

NOT SO POWERFUL PURE POWERS

Poderes puros no tan poderosos

JOAQUIM GIANNOTTI ^{a, b}

<https://orcid.org/0000-0002-4058-4093>

joaquim.giannotti@umayor.cl

^a Núcleo de Ciencias Sociales y Artes, Universidad Mayor, Santiago, Chile.

^b African Centre for Epistemology and Philosophy of Science, University of Johannesburg, South Africa.

Abstract

Pure powers ontologies hold that all or many fundamental natural properties are completely powerful. Their nature is exhausted by the various causal, dispositional, and nomic roles they play. I discuss an underappreciated challenge against the pure powers view based on considerations from physics: How can we harmonise the complete powerfulness thesis and the manifest qualitatively structural, geometrical, and mathematical character of physical properties? I identify and assay five approaches that could answer this question: (i) eliminativism, (ii) the identity view, (iii) emergentism, (iv) essentialism, and (v) prioritarianism. Any satisfactory answer to the challenge should preserve the primacy of the powerful over the qualitative, and it should avoid collapsing the pure powers view into one of its competitors. I argue that each of (i) – (v) either fails to meet such desiderata or raises new problems for the pure powers view.

Key words: Pure Powers; Qualitativity; Dispositionality; Powerful Qualities; Aspects.

Resumen

Las ontologías de potencias puras sostienen que todas o muchas de las propiedades naturales fundamentales son completamente poderosas. Su naturaleza se agota en los diversos roles causales, disposicionales y nómicos que desempeñan. Analizo un desafío subestimado contra la perspectiva de las potencias puras basado en consideraciones de la física: ¿cómo podemos armonizar la tesis de la potencia completa y el carácter manifiesto cualitativamente estructural, geométrico y matemático de las propiedades físicas? Identifico y ensayo cinco enfoques que podrían responder a esta pregunta: (i) eliminativismo, (ii) la perspectiva de la identidad, (iii) emergentismo, (iv) esencialismo y (v) prioritarismo. Cualquier respuesta satisfactoria al desafío debe preservar la primacía de lo poderoso sobre lo cualitativo y debe evitar colapsar la perspectiva de las potencias puras en una de sus competidoras. Argumento que cada uno de (i) a (v) no cumple con dichos desiderata o plantea nuevos problemas para la perspectiva de las potencias puras.

Palabras clave: Poderes puros; Cualitatividad; Disposicionalidad; Cualidades poderosas; Aspectos.

1. The Qualitative Challenge from Physics

The *pure powers view* claims to be an informative and illuminating account of the fundamental natural properties of our world (e.g., Harré, 1970; Harré & Madden, 1975; Ellis & Lierse, 1994; Mumford, 2004, 2006; Bird, 2007, 2016; Yates, 2013; Marmodoro, 2017). On this view, putative fundamental physical properties—such as *mass*, *charge*, and *spin*—are completely powerful. All there is to their nature is encoded in their various causal, dispositional, and nomic roles they play (Bird, 2016, p. 354); fundamental properties are *pure powers*. If *charge*, for example, were a pure power, its nature would be exhausted and perspicuously characterised by its causal, dispositional, and nomic connections to other properties. Plausibly, some of these are the properties specifying the production of an electric field when stationary, the generation of a magnetic field when in motion, and the Lorentz force a charged object experiences due to electromagnetic fields. Theorists of pure powers unpack this initial idea differently. However, a general characterisation will suffice for the present purposes. The problem I set out to discuss targets any theory committed to the thesis of complete powerfulness—namely, that the nature of all or many fundamental properties is wholly and exclusively powerful. At first approximation, it expresses the idea that pure powers consist in “nothing more than a set of connections to, and causal powers for, other properties” (Mumford, 2004, p. 185) or, as Bird claims, that the powerfulness of a property ‘exhausts its being’ (2007, p. 100). If we understand this claim in its most natural interpretation, as Taylor puts it (2018, p. 1435), the whole nature of a pure power is powerful: “there is no part of a property’s nature that is non-powerful”. I shall argue that analogous considerations from physics, which pure powers theorists sometimes invoke to defend the idea of complete powerfulness, should force us to legitimise the manifestly qualitative non-powerful character of physical properties. Thus, a challenge arises: How could the pure powers theorist reconcile the complete powerfulness of pure powers and the qualitative non-powerful character of fundamental physical properties?

I shall argue that the pure powers view so construed cannot address this *qualitative challenge* without weakening the thesis of completeness powerfulness. The strategy I submit on their behalf is to restrict the thesis only to some core aspects of properties. In this paper, I explore and assay five initially promising approaches that preserve the spirit, though not the letter, of the original pure powers view but make room for non-dispositional elements. The approaches I shall discuss are: (i) eliminativism, (ii), the identity view, (iii) emergentism, (iv) the priority view, and (v) essentialism. My goal, however, is not to defend the superiority of a specific approach.

Instead, I intend to articulate these views and persuade the reader that each of (i) – (v) is problematic. Either it fails to satisfy two desiderata or creates novel worries for the pure powers view. My conclusion will be that while they are not downright unsolvable, the problems identified leave the qualitative challenge open.

The structure is as follows. In the remainder of this section, I say more about the qualitative challenge, connecting it to other objections raised against the complete powerfulness thesis. In section 2, I present a framework for aspects of properties. I argue that the introduction of aspects reveals a more precise assessment of the available options of the pure powers theorist. In the same section, I explain how to understand the notions of dispositional and qualitative aspects, respectively. Then, I present two desiderata for meeting the challenge. I shall call them '*primacy*' and '*distinctness*'. I discuss the five views articulated within the aspects framework in the rest of the paper. In section 3, I briefly discuss two approaches that are not acceptable or otherwise too theoretically pricey, for reasons I shall explain in due course, for the pure powers view but remain available for other metaphysical theories of properties: eliminativism and the identity view. In section 4, I discuss three immediately more appealing approaches: emergentism, essentialism, and the priority view. However, as I will explain, they create new problems whose solutions remain to be seen. I conclude in section 5 with some indications for better approaches to the qualitative challenge.

Objections against the complete powerfulness of pure powers are not breaking news. For example, several metaphysicians have argued that a vicious regress concerning the identity and individuation of powers unfolds if their nature is exhausted by their dispositional/causal/nomic connections to other powers (e.g., Lowe, 2010; Bird 2007, pp. 132-146). Because of these worries, some have abandoned the purity of powers in favour of a mixed view of properties as having powerful and non-powerful qualitative parts or aspects (e.g., Taylor, 2018; Giannotti, 2019; cf. Tugby, 2021). Others argued that the pure powers view must be complemented with laws to accommodate a physically adequate conception of functional laws and conservation principles (Ioannidis, Livanios & Psillos, 2020). The qualitative challenge I set out to discuss in this paper stems from considerations from scientific practice. It is, therefore, relevant for those theorists of powers who appeal to naturalistic considerations to motivate the view, as I illustrate below. To my knowledge, this challenge has not been explicitly discussed in the literature. Thus, it presents a novel objection against the pure powers view, one which should be of interest to both advocates and detractors of the pure powers view.

The qualitative challenge originates from some reflections on science, particularly physics. These considerations are often invoked to defend the pure powers view. It is sometimes claimed that how physicists describe or characterise putative fundamental properties supports the complete powerfulness thesis. Molnar nicely expressed this attitude (2003, pp. 135-136):

Physics tells us what is apt to be produced by the having of gravitational or of electromagnetic charge. It does not tell us anything else about these properties. [...] What these properties are is exhausted by what they have a potential for doing both when they are doing it and when they are not. There is thus a strong presumption in favour of saying that the properties of the sub-atomic particles are powers.

Deferring our theoretical choices about the nature of fundamental properties to physics pushes the pure powers theorist to face the qualitative challenge.² It does not take a specialist to observe that physics describes natural properties beyond how they empower their bearers. Physics textbooks are filled with descriptions involving features that are overtly non-powerful features. Physical properties are characterised in structural, geometrical, and mathematical terms. Let us call the set of these features the ‘qualitative character’ of physical properties (but I postpone how to make sense of it to the next section). Examples of alleged non-powerful qualitative features are inevitably controversial.

Ellis offers a variegated array of qualitative features which fundamental physical properties can have (2005, p. 470). The passage, however, is worthy of being quoted in its entirety since it conveys the widespread distribution of qualitative ascriptions in physics.

[...] For even the most fundamental causal powers in nature have dimensions. They may be located or distributed in space and time, have

¹ A similar reasoning can be found in Blackburn (1990), Molnar (1999), Ellis (2001, p. 115; 2002, pp. 74-75); cf. Chakravartty (2017, pp. 99-120). It is closely related but distinct from an argument against fundamental categorical properties sometimes called ‘the ungrounded argument’ (cf. Mumford, 2006; Williams, 2011). Note, however, that not all these authors endorse an ontology of nothing but pure powers.

² Livanios (2010; 2017, chapter 3; 2024) discusses some other ways physics is less friendly to the pure powers view. As I understand them, Livanios’s arguments are meant to cause trouble to the identification of pure powers and call attention to the adequacy of the operative notion of dispositionality. The qualitative challenge is certainly in the spirit of Livanios’s work. However, my focus is different, and the discussion targets the nature of powers primarily.

magnitude, be one or many in number, be scalar, vector or tensor, alternate, propagate with the speed of light, radiate their effects uniformly and so on. But these dimensions of the powers are not themselves causal powers. A location in space and time is not itself located in space and time. Nor does having a magnitude have a magnitude. Nor is being one or many in number itself one or any in number.³

Bird (2007) argues that fundamental constants and conserved quantities are non-powerful features representing an issue for the pure powers view. For example, he argues that the nature of gravitational mass can be understood as powerful since it can be adequately characterised in terms of stimuli and manifestations. However, the pure powers view lacks the resources to explain, in dispositional terms, why the constant G constrains the manifestation of gravitational force. Similarly, the pure powers view is unable to account for the empirical observation that the manifestation of interacting fundamental powers display conserved quantities, such as mass-energy, charge, momentum, lepton number, angular momentum, and so forth (Bird, 2007, p. 213). If we concede, as Bird does, that fundamental constants and conserved quantities are non-powerful features associated with the manifestation of powers but that they cannot be accounted for by the wholly powerful nature of powers, we face the qualitative challenge. I will say more about Bird's own strategy to defend the pure powers view in section 3.1.

The question of which specific features of physical properties are, in fact, non-dispositional is bound to generate disagreement. However, it should be remarked that the qualitative challenge arises once we recognize that analogous considerations from scientific practice aimed at supporting the full dispositionality of physical properties extend to their qualitativity. Since proponents of the pure powers view appeal to such scientific grounds, the challenge must be faced. The pure powers theorist could reject the existence of the alleged qualitative features. This eliminativist approach, as I will argue in section 3.1, faces deep problems. I will discuss this strategy there.

2. Aspects of Properties

To discuss how the pure powers theorist could meet the qualitative challenge, I propose to adopt a framework for *aspects* of properties, coupled

³ I will not use the term 'categorical properties' to refer to the qualitative character of fundamental physical properties. Traditionally, categorical properties are first-order non-powerful properties (e.g., Armstrong, 1997). By contrast, as I will argue in the next section, the qualitative features are best regarded as special higher-order properties or aspects of properties.

with the operative assumption that fundamental properties have some aspects. The introduction of aspects allows us to reformulate the challenge as the problem of reconciling the **Complete Aspect Powerfulness** with the claim that fundamental properties have qualitative aspects.

Complete Aspect Powerfulness: every aspect of a fundamental property is dispositional.

Now, the task is to explain what dispositional and qualitative aspects are. Before doing that, however, it should be clarified what aspects are more generally.

The notion of aspects I have in mind draws from some recent aspects views discussed in the literature of the metaphysics of powers. For example, Taylor (2018, 2023) regard aspects as mereological parts of properties. Williams (2019) and Giannotti (2019) offers a conception of aspects as non-mereological ways of being of properties (perhaps this conception is similar to Engelhard, 2010). However, it differs from these approaches in some relevant characteristics. For instance, it does not construe the relationship between aspects and properties to which they belong as analogous to the mereological relationship between parts and the wholes they compose. Nor does it endorse the view that aspects are ontologically lightweight (e.g., Giannotti, 2019). This claim, as argued by Morales (2024), undermines the ontological robustness of aspects which is crucial for the theoretical work they are meant to perform. By contrast, I suggest that we regard the introduction of aspects as a method of sophisticating the architecture of powers to reveal various solutions to the problem at hand. It is justified by its usefulness. Talk of dispositional and qualitative aspects is meant to make more precise the idea that properties have ontic (and thus ontologically heavyweight), non-predicatory, features playing different roles. However, I leave the task of specifying the best metaphysics for this conception of aspects to another work. The job of this paper is showing how to use this initial framework for solving a problem for the pure powers view.

I propose that we regard an aspect of a property P as an ontic higher-order property of P expressing one of P 's theoretical roles. It is useful to restrict the kinds of higher-order properties we should consider. My preferred view is that aspects are elite or natural higher-order properties. For example, *being a conserved quantity* is plausibly an aspect of *charge*. By contrast, *being my favourite property* is not an aspect of *charge*, though one can certainly predicate that. Disagreement on where to draw the line between elite aspects and those not so much is inevitable. I shall not attempt to solve this issue here.

We will focus on two kinds of aspects: dispositional (or powerful) and qualitative. There may be aspects that fit neither category. But we can set this complication aside for now.

Informally, the dispositional aspects capture the various dispositional, causal, and nomic roles the property plays (cf. Bird, 2016, p. 345). In turn, these roles involve specific dispositional/causal/nomic connections to other properties that determine, on their own or with other items, the behaviour of a thing instantiating the property. As some powers theorists put it, grounding the dispositions and nomic roles is the main theoretical job of powers (e.g., Vetter, 2015; Yates, 2018; Azzano, 2021; Kimpton-Nye, 2021; Tugby, 2021; Coates, 2023). We can formulate the notion as follows, where [p] reads as ‘the fact that p’.

Dispositional Aspect: aspect A_d of a property P is dispositional if and only if there is some dispositional or causal or nomic role ϕ such that [P occupies ϕ] is at least partially grounded in [P has A_d].

Arguably, pure powers theorists should impose some restrictions on the full grounds of P’s dispositional/causal/nomic roles. They should not allow items, whatever these might be, clashing with both the ontology and the ideology of the pure powers view among the full grounds. However, one might worry that it is implausible that a dispositional role is fully grounded in just one dispositional aspect (cf. Azzano, 2021, p. 2976). Perhaps, drawing on Coates’s (2023) proposal, one should include [P has A_d in virtue of P’s nature] among the full grounds. But there might be other ways to handle this issue. I assume that different powers views will deal with this concern differently.

It is more complicated to design an informative characterisation of qualitative aspects. The qualitative aspects capture *how* properties exist or their ‘form’—to use E. J. Lowe’s terminology (2006, p. 48)—independently of grounding some dispositional/causal/nomic roles. One could think that features such as ‘being self-identical’ or ‘having a particular individuality’ are, at least intuitively, some qualitative aspects. It should be emphasized that, in this context, the notion of a qualitative aspect is primarily invoked to group and discuss how to accommodate the non-dispositional structural/mathematical/geometrical features of putative fundamental physical properties as we find them in scientific descriptions. For our purpose, we can start with a minimal formulation. If needed, we can precisify it further to include a more specific conception of qualitativity.

Qualitative Aspect: aspect A_q of a property P is qualitative if and only if A_q is a structural/geometrical/mathematical higher-order property of P .

The formulation may not be particularly insightful. It relies on an intuitive understanding of the structural/mathematical/geometrical features of physical properties. We could extrapolate the relevant qualitative aspects from physics textbooks and scientific practice, starting from those features that are not adequately understood in terms of dispositional/causal/nomic roles.

This definition does not settle which particular aspect is, in fact, qualitative. However, the qualitative challenge arises insofar as we accept that the pure powers theorist's considerations for the recognition of dispositional aspects of physical properties extends to qualitative aspects. The entry-level formulation captures the kind of qualitativity we want to accommodate within the metaphysics of pure powers, which will do for this work's purposes. It is worth stressing that the proposed construal of qualitativity is acceptable for pure powers theorists. For example, Bird (2007, pp. 147-148) acknowledges, at least initially, that geometrical and structural features are plausible candidate for paradigmatic qualitative properties.

The proposed notion captures what we could call 'physical qualitativity', should be distinguished from other conceptions that can be found in the literature. As it happens, unhelpful diversity surrounds the concept of qualitativity. We should not think of qualitative aspects as first-order qualities like some authors do (e.g., Armstrong, 1997; Lewis, 2009; Heil, 2003; see Azzano, 2021 for a more thorough discussion). Nor should we think of a property's qualitativity as another way of talking about its actuality (e.g., Heil, 2003; however, it is plausible that *being actual* is a form of instantiated properties). Similarly, we should not consider a property's qualitative aspects as capturing the phenomenal "what is it like"-ness to bear such a property.

Someone could integrate two other conceptions into **Qualitative Aspect**, which could be said to capture a metaphysical notion of qualitativity. One is a conception of qualitativity as the *thin quiddity* of properties. The other is that of the *thick quiddity*. The latter, however, should not be accepted by pure powers theorists. (See Hildebrand, 2016 for more on the distinction between thin and thick quiddities).

Sometimes, metaphysicians talk of a property's qualitativity when they refer to its self-identity and distinctness from other properties (e.g., Black, 2000, p. 91; Lewis, 1986, p. 205). This is a property's thin quiddity.

A property's thin quiddity is a plausible qualitative aspect of properties. It is independent of whether the property has any dispositional aspects. Being self-identical, for instance, is a paradigmatic *formal characteristic* (Lowe, 2006, pp. 48-49) of properties. Pure powers theorists need not block the possibility that being self-identical is a qualitative aspect. However, they should not feel overly pressured to include the formal character of properties into the physical notion of qualitativity.

Things are different with the notion of a thick quiddity. As I understand it, this is a property's intrinsic nature, which fixes the identity or individuality of the property primitively (Hildebrand, 2016, pp. 4-5; see also Coates, 2021 and Tugby, 2021 for examples of how to employ this notion). Could the thick quiddity of a property be one of its qualitative aspects? The proposed formulation does not impede such a view. However, the pure powers theorist should reject it. Orthodoxy has it that a pure power's nature is constituted by its dispositional rather than qualitative character. Though someone might spurn this view about the nature of properties, I aim to preserve the traditional pure powers view insofar as possible. Therefore, we should exclude a property's thick quiddity from the qualitative aspects under scrutiny. But it is worth stressing that views of properties as having an intrinsic nature fixing their dispositional character remain available if one wishes to abandon the canonical pure powers view (e.g., Tugby, 2012, 2022; see Tugby, 2021 for a map of these alternatives).

Before moving on, it is helpful to illustrate the idea with an example. It is highly plausible, if we take scientific practice at face value, that a property such as *charge* has dispositional and qualitative aspects. On the proposed account, the fact that an electron is disposed to repel like charged particles is plausibly grounded in a dispositional aspect of *charge*. The qualitative aspects are the various structural, mathematical, and geometrical ways *charge* is. A qualitative aspect of *charge* is being conserved namely 'being such that it's the total quantity of charge of its interacting instances in an isolated system never changes'. The example is merely illustrative, of course.

2.1 *Desiderata*

A simple and elegant solution to the qualitative challenge is to abandon the complete powerfulness thesis and embrace the view that fundamental properties have a dispositional and qualitative character (e.g., Taylor, 2018; Giannotti, 2019; Azzano, 2021; Coates, 2021; Kimpton-Nye, 2021; Tugby, 2021; note that most of these authors are primarily motivated by difficulties in making sense of the identity theory of powerful qualities;

cf. Heil, 2003; Martin 2008). Though straightforward, this option is a non-starter if one wishes to retain the complete powerfulness thesis. Since this is the distinctive tenet of the pure powers view, its proponents should first investigate whether there are ways to reconcile complete powerfulness with the qualitative dimension of physical properties. This paper aims to do just that. For this reason, I will not assess mixed approaches.

The search for an approach reconciling the complete powerfulness thesis and the qualitative character of physical properties is constrained by two plausible desiderata. I call these ‘primacy’ and ‘distinctness’—respectively. *Primacy* is the requirement that the candidate should preserve the ontological priority of the powerful over the qualitative. It should protect the idea that the nature of fundamental properties is primarily powerful rather than qualitative. Such an idea can be sharpened in various ways. The priority view I will discuss in 4.3 does just that. I will leave this topic to that section. *Distinctness* requires that the candidate should not collapse into a competing monistic theory of fundamental properties. The desiderata imply that the successful pure powers view should not be categoricism in disguise. According to categoricism, the nature of properties is essentially qualitative (e.g., Armstrong, 1997). But this view also accepts that qualities are linked to causal powers or dispositions. Yet qualitativity is more privileged than powerfulness. Nor should the aspiring pure powers view reveal the canonical version of powerful qualities (e.g., Heil, 2003; Martin, 2008; Ingthorsson, 2013), which takes properties to be simultaneously dispositional and qualitative. Identity is not a priority relationship. Therefore, this approach must reject the priority of the powerful over the qualitative (I will say more about the identity theory of powerful qualities in section 3.2). Lastly, the winning powers view should not be a form of neutral monism—the doctrine that fundamental properties can be ‘conceived or described or characterised both in dispositional and categorical/qualitative ways’ (Livanios, 2020, p. 280; cf. Mumford, 1998, p. 191). Instead, it should conserve the metaphysical import of the complete powerfulness thesis. The five views should be evaluated against the backdrop of these desiderata.

3. Eliminativism and the Identity View

Having presented the desiderata for a pure powers theory-specific solution to the qualitative challenge, we can briefly present and discard two initial approaches: eliminativism, and the identity view. These strategies handle the qualitative challenge straightforwardly and with desirable simplicity. However, since they clash with the desiderata, they are not

available for the pure powers view. Instead, they will remain for other approaches, which I mention below.

3.1. *Eliminativism*

A direct strategy to meet the challenge is, for the pure powers theorists, to deny that fundamental physical properties have *any* qualitative aspect in a robust or ontic sense. The latter do not deserve reality. The qualitative challenge would be illusory: there is no need to revise the **complete aspect powerfulness** thesis in the first place. Bird (2007) seems to gesture towards this approach with respect to the qualitative features of conserved quantities. For example, he says that symmetry principles to which conserved quantities correspond should be regarded as ‘pseudo-laws’ rather than genuine ones (2007, p. 214). As I understand it, the idea is to treat the qualitativity of conserved quantities as non-ontic elements, thereby avoiding the problem of accommodating them within the ontology of the pure powers view. Lamentably, Bird does not develop this proposal further. Thus it remains unclear how to carve the distinction between genuine and pseudo-laws. Leaving the discussion of how one could thicken Bird’s proposal to a different occasion, I point out two major problems with the eliminativist approach. My claim is not that such issues are downright unsolvable. The claim is that the absence of an exact solution undermines the tenability of the eliminativist view.

The first issue is arbitrariness; the second concerns the limits of elimination. Starting with the problem of arbitrariness, we should remember that the pure powers view is often motivated by the dispositional descriptions of physical properties we find in scientific practice. However, similar reasoning should prompt us to legitimise the qualitative character of fundamental properties since qualitative non-dispositional characterisations of physical properties abound (section 1). It is exceptionally arbitrary to confer an ontic reading, under analogous circumstances, just to dispositional aspects but not the qualitative ones (cf. Williams, 2011; Livanios, 2017, pp 16-18). The eliminativist owes us an explanation of why we are not justified in extending the ontological commitment from dispositional aspects to qualitative ones.

Turning to the second problem, it is unclear what prevents us from dispensing with dispositional aspects as well if we should eliminate the qualitative ones. As Tugby puts it (2022, p. 8), scientific methodology is innocent with regard to both the dispositional and the qualitative character of properties. Elimination could be carried across both kinds of aspects. The eliminativist should explain why not every aspect must go. Lacking

an explanation, it seems to me that the eliminativist view is suspiciously *ad hoc*.

3.2. *The identity view*

Another straightforward way to escape the qualitative challenge is to identify the qualitative aspects with the dispositional ones. The resulting identity view holds that fundamental properties are completely powerful, but their dispositional aspects are identical to some qualitative ones. The identity view is the aspects-theoretic counterpart of the identity theory of powerful qualities (Heil, 2003, 2012; Martin, 2008; Ingthorsson, 2013, Strawson, 2024). An initial worry concerns the desideratum of primacy. If the identity relation between dispositional and qualitative aspects deserves the name, it must be an equivalence relation. But if so, the identity view cannot recover the primacy of the powerful aspects over the qualitative ones. If these aspects are identical, it would surely be ill-conceived to regard one kind to be prior to the other. One strategy to mitigate this concern is weakening the desideratum. One could argue that the identity view complies with a weaker version of primacy, according to which no qualitative aspects should be prior to any dispositional ones. This approach makes the claimed identity between these kinds of aspects compatible with it. However, it would not remove two serious problems severely undermining the identity view's tenability.

First, the identity view of aspects, like the identity theory of powerful qualities, faces the charge of incoherence (e.g., Armstrong, 2005). A traditional construal takes the qualitative to be the non-dispositional. If we adopt this approach, it is undoubtedly contradictory to maintain that dispositional aspects are identical to qualitative non-dispositional ones (cf. Livanios, 2020, pp. 281-282; Giannotti, 2019). One could argue that under the proposed formulations, the identification of **dispositional** and **qualitative aspects** is not upfront incoherent. But granting so leads to the second problem. We face, in fact, a collapse objection (cf. Taylor, 2018) that threatens the desideratum of distinctness. Adopting the identification strategy renders pure powers and powerful qualities indistinguishable. It becomes unclear how the pure powers view and the identity theory of powerful qualities are distinct views.⁴

⁴ See Giannotti (2021) for a response to Taylor's collapse argument.

4. Three More Promising Views to Complete Powerfulness

Three other views appear to be immediately more promising as pure powers-theory specific solutions to the qualitative challenge: essentialism, prioritarianism, and emergentism. I discuss them in turn in what follows.

The three views share the idea that the dispositional aspects are special. Yet they specify it in different ways. The dispositional aspects constitute the “core” of a pure power. By contrast, the qualitative aspects are peripheral. The **complete aspect powerfulness** thesis is accordingly restricted to the core aspects of fundamental properties.

Complete Core Powerfulness: for every core aspect *A* of a fundamental property, *A* is dispositional.

These approaches share the advantage of escaping the worries with both eliminativism and the identity view. However, they face new undissolved concerns. Therefore, my overall conclusion is that the qualitative challenge from physics against the pure powers view remains open.

4.1 Emergentism

Minimally, the emergentist view—as one might expect—holds that the qualitative aspects of fundamental properties emerge from the dispositional aspects of that property. One can flesh out this initial idea in many ways, depending on one’s favourite conception of emergence (see Wilson, 2016 for an exhaustive overview). However, for methodological reasons, the pure powers theorist has some theoretical pressure to adopt a power-based conception of emergence (e.g., Wilson, 2021). But before getting there and discussing a related problem, it is worth explaining why the emergentist view might attract a pure powers theorist.

To start, it is easy to observe that the emergentist view escapes the problems afflicting eliminativism and the identity view. The emergentist view neither eliminates the qualitative aspects nor identifies them as dispositional ones.

The dispositional aspects provide the emergence base for the qualitative ones. Therefore, they play an indispensable role in the architecture of the property. One could maintain that on the emergentist view, like the priority view I discuss last, the property itself is ultimately prior to its dispositional and qualitative aspects. Yet the unique emergence base role the dispositional aspects play makes them explanatorily non-disposable. The view that both dispositional and qualitative aspects

emerge from the property remains available. But it would not satisfy the desideratum of primacy.

Despite the advantages, the emergentist view ought to be our last resort. The notion of emergence is mysterious or 'metaphysically dodgy' (Heil, 2023, p. 152,). Its enthusiasts should learn to accept that. It implies that a degree of bruteness or inexplicability pervades the very constitution of the relation between dispositional and qualitative aspects. Any views should eventually tolerate some bruteness. However, in choosing among candidate pure powers theories that could overcome the qualitative challenge, we should prefer one that does not build mystery into the connection we are attempting to illuminate. I think the emergentist view's design makes it less favourable than the essentialist and the priority views from the get-go.

A canonical distinction between two forms of emergence, weak and strong, may help us locate the mystery this approach encounters. However, the enigma is amplified if we appeal to the emergentist view to overcome the qualitative challenge.⁵

Weak emergence is sometimes thought of as possessing an epistemic flavour (Wilson, 2016, pp. 389-397). Weakly emergent features are not deducible from the emergent base. The weak emergence of qualitative aspects would be a failure to derive them from the dispositional aspects of properties. If weakly emergent, the qualitative aspects of *charge*, such as being quantised and being conserved, wouldn't be derivable or deducible from its dispositional aspects. *Strong emergence* has a metaphysically more robust flavour. Strongly emergent features are ontologically novel with respect to their emergent base (e.g., Wilson, 2016, p. 356; 374-375). If qualitative aspects were strongly emergent, the mystery would concern the coming into being of new features. On this interpretation, *charge's* qualitative aspect of being conserved would not just be inscrutable from its dispositional aspects; it would come into existence as something fundamentally over and above its emergent base.

A buyer of the emergentist view should clarify whether qualitative aspects are weakly or strongly emergent from dispositional ones. However, either option is bound to generate a problem, which I explain below. This outcome, combined with the unappealing notion of emergence, should deter us from adopting the emergentist view.

Here is a reasonable piece of philosophical methodology. One should employ the resources already available in one's theory to do as much good

⁵ For reasons of space, I cannot offer an exhaustive overview of the topic of emergence. The reader can rely on Wilson (2016) as a starting point for exploring the vast literature on the topic.

work as possible before complicating it. Since we are dealing with the pure powers view, the reference frame for articulating the relevant notion of emergence should be a powers-based conception (e.g., O'Connor, 1994; O'Connor & Wong, 2005; Wilson, 2016, 2021, pp. 46-55).

Powers-based views of emergence characterise the emergence of certain features in terms of the novelty of their causal contributions compared to the causal contributions of their emergence base. Depending on whether they embrace a strong or weak form of emergence, these views can be committed to one of these schemata (as per Wilson, 2021):

Strong Emergence: What it is for token feature S to be Strongly metaphysically emergent from token feature P on a given occasion is for it to be the case, on that occasion, (i) that S cotermporally materially depends on P, and (ii) that S has at least one token power not identical with any token power of P (Wilson, 2021, p. 53).

Weak Emergence: What it is for token feature S to be Weakly metaphysically emergent from token feature P on a given occasion is for it to be the case, on that occasion, (i) that S cotermporally materially depends on P, and (ii) that S has a non-empty proper subset of the token powers had by P (Wilson, 2021, p. 72).

The terms in these formulations are meant to be as metaphysically neutral as possible (cf Wilson, 2021, p. 165). At least superficially, they do not require us to take a stand on the nature of S. Therefore, we should expect the schemata to be applicable to a view of fundamental pure powers having emergent qualitative aspects. Moreover, talk of “powers” of a feature is cogently understood in terms of a property’s dispositional aspects, and this interpretation reinforces the connection between this conception of emergence and the emergentist view. As Wilson puts it, “powers” is:

[S]imply shorthand for talk of what causal contributions possession of a given feature makes (or can make, relative to the same laws of nature) to an entity’s bringing about an effect, when in certain circumstances (where the circumstances alone are not up to the task of bringing about that effect) (Wilson, 2021, p. 45).

If one recalls it, the similarity with the characterisation of the notion of a dispositional aspect (section 2) will be striking. However, we face a new problem. The above templates for weak and strong emergence can fit, if needed, a view of emergent pure powers (such powers will have at

least a dispositional aspect which is not identical to any of the dispositional aspects of the emergent base or a proper subset of those). Yet, whether they are plausible for a view of emergent aspects is unclear. On the emergentist view, we should replace S and P with some qualitative and dispositional aspects, respectively. Recall: we want to recover the idea that S is either a strongly or weakly emergent qualitative aspect. S would be a strongly emergent qualitative aspect only if it were to possess at least “one token power not identical with any token power of P”, and S would be weakly emergent only if it “has a non-empty proper subset of the token powers had by P”. But what are these “token powers” of S and P?

If these variables stand for properties, such token powers are plausibly regarded as dispositional aspects. However, this interpretation turns out to be puzzling. The token powers of S and P would be higher-order dispositional aspects. Worries creep in. On the one hand, if aspects can have aspects, we open the door to an unlovely proliferation of aspects. Nothing prevents these higher-order aspects from having further aspects. It is best to avoid an explosion of aspects. Managing this risk costs us a restriction of our ontological commitment to first-order aspects, and this price is acceptable. On the other hand, the idea of qualitative aspects having dispositional (higher-order) aspects contradicts the idea that the qualitative aspects are non-dispositional. These problems weaken the plausibility of this approach to emergent qualitative aspects. Overall, it is unclear how to adapt the powers-based conception of emergence, which the emergentist view has theoretical pressure to employ, from properties to aspects. One could quickly point out the option of adopting a different account of emergence. In the absence of a concrete alternative, however, the suggestion carries little force. We cannot claim, for now, that the emergentist view offers an appealing solution to the qualitative challenge unless it is shown how exactly we can make sense of the notion of an emergent qualitative aspect.

4.2 Essentialism

A different strategy to render the idea of a dispositional (or powerful) core more precise is to argue that fundamental properties have essential dispositional aspects and non-essential (accidental) qualitative ones. At heart, this is the essentialist view. It seems to me that the essentialist view is in the ballpark of Bird's (2007) theory of fundamental potencies.⁶

⁶ There are various ways to explicate the notion of an essential aspect. One entry point would be to adapt a popular view about essential properties. Following Kit Fine

The essentialist approach secures the desiderata of primacy and distinctness. The ontological priority of the dispositional aspects over the qualitative claim is encoded in the essentialist claim. The former, not the latter, lies in the nature of fundamental properties. The essentialist view is clearly distinct from categoricism, the identity theory of powerful qualities, and neutral monism. Categoricism is plausibly understood as being committed to the converse essentialist thesis, namely that the qualitative aspects rather than the dispositional ones are essential. The identity theory of powerful qualities must accept that the essential dispositional aspects are identical to the essential qualitative ones. Lastly, neutral monism should refrain, to keep its neutrality, from making any claims about the essential nature of properties.

Despite the initial appeal, essentialism about the complete powerfulness of pure powers faces two concerns. The first is an explanatory worry. The second is what could be called a “problem of glue”. I will present them in turn.

The essentialist view offers a forthright explanation of why a fundamental property is powerful: it lies in its nature that it has some dispositional aspects. Very plausibly, once we appeal to facts about the essence of fundamental properties, we reach the explanatory bedrock (cf. Glazier, 2017). However, we may still wonder why a fundamental property has some accidental qualitative aspects. Why does *charge*, for instance, have the qualitative aspect of being quantised? According to the essentialist proposal, if this aspect is not dispositional, it is not essential either. We cannot appeal to the essence of *charge* to explain its possession. On the essentialist view, it is unclear what explains, if anything, the possession of some qualitative aspects rather than others by fundamental properties. This approach is problematically incomplete without an account of what grounds, if anything, the possession of qualitative aspects. One plausible response to this worry is to accept that it is a brute or ungrounded contingent fact that some fundamental properties have certain qualitative aspects rather than others one. Since ungrounded facts are fundamental (e.g., Schaffer, 2009), the essentialist view implies the acceptance of certain fundamental facts about the qualitative aspects possessed by fundamental physical properties. It is worth noting, however, that someone might find the accidentality of certain qualitative aspects implausible. To use the

(1994, 1995; cf. Rosen, 2015), one might hold that if F is essential to x then it is true in virtue of the identity or nature of x that x is F. Applied to aspects, one could analogously hold that an aspect A is essential to a property P of which it is an aspect of iff it lies in the nature of P that P has A. This view makes clear that one cannot dispense with properties, for they serve to anchor aspects.

previous example, one could argue that being quantised is a plausible essential aspect of *charge* considering plausible interpretations of quantum theory. And if such an aspect is qualitative, then the essentialist view would face a new problem. There might be essential yet qualitative aspects of fundamental physical properties. Presumably, the pure powers essentialist ought to establish that such aspects are not really qualitative. Whether this strategy succeeds remain to be assessed on a case-by-case analysis.

The “gluing problem” is related yet more difficult to address. The essentialist view does not tell us what ties the essential dispositional aspects with the accidental qualitative ones. The problem can be formulated as a question: In virtue of what an essential dispositional aspect goes together with some qualitative one? Arguably, whatever specific metaphysical relation best performs the gluing work should not be external or, if it is indeed external, it should be given an account of how a Bradley-style regress is *not* behind the corner. The proponent of this strategy must offer a principled way to stop the need of another gluing external relation connecting the gluing relation with the essential and non-essential aspects.

One option is to deny that there is any gluing relation between essential dispositional and non-essential qualitative aspects. Invoking a similar strategy to address the explanatory worry, one could argue that it is a brute fact that they are paired together. This option strikes me as methodologically problematic. It leaves the systematic co-occurrence of dispositional and qualitative aspects in fundamental properties unexplained.

Another option is to argue that the gluing relation is internal. Perhaps, what glues the essential aspects with the non-essential ones is some sort of compresence or co-instantiation relation. Aside from the challenge of identifying and choosing between various candidates, the problem is that the essentialist view remains wanting. The issue is not so much that a choice cannot be made in principle. Instead, lacking details on how to solve the gluing problem leaves the essentialist approach pending to further developments.

4.3. *Prioritarianism*

Prioritarianism is an improvement of the essentialist approach. It spells out the difference between the core dispositional aspects and the peripheral qualitative ones in terms of priority. Minimally, it holds that the dispositional aspects of fundamental powers are ontologically prior to (or more fundamental than) the qualitative aspects. Bird (2007, chapter

7) discusses an analogous strategy for handling the objection that some natural properties are not potencies. According to Bird, the pure powers view is a thesis about the fundamental properties of our world. Therefore, it is unproblematic if some non-fundamental properties turn out to be non-powerful (Bird 2007, p. 160).⁷ Prioritarianism makes a similar claim: it is unproblematic if fundamental pure powers have some derivative qualitative aspects. What matters is that the more fundamental aspects are powerful.

This priority view is immediately appealing. To start, it escapes the worries with the elimination of qualitative aspects or their identification with dispositional ones. In addition, it captures both desiderata of primacy and distinctness. It secures the primacy of the dispositional over the qualitative because the dispositional aspects are more fundamental than the qualitative ones. And it ensures the distinctness of the resulting pure powers view from other accounts. Plausibly, categoricism defends the priority of the qualitative aspects over dispositional ones.⁸ By contrast, there is no priority between dispositional and qualitative aspects in the identity theory of powerful qualities or neutral monism. The identity theory must reject any difference in relative fundamentality if the aspects are to be identical. Neutral monism should avoid making priority claims about aspects if it aims to be seriously neutral.

More importantly, prioritarianism is better than the essentialist view. Recall that the gluing problem was the problem of explaining the relationship between essential dispositional aspects and non-essential

⁷ Bird argues that more plausible fundamental yet non-powerful items, such as spatial and temporal properties relations, can be accommodated within the pure powers view by adopting a background-free physical theory. On such a view, spacetime properties and relations are eliminated or turn out to be non-fundamental. An alternative, Bird argues (2007, p. 166), would be to defend the view that spatio-temporal properties are, in some sense, dispositional. For instance, in General Relativity, each spacetime point could be characterized in terms of the disposition to affect the kinetic properties of an object at that point and the disposition to change its dynamical properties if a massive object occupies it. A different strategy, which remains unexplored not only in Bird (2007) but also in the current dispositionalist literature, is arguing that the most scientifically plausible fundamental ontology is given by some version of Quantum Gravity. If some version of QG is true, spatiotemporal properties must be non-fundamental. Accordingly, it would not be necessary to accommodate them in dispositionalist terms.

⁸ Lately, in the literature, one can observe an interesting surge of so-called “grounding theory of powers”. Roughly put, we can think of these views as holding that fundamental properties are qualities that ground the powers of their bearers (e.g., Yates, 2018; Azzano, 2021; Coates, 2021, 2023; Kimpton-Nye, 2021; Tugby, 2021). We should not confuse these approaches with the priority view. Such grounding theory of powers, interpreted within the aspects framework, assign priority to the qualitative aspects of fundamental properties. The priority view I am discussing here holds the opposite claim.

qualitative ones. On the priority view, the gluing relation between dispositional and qualitative aspects is a suitable form of ontological priority relationships. Of course, the advocate of the priority view must specify which priority relationships among a sundry array of candidates should be selected. However, facing this issue does not threaten the plausibility of the priority view.

Because of its connection with relative fundamentality, a form of *metaphysical grounding* appears to be an eligible candidate for specifying the priority between dispositional and qualitative aspects (Schaffer, 2009, p. 373; Rosen, 2010, p. 116; Raven, 2012, p. 689; Bennett, 2017, p. 40; Rabin, 2018, p. 42). Grounding is typically held to be explanatory (for classic papers on the topic, *inter alia*, see Schaffer, 2009; Rosen, 2010; Fine, 2012; to avoid complicating the discussion unnecessarily, I will keep the discussion of grounding at a minimum). A priority view formulated in terms of grounding could also address the explanatory concern faced by the essentialist view. Recall that essentialism is seemingly unable to explain why a fundamental property has some qualitative aspects rather than others. The grounding version of the priority view licenses a pertinent metaphysical explanation. A fundamental property has certain qualitative aspects *because* they are grounded in some of its dispositional ones. Someone might argue that the link between dispositional and qualitative aspects must be “transparent” to be explanatory. But since it is *a priori* open or logically possible that particular dispositional aspects obtain without the obtaining of certain qualitative aspects, we face an explanatory gap. An advocate of the grounding view could adopt a Schafferian solution to the transparency problem (Schaffer, 2017). They could supplement the grounding view with some metaphysical laws connecting dispositional and qualitative aspects together. Such laws could disperse the opacity of their link. Whether this grounding approach ultimately succeeds depends on the details of such laws. Here, I’ve just presented this option just to offer a possible illustration of prioritarianism.

Despite its theoretical appeal, prioritarianism faces some unresolved difficulties. The problem revolves around an exceptionally plausibly *chaining principle*, which can be formulated as follows.

Chaining: for any x, y and z , if (x is prior to y and y is prior to z), then x is prior to z .

The “chaining problem”, as I shall call it, arises if we mix this principle, the priority view, and the conception of aspects as features of properties.

I suggested regarding dispositional and qualitative aspects as higher-order properties of a *sui generis* variety. This construal makes it plausible to think that the property they are aspects of is prior to them. A schematic discussion will help illustrate. Let us employ P for an arbitrary fundamental property, D for a particular dispositional aspect of P, and Q for a qualitative aspect of P. If you agree, P should be prior to both D and Q. Now, let us add the priority view to the mix. Accordingly, we should accept that D is prior to Q. If you still agree, we obtain the resulting priority chain: P is prior to D, and D is prior to Q. Lastly, we plug in the chaining principle. It yields that P is prior to Q because P is prior to D and D is prior to Q (see Figure 1; the arrowheads indicate the more fundamental item).

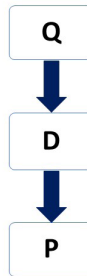


Figure 1

Nothing is strikingly worrisome about this chain. Trouble hits the priority view when we notice that the intermediate link between P and Q, namely the dispositional aspect D, is at serious risk of irrelevance.⁹ If P is ultimately prior to Q, it is reasonable to suppose that P's obtaining is sufficient to account for Q's obtaining. After all, if the priority chain has tight links, fixing P should be enough for fixing Q. If sound, this reasoning suggests that the role of the intermediate link D is unclear. If P suffices to fix the qualitative aspects, then the dispositional aspects are seemingly redundant. This upshot is certainly unwelcome. The goal of the priority view is to recover, not dispense with, the complete powerfulness of fundamental properties.

Some solutions that preserve the aspects framework immediately spring to mind. (For reasons of space, I won't explore strategies that reject

⁹ This chaining problem resembles some objections against higher-order theory of powers (see Molnar, 2003, p. 151; Armstrong, 1997, p. 84; Livanios, 2020, pp. 286-289).

aspects.) However, they raise new difficulties that erode prioritarianism's initial appeal.

One option is denying that P, namely the property, suffices *on its own* to determine the qualitative aspects. This strategy permits us to argue that D, the dispositional aspect, is also a partial determinant or partial ground of Q. Although this approach preserves the priority of the dispositional over the qualitative, it gives rise to an unfamiliar structure, which can be illustrated in terms of grounding (although this interpretation is not mandatory). It appears that Q is doubly grounded in P: Q is immediately grounded in P, but it is also mediately or indirectly grounded in P through D (since the latter is also a partial ground of Q and, in turn, is grounded in P). It is at least immediately odd that Q is both immediately and mediately grounded in P. Arguably, this result is not what the proponent of this approach has in mind. Yet, it is unclear how to handle this peculiarity. Perhaps, one could just bite the bullet, investing prioritarianism with an air of implausibility. Another option might be to change the order of priority, placing the dispositional aspect to ground the property, and the property to ground the qualitative aspect. Although original, this proposal seems to require the adoption of a different conception of aspects, one which reverse the order of dependence. Unlike the operative framework, this original view should hold that aspects depend on properties rather than the other way round—as I presumed so far.

Another option is to reject the chaining principle. The strategy is to identify a compelling counterexample to the relationship that replaces 'priority' in the chaining principle. For example, if the relevant priority is grounding, one could invoke the alleged counterexamples against the transitivity of grounding (e.g., Schaffer, 2012). However, it won't do to show that the target priority relationship does not obey the chaining principle in some other case. Either one shows that the relevant priority never chains (which strikes me as a hard-to-defend claim), or one must establish that the specific structure involving P, D, and Q does not chain. The success of either manoeuvre is yet to be shown.

A further option is to distinguish between different senses of priority. One could argue that the priority relationship between a property and its dispositional aspects differs from the priority relationship between the dispositional and qualitative aspects. To put things schematically, we can reconstruct the argument like this. If P is prior₁ to D and D is prior₂ to Q, and priority₁ ≠ priority₂, one should not expect that P is prior₁ to Q (see figure 2; the differently coloured arrows indicate two distinct kinds of priority).

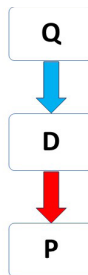


Figure 2

The strategy is reasonable. However, its success hangs on two crucial points that its proponent should establish. First, whether the chaining from P to Q is blocked depends on which specific relationships will replace $\text{priority}_1 \neq \text{priority}_2$. Second, we need some reasons for offending the economy of the priority view. Otherwise, this strategy has an air of *ad hoc*-ness. An account that employs just one kind of priority relationship is preferable, all else being equal, to one that posits two distinct kinds. Whether a plausible defence of two kinds of priority relationships is tenable remains to be seen.

An alternative would be to reject the priority between the aspects but maintain the priority of the property over them. According to this view, both dispositional and qualitative aspects are derivative upon the property they are aspects of. Figure 3 illustrates the metaphysical design of properties according to this latter view. It is worth noting that this “egalitarian view” fails to recover the primacy of dispositional aspects over the qualitative ones. Albeit in stock, it does not meet one of the desiderata for meeting the qualitative challenge within the pure powers view.

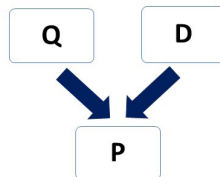


Figure 3

The previous challenges do not remove the priority view from the pool of candidates. But if the pure powers theorist embraces the priority view, they must address the chaining problem. For now, we lack clarity on what

the best solution is. The provisional assessment is that the priority view does not help the pure powers theorist overcome the qualitative challenge.

5. Conclusion

The conclusion is that more work needs to be done to win the qualitative challenge against the complete powerfulness of fundamental powers. I have argued that essentialism, prioritarianism, and emergentism are more promising approaches than eliminativism and the identity view. But the initial appeal of these views faded considering the new unsolved problems they raise. Again, let me emphasise that the problems I identified are not downright unsolvable. However, my objective was not to provide solutions to them. Instead, my goal was to say just enough to persuade the reader that such concerns are metaphysically serious. By doing so, I hoped to steer the discussion toward a more successful view of powerful yet qualitative fundamental properties. There are two positive notes that the pure powers theorists can take with them. One is that the aspects framework clears the way for strategies to meet the qualitative challenge. The other is that a triumphant account of pure powers which accommodates their manifest qualitative character demands a parallel investigation of key metaphysical notions, such as essence, priority, dependence, and emergence. Contrary to the impression transpiring from the compartmentalised literature on the metaphysics of powers, articulating a scientifically respectable theory of fundamental pure powers is not an isolated piecemeal enterprise.¹⁰

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