*

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*Abstract.* Dispositions abound in our world. Intuitively, some of them are natural. Fragile objects are disposed to shatter if struck. Electrons are disposed to repel each other. Crimson surfaces are disposed to reflect light at a specific range of wavelength. Again intuitively, some other dispositions are artificial. Visual recognition systems are disposed to identify individuals when target facial traits are detected. Aircraft autopilot systems are disposed to regulate altitude and cruise speed. Predictive text technologies are disposed to output the correct word we might type next. Is there a metaphysically robust distinction between natural and artificial dispositions? This chapter argues that there is not. Drawing on the metaphysics literature of powers, I discuss eight plausible candidate features that might ground a substantive distinction between these kinds of dispositions. I offer reasons for thinking that they all fail or are otherwise wanting. A positive conclusion emerges: if natural dispositions are real properties, so are artificial dispositions.

## 1. Introduction

The term “disposition” is meant to capture the causal powers or capacities of things—namely, what such things could do in various possible circumstances (e.g., Heil 2005). The distinctive trait of dispositions is that they are manifested in characteristic situations. A fragile vase, for

example, is typically disposed to shatter when struck. The shattering of the vase is the manifestation of this disposition.

It seems that dispositions abound in our world. Electrons are disposed to repel negatively charged particles. Sugar cubes are disposed to dissolve in water. Massive objects tend to exert an attractive force on each other. The list might continue. At least intuitively, these examples involve *natural* dispositions. But again intuitively, our world is seemingly populated by *artificial* dispositions as well. Keys have the capacity to unlock specific doors. Facial recognition devices are disposed to identify target faces. Heaters equipped with a temperature controller have the power to change their output when they detect a set temperature.

If we concede that there is an intuitive difference between natural and artificial dispositions, and if we believe that objects owe their dispositional character to their properties (e.g., Bird 2007), two philosophical questions arise.

*The Ontological Question*: Are artificial dispositions genuine properties?[1]
*The Metaphysical Question:* Is there a metaphysically robust distinction between natural and artificial dispositions?

This chapter aims to defend a negative answer to the *Metaphysical Question*. I shall argue that we possess good reasons for rejecting a metaphysically robust distinction between the two kinds of dispositions. I will contend that, if sound, this claim supports a positive answer to the *Ontological Question*. To make my case, I shall discuss eight plausible candidate features, drawing from the metaphysics literature on powers, that could ground a robust distinction between natural and artificial dispositions. For the purpose of aiding the assessment of the arguments put forward in this chapter, I will separate them between "internal" and "external" criteria. We can remain agnostic on whether *this* division tracks a substantive metaphysical

difference. Concerns about its depth or robustness will not undermine the following discussion. The internal criteria are: intrinsicality, reciprocity, actuality, multi-trackability, and self-directedness. I call these "internal" because they concern features of powers usually taken to be constitutive of them. The external criteria are fundamentality, ungroundedness, and modality. I call these "external" because they concern putative distinguishing features that concerns the relationship of powers to other non-powerful properties. After illustrating them, I will argue that the internal criteria fail to establish a metaphysically substantive distinction between natural and artificial dispositions. The external criteria are initially more promising, but they remain—I will conclude—wanting.

The structure is straightforward and goes like this. In the remainder of this section, I offer brief clarification on how I understand the two *Questions* and elucidate the notion of a natural disposition. In section 2, I discuss the internal criteria after presenting them in turn. In section 3, I do the same but for the external criteria. In section 4, I return to the *Ontological Question*, linking it to the considerations against a robust metaphysical distinction between natural and artificial dispositions in the preceding sections.

### 1.2 Clarifications

Before diving into the discussion of the internal criteria, I must elucidate the *Ontological* and the *Metaphysical Question* since both are amenable to various interpretations. Starting from the *Ontological Question*, I rely on an intuitive understanding of what a genuine property is. What motivates this approach is the desire to render the upcoming discussion of interests for philosophers with different meta-ontological inclinations. Minimally, I take genuine properties to be real or ontic non-predicatory entities. They must make a difference to our theories of what is real, though I remain uncommitted whether we can explicate the relevant notion of reality in more basic terms (cf. Fine 2001).

Now, I turn to say something more about the *Metaphysical Question*. Unfortunately, I lack a complete theory of what makes a distinction metaphysically robust. However, the following remarks will suffice for the aims of this chapter. An entry-level formulation for a robust distinction between some *x* and *y* relative to some property F is this: if *x* is F and *y* is not F, the distinction between *x* and *y* is metaphysically robust just in case there is some difference between *x*'s and *y*'s nature or essence regarding F. For present purposes, we can leave it open why such a difference occurs. What matters is that the formulation intuitively captures the idea that a robust distinction is ultimately grounded in a difference concerning the nature of *x* and *y*. It seems to me that if the difference with respect to F were a matter of describing or conceptualizing *x* and *y* differently, this feature would not be demarcating a robust distinction between them.

My strategy to argue against a robust distinction between natural and artificial dispositions is to discuss features of the former, which plausibility I defend in due course, and show that they can be possessed by the latter. To this end, I need to tell you how I understand natural dispositions. In what follows, I will work under the assumption that natural dispositions are ontic properties often called "powers" (e.g., Bird 2007, 2016; Mumford 2004; Marmodoro 2017; McKitrick 2018; Taylor 2018; cf. Tugby 2021). These are genuine properties whose nature, and therefore identity, is exhaustively characterized by how they empower things that instantiate them. Typical examples of powers are properties such as *charge*, *mass*, and *spin*. C*harge* is, the powers theorist would say, the property which is wholly responsible for specific causal powers, such as the power to produce an electromagnetic force, objects instantiating it possess. And *charge* has such a powerful character because that is its nature. Unsurprisingly, there is in-house disagreement on how to conceive of powers. Since my aim is to persuade a general audience, I shall not fix on a specific account.[2]

The sense in which powers are natural is not equivalent to the claim that they are non-artificial. Instead, it is distinctively philosophical and follows the Lewisian notion of naturalness. According to Lewis, natural properties are elite:

'[…] sharing of them makes for qualitative similarity, they carve at the joints, they are intrinsic, they are highly specific, the sets of their instances are ipso fact not entirely miscellaneous, there are only just enough of them to characterize things completely and without redundancy' (Lewis 1986, p. 60).

Our world, Lewis says, is one where physics is in the business of compiling 'an inventory of the sparse properties of this-worldly things' (ibid). Powers are excellent candidates for being natural. Think again of the previous examples of physical properties. Along these lines, Yates takes the powers view to be a 'claim about the properties of (ideal, completed, fundamental) science' (2013: 93).

Taking natural dispositions (i.e., powers) to be "natural" in the Lewisian sense gives us a useful way to frame and appreciate the *Metaphysical Question*. In asking whether there is a metaphysically robust distinction between powers and artificial dispositions, we are wondering two related things. One is whether it is somehow possible that artificial dispositions are powers; the other is whether they are, at least to some degree, natural (more on this in a moment). The strategy in this chapter is to assume that powers are natural in the Lewisian sense. Then, it is to argue that if artificial dispositions are not metaphysically distinct from powers, we have reasons to grant them some degree of naturalness.

## 1.3 A Complaint

One reason for thinking of powers as natural properties in the Lewisian sense concerns an immediate complaint. One could protest that we have a ready-made and ordinary way of distinguishing between natural and artificial dispositions: the latter, but not the former, involve some form of agency or intelligent design. The notion of involvement can be refined in various manners. However, to accord with the discussion's setup, it should be related to the nature or essence of artificial dispositions. They ought to involve some form of agency or intelligent design by virtue of their own nature, whereas powers (i.e., natural dispositions) do not. One might think, for example, that the adaptive brightness of a mobile phone is essentially agency-involving. To put it bluntly, someone has to build such a disposition into the phone. By contrast, the objector would say, the elementary charge of an electron is not agency-involving. Under the adoption of this "ordinary criterion", one could think we have a straightforward metaphysical distinction between powers and artificial dispositions.

The ordinary criterion is neither unproblematic nor illuminating, however. For this reason, I wish to pursue a different approach. To start, it is unclear how to specify the relevant notion of agency or intelligent design. It is theoretically restrictive to grant the craft-making rights of artificial dispositions to humans only. But if we liberalize the notion of agency, the risk is to summon designers that may be involved in both natural and artificial dispositions, such as Gods or Demiurges or the like.

Even if the previous concerns could be addressed by specifying the relevant notion of agency-involvement, the ordinary criterion remains unilluminating. It does not facilitate progress in the philosophically interesting question of whether artificial dispositions can be natural in the Lewisian sense. Such a possibility is left open, for Lewisian naturalness comes in degree. For example, Schaffer (2004) distinguishes between two conceptions of sparse properties: fundamental and scientific. The former appear in our best physics and provide a minimal ontological basis. These are properties that Lewis would call 'perfectly natural' (1983).

The other kind of natural properties populate scientific disciplines more broadly. These are nonfundamental or imperfectly natural: they do not belong to a minimal ontological basis (cf. Lewis 1986, p. 60), but they do ground objective similarities and the causal powers of things. Take the artificial disposition of a fingerprint recognition system to unlock the display when the target friction ridges are detected. This artificial disposition is an obviously poor candidate for being a perfectly natural property. But it is not upfront gerrymandered either. For example, it is neither conjunctive nor structural nor negative. And it could serve to ground objective similarities among things, such as recognition systems. (Lewis claims that natural properties are intrinsic. Since this is one of the internal criteria, I will discuss it later.) The discussion of the *Metaphysical Question* under Lewisian lenses of naturalness is more fruitful. Not only does it escape the worry concerning the specification of agential involvement, but it also indirectly supports the view that artificial dispositions—if genuine properties—are plausible candidates for being imperfectly natural.

## 2. Internal Criteria

I now turn to discuss the internal criteria. These concern the 'internal structure' of powers, namely the way powers are by virtue of their own nature. The strategy is to identify some features that powers have and artificial dispositions lack, respectively, by their very design. Five internal criteria could serve this purpose: intrinsicality, actuality, reciprocity, multi-trackability, and self-directedness. These features are widely accepted to be essential qualifications of powers by their advocates. Thus, a difference between powers and artificial dispositions concerning some of these features would be a strong indicator of a metaphysical distinction between them. For example, Molnar (2003) list both intrinsicality and actuality among the constitutive features of powers. Reciprocity and multi-trackability are claimed to be the most appropriate ways of thinking about the manifestation of powers. And self-directedness,

as I will explain, has beeen explicitly defended for paradigmatic natural powers of biological organism.

The reader might wish to evaluate each of the criteria by considering whether it supports the soundness of the following argument.

1. Powers have feature F that artificial dispositions lack.
2. If powers and artificial dispositions differ with respect to F, then there is a metaphysically robust distinction between them.
3. Therefore, there is a metaphysically robust distinction between powers and artificial dispositions.

Despite the initial plausibility, I will argue that the internal criteria fail to ground a robust distinction between powers and artificial dispositions. That is, I will contend that we have reason to think that premise (1) is false for every candidate feature. Note, however, that my claim is not that the features under scrutiny are uncontroversial among power theorists. I will register the dissenting voices when appropriate. Yet, I will argue that even the proposed alternatives fail to establish the sought metaphysical distinction. A similar strategy will be employed for the external criterial. But let us proceed with order.

## 2.1 Intrinsicality

The first internal criterion is "intrinsicality". It is orthodoxy or something near enough that all or many powers are intrinsic properties. As Heil puts it discussing the view (2003, pp. 76 – 77):

Philosophers of many persuasions have been attracted to the thesis that properties are powers or dispositions. More precisely, the thesis is that intrinsic properties of concrete objects are

distinguished by distinctive contributions they make to powers or dispositionalities of their possessors.

We can formulate the intrinsicality claim in various ways. But the core idea, which can be strengthened if required, is that the possession of a power by an object *x* is independent from the existence or non-existence of objects that are wholly distinct from *x* (e.g., Molnar 2003: 102; say that a property is extrinsic iff it is not intrinsic). The strategy, then, would be to argue that powers are intrinsic, whereas artificial dispositions are not. And if this claim turns out to be correct, we have a suitable feature for demarcating a robust distinction between powers and artificial dispositions. But I shall explain below, intrinsicality is not a good internal criterion.

One might believe that artificial dispositions are not intrinsic because the truth of this claim is intuitively compelling. For example, consider a door equipped with a card-reader device for accessing the room. At least intuitively, the lock seems to possess the artificial disposition to unlock the door when a scanned card matches a card registered in the system's list of enrolled users. Suppose that your card has been registered in the system. The lock is therefore disposed to open the door when your card is detected. One could think that the lock, on its own, does not have the disposition to unlock the door when your card is read. Consider a perfect duplicate of the lock linked to a different list of activated cards that does not include yours. It would seem that this lock does not have the disposition to unlock the door (when your card is read). Likewise, a duplicate lock could be installed on a *different* door. In this case, the disposition is intuitively different though similar in type. Following the intuition of extrinsicality, we may believe that the possession of the disposition would require us to duplicate both the lock, the door, and the list of activated cards—standing in the appropriate relation to each other. Only under such circumstances, the lock would preserve the disposition to unlock the original door. Presumably, the advocate of the intrinsicality criterion for

demarcating a robust distinction would argue that many or all artificial dispositions are extrinsic in a structurally analogous way.

Although the above example (and, by extension, similar cases) might appear intuitively compelling, I challenge the suitability of the intrinsicality criterion on three counts.

First, we call into question the bearer of the target disposition. Arguably, the intuition of the extrinsicality of the artificial disposition has its source in the tacit assumption that the lock is its bearer. But one could argue that the lock is just a proper part of the card access system, which is the bearer of the disposition. It is the system as a whole, including the list of activated cards (among which there is yours) and the door, that possesses the disposition to unlock the door when your card is red. To generalize, it should not be surprising that duplicating a part of a whole does not preserve the target disposition if the latter is borne by the whole. Once we consider the whole system as the bearer, the artificial disposition may well turn out to be intrinsic as its possession depends on how the card access system is, independently from the existence or non-existence of other objects.

Second, even if we grant that the lock is the bearer of the disposition to unlock the door when your card is read, it is possible to resist the idea that its perfect duplicate lacks such a disposition. Someone could argue that a perfect duplicate of the lock should possess the disposition to unlock the door because it is an exact copy of one that does so. But a copy that fails to do so is arguably imperfect. The same strategy would generalize to other cases: we can dispute the alleged perfection of the duplicates in question. Here intuitions will clash inevitably. However, the burden to show that a perfect duplicate of the lock has different dispositions is on the shoulders of the defender of the idea that artificial dispositions are extrinsic.

Third, we can demur the claim that all or many powers are intrinsic. This tactic weakens the appeal to intrinsicality. Here I cannot reconstruct the discussion for reasons of spaces. However, the appreciation of the general strategy will suffice for the purposes of the discussion.

Some advocates of the powers view defended the thesis that some powers are extrinsic (for example, see McKitrick 2008, chapter 8 for an extensive discussion; see Bauer 2011 for a detailed discussion of *mass* as an extrinsic power). If they are right, the fact that *some* artificial dispositions are extrinsic does not support a robust distinction since some powers are extrinsic too. If we wish to establish a substantive difference, it should be shown that *all* artificial dispositions are either extrinsic or intrinsic. However, the difficulties raised by the example of the lock and its artificial disposition already undermine the plausibility of this approach.

### 2.2 Reciprocity

The next internal criterion is what I call "reciprocity". This label refers to an account of the manifestation of powers that goes under the name of the "mutual manifestation" (MM) model. This model, which I outline below, is claimed to be the most adequate framework for theorizing about the effects of powers, particularly physical ones, by philosophers of various stripes (e.g., Heil 2003; Martin 2008; Mumford and Anjum 2011; Marmodoro 2017; Williams 2019; Ingthorsson 2021). A comparison with the competing stimulus-manifestation (S-M) model will illustrate (e.g., Bird 2007; here I assume, for the sake of the argument, that these models are substantially distinct). On the S-M model, a power's manifestation is brought about when a bearer of the power is in the right circumstances for its manifestation. To avoid the collapse between the two models, we should concede that the matching of a partner power is not the sort of ontological item covered by the "right circumstances" in the S-M model. Instead, these circumstances are like stimuli or triggers that yield the manifestation of the power. For example, suppose that the production of an electric force is one of the manifestations of *charge*. On the S-M model, the production of an electric force is manifested when a charged object (namely, an object instantiating *charge*) is appropriately stimulated or triggered—for example, by the presence of another charged object.

Though they diverge on the fine details, advocates of the MM model argue that the S-M view is problematic on various counts. For instance, Mumford and Anjum (2011, pp. 107–112) raise various issues, which I left to the reader to assess, concerning a temporal gap between trigger and manifestation opens. And Ingthorsson (2021, chapters 3 & 4) argues at length for embracing the reciprocity of manifesting powers if we wish to articulate a scientifically-fitting account of causation. The MM model is thus presented as a more promising alternative. On this model, the manifestation of a power is not a matter of being stimulated or triggered by the right circumstances. Rather, it is the product of more powers operating in concert. There are various ways to spell out this claim. Here I do not wish to complicate this section unnecessarily. A toy example will suffice to convey the main idea. Consider the solubility of a salt cube in water, and suppose that solubility is a power. Proponents of the MM model would argue that the dissolving of the salt cube is not a manifestation triggered by, for example, the immersion of the cube in a glass of water. Rather, the dissolving of the salt cube is the dynamic product of various powers acting together, such as the solubility of the salt cube and the water's power to dissolve salt. These powers are reciprocal disposition partners: when they are matched, they mutually contribute to the production of a given outcome (Martin 2008: 48–51).

Let us return to powers and artificial dispositions. Reciprocity may offer an interesting internal criterion. The defender of a robust distinction between powers and artificial dispositions may argue that the manifestation of powers, but not that of artificial dispositions, involves reciprocal disposition partners. Underlying this idea is the thought that reciprocity is a feature of natural dispositions, not artificial.

This approach does not get us very far. Perhaps, the idea that artificial dispositions manifest in accordance with the S-M model, and not the MM one, has an intuitive grip. But as I will explain, this conception is mistaken. An example, which can be suitably generalized, will ilustrate. Think of a mobile phone's plausible artificial disposition to unlock its display when a

target face is recognized by the camera. One might feel that it is very natural to regard the unlocking of the display as the phone's response to being appropriately stimulated. The detection of the face would be the stimulus. One might find detecting the face as a trigger more plausible than the idea of someone's face possessing the power or disposition to unlock a phone's display. But these intuitions do not support the correctness of the S-M model for artificial dispositions.

An initial problem with the S-M model is as follows. The model appears to treat a necessary condition for the manifestation of the artificial disposition as its cause. It falsely suggests, in our example, that the detection of the target face is what causes the unlocking of the display. But this way of regarding the relationship between detection and unlocking strikes me as wrong. The detection of the target face is certainly necessary for the unlocking of the display. However, the manifestation of the latter requires the continued presence of the target face. For instance, if the phone's camera were to be obfuscated or the target face removed from its field, the display would not unlock. Someone could argue that the S-M model gains plausibility if we think that the stimulus is not just the mere detection of the face. Rather, we should consider it a specific temporal amount of uninterrupted face exposure. However, this very response suggests that the MM model is preferable since it acknowledges the reciprocal interaction of the target facial features and the facial recognition software of the phone.

On the MM model, the unlocking involves the mutual manifestation of the phone's artificial disposition and some reciprocal disposition partners instantiated by the target face. It is the continued matching of these that brings about the unlocking of the display, which is the outcome of their acting together. This model rather than the S-M one gives us a plausible account of why the removal of either the target face or the camera from it prevents the unlocking of the display. If the latter is the mutual manifestation of the phone's artificial disposition and the target face's powers, then removing either of these blocks their joint manifestation. One

could argue that oddness remains. The claim that the target face has some powers that, when matched with the phone's artificial disposition, result in the unlocking of the display sounds weird. But there are ways to mitigate this issue. We can think of the target face's "power to unlock the display" as a convenient shorthand for referring to the facial features' power to give rise to a specific visual pattern. A similar strategy can be employed for other cases of artificial dispositions that can be superficially regarded as abiding by the S-M model.

If the manifestation of both powers and artificial dispositions is suitably interpreted along the lines of the MM model, we cannot ground a robust distinction between powers and artificial dispositions in the way they manifest.

### 2.3 Actuality

The next candidate feature is what I call "actuality". The actuality of power is said to be constitutive of them (e.g., Molnar 2003: 99–102). Therefore, variation concerning this feature between powers and artificial dispositions would suggest a deeper metaphysical between these kinds of properties.

Any sensible powers theorist believes that powers are actual properties of their bearers. It is the manifestation of powers that need not be actual. What motivates the emphasis on actuality is a parallel debate concerning the distinction between powers and non-powerful, categorical properties. An attempt was made to ground the distinction between them by pointing out that categorical properties are here-and-now, occurrent properties, whereas powers are not. But it is now well-known among the participants in the debate that such an attempt is unsuccessful, for it relies on a confusion between the actuality of powers and the possible non-actuality of their manifestation (see Heil 2003, Chapter 9 for an extensive discussion).

An analogous strategy for grounding a distinction between powers and artificial dispositions fails for similar reasons. Artificial dispositions, if they exist, are actual properties of objects. It is the manifestation of artificial dispositions that need not be actual. The display of my mobile phone is currently locked. When I move it in front of my face, the device recognizes my facial features and unlocks the display. The artificial disposition to unlock the display was already there, waiting to go.

The proponents of actuality as the distinguishing feature between powers and artificial dispositions face another issue. On the resulting view, powers are actual and artificial dispositions are not. Thus, we need some sort of justification for believing in unactualized artificial dispositions. It remains unclear, however, what benefits could outweigh this loss of ontological economy. It is worth flagging that there is a powers view embracing actualized and non-actualized properties (*qua* universals): this is power Platonism defended by, e.g., Tugby (2013, 2022). Perhaps, someone could extend the considerations for endorsing powers Platonism to artificial dispositions. This ecumenical Platonism, however, does not support the actuality criterion. We would need to say that only powers are Platonic entities, whereas artificial dispositions are not. Again, we are missing a story of what could ground such a difference. In the absence of a solution to these concerns, I suggest that actuality is not a good candidate for establishing a metaphysically robust distinction between powers and artificial dispositions.

### 2.4 Multi-trackability

An initially more promising candidate is what I call “multi-trackability”. Powers are multi-track if the same power can produce different types of manifestation. Natural powers, such as *mass* and *charge*, are immediately plausible candidates for being multi-track. Think of how they figure in laws of nature. In considering Coulomb’s law, for instance, we may find it

compelling that the same *charge* power produces forces with different magnitudes. By contrast, powers are single-track if they produce only one type of manifestation (Williams 2011; Vetter 2013). While not every powers theorist is happy with that (e.g., Bird 2007), the view that powers are multi-track has broad consensus. The strategy would be to argue that artificial dispositions are not multi-track, and this difference grounds a metaphysically robust distinction with powers.

This move is superficially appealing. At least intuitively, some artificial dispositions seem to be highly specific. Consider the example of a mobile's artificial disposition to unlock the display when it recognizes the target face. Such a disposition seems to have only this type of manifestation. For all we know, it has no corresponding law of nature. Nor does such a disposition's manifestation has the determinable character of a power such as *charge*. However, even if we concede this case, it does not seem that *all* artificial dispositions are single-track. And if so, such a difference does not suffice to ground a robust distinction between powers and artificial dispositions.

As it happens, plausible multi-track artificial dispositions are not hard to find. Here is a quotidian example. Think of a modern aircraft's autopilot system. New generations of autopilot systems can control most parts of the flight after take-off. They govern altitude, direction, engine power, throttle, speed, and so on. It is very plausible to regard the autopilot system as instantiating an artificial disposition, which we could call the "disposition to fly the aircraft without direct assistance when C", where C is the set of dispositional partners and circumstances under which the disposition is manifested (here we can remain neutral on what these are). For the sake of brevity, let us call it the "autopilot disposition". It seems to me that the autopilot disposition is multi-track. It is displayed in different situations and in diverse ways. The autopilot system displays its disposition depending on the navigational route, the mode set, the environmental conditions, the signal received, and so on. Its manifestations are various: the

autopilot could increase/decrease the engine power, alter the altitude, change direction, and these are only a few effects that can be traced to the autopilot disposition.

Artificial dispositions like the autopilot disposition are common. Think of all the objects that have some built-in systems that can perform different output actions under the input of some ambient signals or data, such as refrigerators, air conditioners, and iPhones. If the above suggestion is plausible, these also instantiate multi-track artificial dispositions.

Setting aside potential issues with the specific examples, an objector could argue that multi-track artificial dispositions are conjunctions or collections of single-track dispositions. And if powers are multi-track, this manoeuvre would allow us to establish a robust distinction. But the same objection could be raised against multi-track powers (e.g., Bird 2007: 23–24). These could be regarded as collections of single-track powers too. We need some argument for thinking that powers, but not artificial dispositions, cannot be suitably understood as collections of single-track powers. Without this argument, we are not warranted in taking multi-trackability as a good candidate feature for demarcating a robust distinction between powers and artificial dispositions.

### 2.5 Self-Directedness

The last internal criterion I will consider is a feature of powers that have been primarily motivated in connection with the project of offering a powers-based analysis of the metaphysics of organisms, such as humans, plants, and flies. I call this "self-directedness" (cf. Tugby 2020; Austin and Marmodoro 2015). Given this context, the self-directedness of powers is a promising candidate for demarcating a robust difference with artificial dispositions.[3]

One of the advertised benefits of the powers approach to the metaphysics of organisms is that it gives an illuminating account of their persistence over time, or diachronic unity. For example, Austin and Marmodoro suggest that the unity of an organism over time is the

manifestation of the organism's powers to unify the structural organization of the biological elements constituting its morphological profile (2015: 286). To simplify, we could say that the manifestation of such a power is the production and maintenance of a particular morphology by means of generation, regeneration, and auto-regulation of the organism's constituents. How to precisify these metaphysical claims must be assessed on a case-by-case analysis, considering the target organism under study.[4]

The peculiar feature of these powers sustaining the organismal unity is that they are self-directed: their manifestation has the organism bearing them as the target. For example, Tugby takes self-directed powers to be (or to closely resemble) autopoietic functions such as respirating, healing injuries, capturing sunlight, and so forth (2020b: 221). The latter aim to establish, maintain, and enhance the survivability of an organism. Austin and Marmodoro think that the manifestation of self-directed powers has the goal of perpetuating biological cycles that safeguard a particular morphology (2015: 287). We can say that self-directed powers have manifestations that ensure the continued existence of their bearers. For instance, the self-directed powers of a cell ensure that its unity and stability over time.

Supposing to accept the feature of self-directedness, we can now evaluate whether this criterion allows us to demarcate a robust distinction between powers and artificial dispositions. As it happens, we face two issues, the second of which is more substantial than the former.

First, it is hard to believe that all powers are self-directed. The *solubility* of an ordinary sugar cube is a power whose manifestation amounts to the ceased existence of its bearer. And while someone would protest that *solubility* is not a genuine power, concerns remain. For example, it is unclear whether putative fundamental powers that are paradigmatically natural such as *mass* and *charge* are self-directed. Does the manifestation of an electric force, say, have the continued existence of a particle, say, as its goal? It is unclear how to answer this question. Less charitably, it is not obvious whether this is a good question to ask. Even if we grant that a

charged particle cannot exist without exerting some electric force, this fact does not give us reason to believe that the manifestation of electric force is akin to some auto-poietic function of the particle. I am inclined to think that fundamental powers are not self-directed because their characterization, as we find it in our physical theories, does not suggest otherwise. The argumentative burden is then on the believer of the self-directedness of fundamental powers.

Second, a more substantive objection—even conceding that there may be fundamental self-directed powers—is that some artificial dispositions are plausibly self-directed. There are examples of intuitively plausible artificial dispositions whose manifestation targets their bearer and has its continued existence as a goal. One nowadays familiar and pervasive example is that of predictive text technologies, which you have installed on your mobile phones or laptops. (Another quotidian example, suggested by William Bauer, is a robot vacuum that plugs itself to recharge.) A predictive text system is plausibly regarded as having the disposition to output a correct word (the predicted word) when certain other words are typed. For example, if you want to compose the message "I will be home soon", the system may output the predictions "home" and "soon" after you type "I will be". We could say, then, that a predictive text system is disposed to output good predictions. My suggestion is that this is a self-directed disposition.

The quality of the predictions depends on the system's training. Most users are familiar with the frustrating experience of composing a message in a rush and having to fix the predicted words manually. But the system can learn and improve its predictions over time. This feature links to the idea of self-directedness. A predictive text system enhances its outputs, namely the predicted words, by receiving feedback from the user. Typically, feedback takes the form of disambiguation of the output predictions and considerations regarding the number of times the user selected one word over others within the context of a target sentence. The more correct predicted words the system outputs, the better its predictive abilities become. And the outputting of correct words is plausibly self-directed in the sense that it targets the predictive

system itself: by predicting correct words, the system receives positive feedback that enhances its predictive abilities, expands its vocabulary, and ensures its future usage. To generalize this example, systems that can modify the quality of their outputs by processing environmental data or user feedback are plausibly self-directed. The manifestation of such systems has their well-functioning as target.

If my suggestion that some artificial dispositions are self-directed is correct, then this feature is not a good candidate for demarcating a robust distinction between powers and artificial dispositions.

## 3. External Criteria

So far, I have argued that five plausible internal criteria for demarcating a robust distinction between powers and artificial dispositions are unsatisfactory. Now, I turn to discuss three external criteria focussing on these features of powers: fundamentality, ungroundedness, and modality. These features are external in the sense that they do not concern, at least intuitively, the internal structure of powers. Instead, as I will explain in due course, these criteria involve the relationship between powers and other properties.

Before moving on, I wish to quickly address a potential objection. It may be argued that whatever grounds a robust distinction between kinds of properties ought to be classifiable as an internal criterion. It should be a feature concerning the intrinsic or internal structure of these properties. The external criteria regard features concerning how powers stand to other existents. Thus someone might find them unfit for the task. However, I do not wish to pursue this objection further. What matters is that the metaphysical distinction is ultimately grounded in a difference between the nature of powers and artificial dispositions (cf. Section 1.2). In the absence of auxiliary considerations, there is no reason to think that a difference with respect to

either fundamentality or ungroundedness or modality cannot be traced to different features that powers and artificial dispositions have by virtue of their nature.

As it will emerge in the remainder of the chapter, the external criteria are worthy of consideration because they are initially more promising that the internal criteria. However, my overall assessment is less positive: I will argue that such criteria are still wanting and, therefore, do not satisfactorily demarcate a robust distinction between powers and artificial dispositions.[5]

### 3.1 Fundamentality

Many believe that powers are fundamental (e.g., Bauer 2013; Bird 2007, 2016; Ellis 2001; Ellis & Lierse, 1994; Marmodoro, 2017b; Yates, 2013). Classic examples of fundamental powers are physical properties such as *mass*, *charge*, and *spin*—which I mentioned in previous examples. While there are several ways to interpret the claim that powers are fundamental, it is hardly controversial to believe—one might initially think—that artificial dispositions are nonfundamental (see *reference redacted* for more on the fundamentality of fundamental powers). Accordingly, a difference in fundamentality represents a promising and accessible criterion for distinguishing between powers and artificial dispositions.

One reason for thinking that artificial dispositions are nonfundamental is that they are derivative upon powers by virtue of standing in some relevant asymmetric dependence, R, to them. In a slightly more precise way, we could say that a property Q is derivative upon a fundamental property (or a cluster thereof) P iff Q exists only if P does, and P and Q are R-related. Specifying the R-relation between fundamental powers and nonfundamental properties is an open problem for the theory of powers. Here I leave it to the reader how to interpret R. Instead, let us consider whether the claim that powers are fundamental and artificial dispositions are derivative upon them is a good criterion for demarcating a robust distinction. Someone

might think that the distinction is indeed informative and non-trivial. However, I have one complaint suggesting that it is dissatisfactory.

Fundamentality is not a reliable guide to metaphysical distinctions between kinds of properties. A difference in relative fundamentality, on its own, does not automatically yield a difference in kind among the properties in questions. Note that this claim does not deny that some nonfundamental properties are distinct in kind from fundamental physical properties. For instance, some properties of social sciences, such as those capturing a consumer's preferences in a specific economics model do not figure in our physics textbooks.[6] However, it is not hard to find plausible cases of nonfundamental physical properties. For example, the property of having a determinate acceleration is physical but not fundamentally so. We should offer further reasons for thinking that a difference in fundamentality necessarily amounts to a difference in kinds of properties. But whatever these considerations are, they presumably require us to adopt a specific and substantive conception of fundamentality—namely, one which somehow and systematically alters the kind of nonfundamental properties.

I do not claim that such a view is a non-starter. As such, this strategy remains available for the advocate of a robust distinction between powers and artificial dispositions on relative fundamentality grounds. However, an evaluation of this strategy is hostage to the nitty-gritty of the notion of fundamentality at play, which remains to be seen. Note that there are already available reasons for doubting the suitability of this conception. For example, we should leave open the possibility that there are fundamental and nonfundamental powers. But if we were to adopt this kind-altering conception of fundamentality, such a possibility would be closed—yielding a theoretically inadequate restriction of the space of possibilities. Perhaps, there are ways to improve the suitability of the fundamentality criterion. And it may still reveal that fundamentality is a sufficient but not necessary condition for the naturalness of powers. But our

intermediate conclusion is, as it stands, that such a criterion is unfit for demarcating a robust distinction between powers and artificial dispositions.

### 3.2 Ungroundendess

The penultimate criterion is what I call "ungroundedness". Some metaphysicians believe that some powers can exist without being grounded in the existence of any other properties distinct from them (e.g., Molnar 2003; McKitrick 2003, 2018: Mumford 2006; Bauer 2011). Not all powers do so. For example, the fragility of a vase, supposing it is a power, is plausibly grounded in other properties, constituting the so-called "causal base", of the vase, such as that of having a specific crystalline structure.[7] But when it comes to putative fundamental powers such as *charge*, *mass*, and *spin*, the claim that these are ungrounded gains plausibility. I do not have space for reconstructing the arguments for ungrounded powers (se McKitrick 2018, chapter 7 for an overview). Instead, I wish to assess this feature as a possible demarcating criterion. The strategy would be to argue that some powers can be ungrounded whereas artificial dispositions cannot.

Since it is intuitively compelling to think that artificial dispositions are always grounded in more fundamental powers, this approach is initially promising. It does not seem so outrageous to regard artificial dispositions, such as the ones discussed in the previous examples, to be like fragility: they require the existence of other properties grounding their existence. However, upon reflection, I think that the ungroundedness criterion is not up to the task.

It is a metaphysical possibility that supports the idea of ungrounded powers (Williams 2009; McKitrick 2018: 141–145). If so, we could argue that it is a metaphysical possibility that there are ungrounded artificial dispositions. This strategy, if available, would undermine the robustness of the distinction. To block it, the defender of a robust distinction should argue that it is metaphysically impossible for artificial dispositions to be ungrounded. One approach would

defend the view that artificial dispositions are necessarily grounded in some other properties *because* they are nonfundamental. But while this is a plausible argument to make, it problematically overgeneralizes. Unless one endorses an exotic view, artificial dispositions are not the sole nonfundamental properties. And if artificial dispositions are necessarily grounded by virtue of being nonfundamental, so are other nonfundamental properties. The worry is that a difference with respect to groundedness becomes too generic to be illuminating. Accordingly, I submit that the ungroundedness criterion is not a suitable candidate.

### 3.3 Modality

The last candidate I discuss before returning to the *Metaphysical* and *Ontological Questions* is what I call "modality". This criterion is, for reasons that will become clear in a moment, intimately connected to both fundamentality and ungroundedness. The general strategy is, for the proponent of a robust distinction, to argue for a substantial modal difference between powers and artificial dispositions. There are various ways to spell out such an idea. Here I focus on a modal difference concerning the instantiation of powers and artificial dispositions. The proponent of the robust distinction could argue that powers are, in a sense that I explain in a moment, *modally free*, whereas artificial dispositions are not. If we assume that modal freedom (and lack thereof) flows from the nature of the properties in question, the criterion—if successful—would serve the purpose of establishing a metaphysically robust distinction.

Following Wang, let us say that a set of properties (and relations) Γ is modally free just in case 'any pattern of instantiation of the properties or relations in Γ is possible' (2016: 401). Why think that powers are modally free? Perhaps an argument is that they are fundamental properties. On a popular view, fundamentality is a form of ontological independence. Powers—if fundamental—could display various possible patterns of instantiation because they would not be constrained by other property dependees. Using the language of possible worlds, we could

say that in a different world than our fundamental power P could be replaced by fundamental power Q or, in another world, P or Q could fail to be instantiated. By contrast, the same considerations for thinking that artificial dispositions are both grounded and nonfundamental plausibly support the view that they are ontologically dependent on other properties. Such a dependence prevents unrestricted patterns of recombination among them. If, for example, artificial disposition A is dependent on P, we cannot have a scenario where A exists but P does not.[8]

There are two problems with this approach. First, it relies (once again; see 3.1) on a substantive notion of fundamentality, which stands in need of justification. This conception rules out the possibility of fundamental yet dependent entities. However, such a restriction is theoretically costly (for discussion, see J. M. Wilson 2014; *reference redacted*).

Second, and more pertinently, we can make the case that set of fundamental powers is not modally free. For example, some dispositionalists argued, on physical grounds, that *charge* and *mass* are essentially related: it is part of the nature of *charge* to exert a force producing certain accelerations in massive objects (see Yates 2013: 105–111 for a technical discussion). Ignoring potential issues with the specific example, I strongly suspect that it is possible for fundamental powers to bear essential and thus necessary connections to other powers. This might happen if one power is included in the manifestation of another.[9] In the absence of an argument ruling out the possibility of necessarily connected powers, the claim that they are modally free is no more than an expression of a philosophical prejudice.

These considerations should raise dissatisfaction with the modal criterion for grounding a robust distinctness between powers and artificial dispositions. As for the other criteria, my claim is not that the issues I identified are unsolvable. Rather, it is that such problems suffice to cast doubt on the tenability of the modality criterion.

## 4. Back to the Ontological Question

I wish to use the remainder of this chapter to discuss some important implications of what I have argued so far. I started this chapter by asking two questions: one ontological, and the other metaphysical. So far, I have offered considerations for thinking that the answer to the metaphysical question is negative. Plausible criteria extrapolated from the powers literature do not warrant a metaphysically robust distinction between these properties and artificial dispositions. The reader can regard this chapter as a long argument by elimination, one which plausibly assumes that the alleged distinguishing feature between powers and artificial dispositions should not trivialize the distinction. Schematically, then, my argument was this:

1. If there are no good distinguishing internal or external features, then there is no metaphysically robust distinction between powers and artificial dispositions.
2. There are no good distinguishing internal or external features.
3. Therefore: there is no metaphysically robust distinction between powers and artificial dispositions.

Like any argument by elimination, the argument by elimination against the robustness of the distinction between powers and artificial dispositions suffers a structural problem. There may be more promising candidate features that I have not considered. Hence, my conclusion is more cautious: since many *prima facie* plausible candidates fail, we have compelling yet defeasible reasons to deny the robustness of a metaphysical distinction between powers and artificial dispositions.

I conclude by linking this result to the ontological question, namely the question of whether artificial dispositions are genuine properties. The considerations I offered against the robustness of the distinction have significant implications for our ontology. If we are willing to

deem powers as genuine properties, then we should do the same for properties sharing a structurally analogous metaphysics. The discussion of the internal and external criteria strongly suggests that artificial dispositions are like powers, from a metaphysical point of view. Therefore, we can justifiably extend our ontological commitment. It would be methodologically odd, and I believe mistaken, to accept powers and deny artificial dispositions. A negative answer to the metaphysical questions supports a positive answer to the ontological question. The fact that artificial dispositions are, in our world, plausibly grounded and nonfundamental is not enough to establish a robust distinction with powers. Nor does it suffice to ban artificial dispositions from the inventory of what there is. In sharing a similar conclusion to McKitrick (this volume), I say that this is good news for those who believe that a dispositional conception of properties can do good service for accounting for natural and artificial features of our world.[10]

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[1] A different ontological question is this: are there any artificial dispositions? This chapter assumes a positive answer and focuses on their genuinity instead.

[2] Theorists of powers tend to believe that such properties ground laws of nature. However, the link between powers and laws of nature is shaky and remains an open dispute. For more on this, see Mumford (2004), Vetter (2012), Kimpton-Nye (2021).

[3] The idea of self-directedness is arguably related to the directedness of powers (e.g., Molnar 2003: 60-66). This is the idea that powers are oriented towards some objects beyond themselves. The directedness of powers is sometimes explicated in analogy to the idea of intentionality.

[4] For reasons of space, I offer a generic overview of Austin's and Marmodoro's (2015) and Tugby's (2020) views, respectively. The moving parts of these accounts are more sophisticated than what my presentation could suggest. I invite the reader who wants to know more to check the cited works, including Williams (2005) who has defended the idea of static disposition. These exhibit a kind of self-directedness.

[5] Relatedly, it is worth stressing that my considerations against the robustness of the distinction between powers and artificial dispositions are not hostage to the correct classification of internal and external criteria. The distinction is primarily meant to be a device facilitating the assessment of the arguments presented in this chapter.

[6] If the example is contentious, think of different plausibly non-fundamental non-physical properties such as being kind-hearted or being open-minded.

[7] The label "causal base" (e.g., Prior, Pargetter, Jackson 1982) is unfortunate. The relationship between a power and its causal base, if any, is best understood as a form of non-causal dependence.

[8] Here the modal freedom claim regards the set of fundamental powers. It excludes the manifestation properties and dispositional partners of fundamental powers. The default view is that there are necessary connections between fundamental powers and their manifestation properties and dispositional partners. The properties in this set would not enjoy modal freedom.

[9] This claim does not imply that the manifestations of a powers are nothing but other powers. Hence, we should not be too quick to raise the charge of vicious regress. Another clarification: my suspicion concerns the possibility of necessarily-related distinct types of fundamental powers. The idea of necessary links between fundamental powers is less controversial, I think,

if we consider tokens of the same type (or, if one prefers, determinates of the same determinable). For example, consider the well-established fact that different determinates of *charge* produce forces proportional to their coulombs when they interact.

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