



Fundamental non-qualitative properties

Byron Simmons¹ 

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Abstract

The distinction between qualitative and non-qualitative properties should be familiar from discussions of the principle of the identity of indiscernibles: two otherwise exactly similar individuals, Castor and Pollux, might share all their qualitative properties yet differ with respect to their non-qualitative properties—for while Castor has the property *being identical to Castor*, Pollux does not. But while this distinction is familiar, there has not been much critical attention devoted to spelling out its precise nature. I argue that the class of non-qualitative properties is broader than it is often taken to be. When properly construed, it will not only include properties such as *being identical to Castor*, which somehow make reference to particular individuals, it will also include more general properties such as identity, composition, set membership, as well as various peculiarly ontological properties. Given that some of these more general properties help to explain objective similarity, we have reason to believe that there are fundamental non-qualitative properties.

Keywords Qualitative properties · Fundamental properties · Observable properties · Causal powers · Necessary connections · Absolute actuality

1 Introduction

Let's begin with an example from Max Black (1952, p. 156). Imagine a world consisting of nothing but two iron spheres—Castor and Pollux—located a small distance apart. Imagine, further, that these two spheres are perfect qualitative duplicates of each other. Given that this world contains nothing besides these two spheres and perhaps some empty space, Castor and Pollux are not just qualitative duplicates, they are qualitative indiscernibles. They are, we might say, qualitatively identical but numerically distinct. And yet they do not share all the same properties: one has the haecceitistic

✉ Byron Simmons
bsimmons@syr.edu

¹ Philosophy Department, Syracuse University, 541 Hall of Languages, Syracuse, NY 13244, USA

property *being identical to Castor*, the other does not.¹ Some haecceitistic properties appear to be non-qualitative.

Let's turn next to an example drawn from Immanuel Kant ([1781/1787] 1998, A 599/B 627).² Consider a hundred actual and a hundred merely possible silver dollars. They are exactly alike in all qualitative respects, but they nevertheless appear to differ in an important respect—they are fundamentally different kinds of things, they belong to different ontological categories (the former is actual, while the latter is merely possible). They are, we might say, qualitatively identical but numerically as well as categorially distinct. The difference between them appears to be absolute, not merely due to their relations to us. An actual and a merely possible dollar might be perfect qualitative duplicates, but they do not thereby share all the same properties; they do not even share all the same non-haecceitistic properties: one has the categorial property *being actual*, the other does not.³ Some categorial properties appear to be non-qualitative.

Let's turn finally to an example drawn from Leibniz ([1717] 1956, p. 38/G VII 373). Imagine two worlds otherwise exactly alike except that everything in one world is at absolute rest and everything in the other moves at an absolute velocity of 5 km per hour to the west. There appears to be no discernible difference between these worlds: they have the same fundamental laws and are observationally exactly alike. Consider some particle in the first world and its boosted counterpart in the other. These particles are indiscernible, but they do not thereby share all the same properties: one has the physical property *being at absolute rest*, the other does not. Some physical properties appear to be non-qualitative.

We have here three different examples of seemingly non-qualitative properties. But the qualitative/non-qualitative distinction, while somewhat familiar from discussions of the principle of the identity of indiscernibles, does not admit of a canonical interpretation. The standard way of drawing this distinction focuses on the non-qualitative side. The non-qualitative properties and relations are positively characterized as those properties and relations that, in some intuitive way, involve or make essential reference to particular individuals.⁴ They are, so characterized, just the haecceitistic properties.⁵ The qualitative properties are then negatively characterized as those properties that do not involve particular individuals, and thus are not haecceitistic. It should be clear that this is a mistake. For, as we have just seen, at least one non-qualitative property is

¹ A *haecceitistic* property is a property—like *being identical to Plato* or *being a student of Socrates*, and unlike *having a beard* or *being a philosopher*—which in some rough, intuitive sense involves or makes essential reference to a particular individual.

² The property of presentness, at least given something like the moving spotlight theory of time described in Broad (1923, p. 59, 1938, p. 277), is another potential example of a non-qualitative property.

³ A *categorial* property is 'a property something has by virtue of being or having an item from one of the categories' (Wedin 2000, p. 194).

⁴ The nature of this involvement is often understood in non-linguistic terms. Fine (1977, p. 137) takes it to be a kind of *dependence*: a property is non-qualitative when its identity depends upon the identity of a particular individual; Rosenkrantz (1979, p. 517) takes it to be a kind of *constitution*: a property is non-qualitative when it has an individual as a constituent; and Cowling (2015, pp. 289–91) considers an account that takes it to be a kind of *grounding*: a property is non-qualitative when it is grounded in a particular individual.

⁵ I will generally take talk of 'properties' to cover both properties and relations.

not haecceitistic. An actual and a merely possible silver dollar might be composed of exactly the same kinds of metals and have exactly the same size, shape, and weight. They might even be qualitatively indiscernible. But they would still differ with respect to their actuality. This property does not, however, involve or make essential reference to particular individuals. The standard characterization fails to categorize actuality as properly non-qualitative.

Another popular strategy focuses on the qualitative side. The qualitative properties are positively characterized in terms of duplication and indiscernibility: intrinsic qualitative properties are those properties that intrinsic duplicates must have in common, while extrinsic qualitative properties are those additional properties that indiscernibly situated intrinsic duplicates must have in common as well. Since haecceitistic properties like *being identical to Castor* cannot be had by distinct individuals, they cannot be shared by indiscernibly situated intrinsic duplicates, and thus get classified as non-qualitative. This lends an air of plausibility to the proposed strategy. But, once again, the problem lies with actuality. For while an actual and a merely possible dollar might be *qualitative* duplicates, they are not thereby duplicates *without qualification*. They would, given the seemingly fundamental categorial difference between them, appear to differ in an important intrinsic respect: one is actual, the other is not. But given that the intrinsic categorial property *being actual*—unlike the intrinsic haecceitistic property *being identical to Castor*—can be shared by distinct individuals, an actual and a merely possible dollar aren't really *intrinsic* duplicates after all. We might seek to revise this strategy by requiring the duplicates involved to be qualitative duplicates. But unless we can give substance to the word 'qualitative', the revised strategy will be circular and empty.

I seek an alternative way of characterizing the qualitative/non-qualitative distinction, which correctly classifies the property of actuality and, at the same time, provides substance to the distinction itself. To this end, I will look to the various ways the distinction gets invoked. This survey will generate a list of features that are typical—rather than definitive—of the properties on either side of the distinction. I list them not with the intention of laying down strict requirements, but with the hope of setting up mere desiderata. My overarching goal is to provide a positive characterization for both sides of the distinction: to account not only for the unity of the qualitative, but for the unity of the non-qualitative as well.

I shall proceed toward this goal as follows. In Sect. 2, I distinguish the qualitative from the non-qualitative properties by appealing to the role that some properties play in causal processes. This provides a positive account of the qualitative side of the distinction: a property is *qualitative* whenever it plays—or is grounded in properties that play—a fundamental causal role at some world. In Sect. 3, I argue that that class of non-qualitative properties is much broader than it is traditionally taken to be. In addition to the haecceitistic properties, there are three interesting classes of properties that have claim—quite independent of the causal account—to being non-qualitative: namely, the logical, mathematical, and ontological properties. Yet while this gives us a sense of the range of the non-qualitative properties, it leaves us without a positive account of their nature. In Sect. 4, I will begin to develop just such an account. I first argue that some logical, mathematical, and ontological properties are fundamental, where a property is *fundamental* just in case it is an ultimate source of objective similarity. I then argue

that these properties are negatively unified in their failure to ground causal powers. In Sect. 5, I offer a positive account of the non-qualitative side of the distinction: the fundamental *non-qualitative* properties are best understood as the source of various necessary connections and exclusions. Thus, unlike the fundamental properties that play various causal roles, they fail to be subject to principles of recombination. This Humean link allows us to capture the dual unity of the qualitative/non-qualitative distinction.

Before moving on, I should pause to lay out some background assumptions. I'll begin with my preferred ontology.⁶ I assume modal realism with absolute actuality. Our world is but one of a plurality of possible worlds. These worlds are very much like our own. They are concrete, fully determinate individuals. Each world is an internally unified whole, and is absolutely isolated from every other world. I assume that these worlds do not overlap, that no individual is wholly part of more than one world. The plurality of these worlds is plenitudinous: whenever something is possible, there is a world (or a plurality of worlds) at which it is true.⁷ But these worlds are, presumably, not all on a par. Our world, at least, is special. It is actual, while others are merely possible. This marks a genuine, objective difference between them. I thus reject David Lewis's indexical account of actuality. A possible object's status as actual is not a mere matter of its belonging to our world. Actuality is absolute.

I also assume a robust form of mathematical platonism. There is, beyond the realm of concrete possible worlds, a realm of abstract mathematical entities. These entities are causally inert. They are entirely lacking in intrinsic qualitative character. They have only a relational character, and belong to isolated systems or structures. The 'pure' sets—namely, those sets that have in the transitive closure of the membership relation only other sets—form but one of a plurality of mathematical structures. The *sui generis* natural numbers—which are not themselves set-theoretic constructions of any kind, and thus are not to be identified with either the 'von Neumann' or the 'Zermelo' numbers—form another such structure. The plurality of these structures is plenitudinous: whenever a structure is possible, there is some collection of *sui generis* mathematical entities that matches and is isolated by that structure.⁸

I'll turn next to my preferred conception of properties.⁹ I assume an abundant conception of properties according to which, for any class of possible entities, there is a property had by all and only the members of that class. The entities that share such properties might be nothing alike, the classes they form might be gruesomely gerrymandered. But some few of these properties—presumably, a very small minority—will be fundamental or perfectly natural. The entities that share fundamental properties are objectively similar, the classes they form are internally unified. The fundamental properties correspond not only to universals or tropes, but also to modes of being, haecceities, and whatever other sparse similarity makers are employed to

⁶ I have taken this ontology wholesale from Bricker (2001, 2006, 2008, forthcoming).

⁷ The parenthetical clause is included in order to accommodate the possibility of island universes. See Bricker (2001).

⁸ Let's say following Bricker (forthcoming) that a collection of entities *matches* a structure if it instantiates that structure and no more inclusive structure; and that a structure *isolates* a collection that instantiates it if the structural relations never hold between entities inside and outside of the collection.

⁹ I here mostly follow Lewis (1983, pp. 10–19, 1986, pp. 59–69) and Bricker (1996, p. 227, 2001, p. 31).

solve problems of one over many.¹⁰ I will mostly avoid talk of such things and will simply posit a primitive inegalitarian distinction among the properties. This gives us a broad conception of naturalness according to which a property is *fundamental* or *perfectly natural* if and only if it is an ultimate bearer of objective similarity.

I also assume an intensional conception of properties according to which two properties are identical if they are necessarily coextensive. Take, for example, the properties *being a triangular figure* and *being a trilateral figure*. These properties are necessarily coextensive: they are shared by exactly the same possible entities. They have the same underlying reality. But while I identify these properties, I distinguish the concepts we use to designate them. A *concept* is what we grasp in virtue of our understanding of a predicate in our language and is associated with that predicate's meaning, while a *property* is what gets designated by the use of a concept. When we apply the predicate 'is triangular' to some figure, we are primarily concerned with the number of that figure's angles; and when we apply the predicate 'is trilateral' to that very same figure, we are primarily concerned with the number of its sides. These predicates—and the concepts they express—allow us to represent the same underlying reality in different ways. But this difference lies only in thought, not in what is thought about. Thus, while properties are intensional, the concepts we use to designate them are hyperintensional.

I have assumed a vast plenitude of objects and a rich abundance of properties. These are controversial assumptions. But given the project at hand, we should have no problem taking them on board. We're looking for positive accounts of both the qualitative and the non-qualitative properties. We should thus be fairly permissive about the entities we countenance—especially when their properties have good claim to being non-qualitative. But we shouldn't be overly permissive about the properties we countenance—especially when those properties are hyperintensional. For sometimes the easiest way to designate a qualitative property is with an impure—and seemingly non-qualitative—concept. Consider, for example, the very specific mass of Mars. This mass is something Mars shares with countless merely possible entities, and the property of having this mass is clearly qualitative. But we can most readily designate this property with the impure concept *having the mass of Mars at this world*. We should not, however, confuse our representation of this property with the property itself, and would do well to adopt an intensional conception of properties, which avoids this confusion entirely. Whoever does not believe in the entities we countenance or accepts a hyperintensional conception of properties might disagree with us about the overall extension or existence of various allegedly non-qualitative properties, but she need

¹⁰ Modes of being correspond to properties like *being actual* and *being present*, while haecceities correspond to properties like *being Socrates* and *being Plato*. They appear to underwrite non-qualitative similarities among their instances. (My claim that haecceities are a kind of one over many might seem strange given that haecceities are usually taken to be shared only by individuals that are identical to each other, and these individuals are one, not many. But haecceities have traditionally been taken to be responsible for the identity of the individuals that enjoy them; they take what would have otherwise been many individuals and make them one. Haecceities are, in this respect at least, a kind of one over many. There is, however, a stronger respect in which haecceities might be taken to be a kind of one over many. For if worlds do not overlap and no individual is wholly part of more than one world, then the non-fundamental property *being identical to Socrates*, had by a single individual at a single world, might be distinguished from the potentially fundamental property *being Socrates*, had by many different individuals at many different worlds. It is, on this non-traditional view, the latter property that would correspond to a haecceity).

not disagree with our characterization of the qualitative/non-qualitative distinction itself. Our understanding of this distinction will be enriched by having more test cases available, and fortified by taking cointensive properties to be identical.

2 The unity of the qualitative

There are three importantly different features that have typically been associated with the qualitative/non-qualitative distinction. The first is *metaphysical*: the qualitative properties are often taken to be those properties that make for qualitative discernibility and give an object a certain qualitative character, while the non-qualitative properties are taken to be those properties that divide qualitative indiscernibles.¹¹ To ensure that this characterization is neither empty nor circular, let's start by saying that two things are *indiscernible* with respect to a class of intrinsic and extrinsic properties when they do not differ (and when their parts do not differ) with respect to (the arrangement of) any of the properties in that class. If one of these things has (or fails to have some arrangement of) a property in that class, the other has (or fails to have) it as well. Let's then say that a property *divides* a pair of objects when one item in the pair has that property (or when some arrangement of its parts has a particular distribution of that property) and the other does not. And let's next say that a *metaphysically unified* class of properties is a class of properties that, in some way or another, can be reduced to some metaphysically interesting class of properties. To give substance to the notion of qualitative indiscernibility, we can now say, at least provisionally, that the *qualitative* properties form a metaphysically unified class of properties, which, among other things, does not divide the following pairs: Castor and Pollux, an actual and a merely possible dollar, and a 'resting' world where everything is at absolute rest and a 'boosted' world where everything moves at an absolute velocity of 5 km per hour to the west. If we can find an underlying unifying notion, we will be able to say, without fear of vicious circularity, that two things are *qualitatively indiscernible* when they (and their parts) do not differ with respect to (the arrangement of) any of their intrinsic or extrinsic qualitative properties.

The second feature is *epistemic*: the qualitative properties are sometimes taken to be those properties that can be observed or otherwise detected and provide markers of an object's qualitative character, while the non-qualitative properties are taken to be those properties that are not, even in principle, detectable.¹² Let's say that we are *receptive* to differences in a property when our sensory receptors are sensitive to an object's having or lacking that property: if the object has that property, our sensory receptors will be affected in one way; if it lacks that property, they will be affected in another way. Let's stipulate that we can *detect* a property when we are receptive to differences in that property. And let's stipulate further that a property is, in principle, *observable* or *detectable* when some possible observer or instrument is receptive to differences in that property: that is, when it is possible for something both to be

¹¹ See, for example, Lewis (1983, p. 25, 2001, p. 382 n 6), Eddon (2009, pp. 15–19), and Cowling (2015, pp. 279, 285).

¹² See, for example, Carnap (1947a, p. 84, 1947b, p. 138, 1950, p. 74), Ismael (2001, pp. 186–93), Ismael and van Fraassen (2003, pp. 375–378), and Rickles (2006, pp. 152–153, 159, 2008, pp. 7–9).

capable of reacting in one way to the presence and in another way to the absence of that property. There seems to be a tight connection between the ability to observe or detect various properties and the ability to discriminate between objects based on their having or lacking those properties. For qualitative similarities and differences appear to be epistemically more robust than non-qualitative similarities and differences. We can, on the basis of our experience, recognize that one object is red and that another object is blue. The seemingly intrinsic qualitative difference between a red ball and a blue ball is robust in a way that the intrinsic non-qualitative difference between two red balls is not. It is on the basis of this qualitative robustness that we have the ability to observe or detect various properties. The qualitative properties are thus presumed to be observable—although, due to our limitations, we humans might not always be in a position to observe them. The basic idea here is that the qualitative properties are those that can, at least in principle, be detected by the senses, while the non-qualitative properties are those that require the additional workings of the intellect.

The third feature is *linguistic*: the qualitative properties are taken to be those properties that we can designate descriptively without the aid of directly referential devices (such as demonstratives, pure indexicals, or proper names), while the non-qualitative properties are taken to be those properties that can only be expressed with the aid of such devices.¹³ Suppose we had a mighty language that contained general predicates for all the fundamental discernibility makers, allowed for complex infinitary constructions, but was completely lacking in directly referential devices. We could, with such a language, describe the qualitative characters of various objects, but we would lack the resources to pick out or describe one but not another of two indiscernible objects. To do that, we would also require the use of directly referential devices. Some of the properties that we could thereby pick out would be highly specific haecceitistic properties such as *being identical to Plato*, while others such as *being a student of Socrates* or *being exactly ontologically like me and everything else at my world* might be more general.

There are, as we have just seen, at least three features that have typically been associated with the qualitative/non-qualitative distinction. I will use the general thrust of these features to construct a list of desiderata for a positive account of the qualitative properties. But before I do that, I should explain how I think these features are related and which I believe should take priority.

It is a working assumption of the approach taken here that the qualitative/non-qualitative distinction is primarily metaphysical in nature and can be accounted for in more basic terms. The qualitative properties should thus be taken to reduce to—or otherwise depend upon—some class of fundamental (or broadly perfectly natural) properties. I will take the relevant notion of dependence to be one of grounding (where the relevant grounding relation is understood in terms of global supervenience and comparative naturalness).¹⁴ This, however, limits the extent to which the qualitative

¹³ See, for example, Carnap (1947b, p. 138), Adams (1979, p. 7), Lewis (1986, p. 221), Gallois (1998, p. 249), and Divers (2002, p. 349 n 12).

¹⁴ I will say that the B-properties *ground* the A-properties iff the A-properties globally supervene on the B-properties, and the A-properties are all broadly less natural than the B-properties. I thus take the relevant grounding relation to be a relation between properties. It is intended to be irreflexive, asymmetric, and transitive. It is not intended to be hyperintensional.

properties can be plausibly taken to be observable or detectable. For assuming that *being an electron* is a fundamental qualitative property, both *being a non-electron* and *being an electron or a non-electron* would appear to be grounded in it. But since everything in every possible world has the property *being an electron or a non-electron*, it won't be possible to detect its presence as opposed to its absence. The property *being an electron or a non-electron* thus appears to be both qualitative and undetectable.¹⁵

But even supposing that a property's qualitative robustness can become diffuse enough to be undetectable, there might still be a principled connection between the qualitative and the detectable properties. For fundamental properties are the ultimate bearers of similarity, and assuming that qualitative similarity is epistemically more robust than non-qualitative similarity, the fundamental qualitative properties should be detectable in principle. We might not be in a position to detect them: our sensory receptors are certainly not fine-tuned enough to observe differences at the sub-atomic level or beyond, and our best instruments might be too crude to devise suitable experiments to detect them. But an epistemic agent better acquainted with these properties should be able to detect them on the basis of their qualitative robustness. The desired connection between the qualitative and the detectable properties can thus be secured at the fundamental level.

The primitive predicates of a mighty language should be taken to correspond only to properties that are epistemically qualitatively robust. But a property's expressibility in such a language should not be taken as an infallible guide to its qualitative status. For thought, I believe, is prior to language, and if we allow, as I think we should, that an impure—and seemingly non-qualitative—concept such as *having the same mass as Mars at this world* can designate a qualitative property, we should also allow for the possibility that a pure—and seemingly qualitative—concept can designate a non-qualitative property.¹⁶ We should not, as Sam Cowling (2015, p. 287) points out, take thought or language, which are plainly mind-dependent, to determine the scope of the qualitative/non-qualitative distinction, which is plainly mind-independent.

I hereby propose the following desiderata for a positive account of the qualitative properties: such an account should reduce these properties to some metaphysically interesting notion, it should rule the three examples with which we began our investigation as non-qualitative, it should secure a connection to what is observable or detectable, and it should supply primitive predicates for a mighty language.

I believe that these desiderata can be satisfied by a causal account which takes the relevant metaphysical notion to be that of playing a fundamental causal (or nomic) role.¹⁷ This account has two components which together capture the desired reduction and satisfies the first desideratum:

¹⁵ The negation employed here is not strict negation. I am assuming that the intension of *being a non-electron* is properly contained in the intension of *being strictly a non-electron*. The latter, unlike the former, is had by abstract mathematical entities. For more details, see footnote 27 below.

¹⁶ I believe this to be a live possibility. For depending upon the lay of logical space, the property of absolute actuality, which we designate with the impure, directly referential concept *being exactly ontologically like me and everything else at my world*, might also be designatable with a purely descriptive, infinitely disjunctive concept. But absolute actuality should I think, nevertheless, be taken to be non-qualitative. See Simmons (forthcoming, Sect. 2) for further discussion.

¹⁷ Teller (1984, p. 148) plausibly attributes something like this account to Lewis (1983). It is similar to the supervenience view discussed in Cowling (2015, pp. 295–298).

The Causal Thesis: a fundamental property is *qualitative* if and only if it plays a fundamental causal (or nomic) role at some world.

The Grounding Thesis: a property is *qualitative* if and only if (i) it is a fundamental qualitative property, or (ii) it is grounded in the fundamental qualitative properties.

A complete defense of this account would need to provide an explanation of what it is to play a fundamental causal (or nomic) role. I will settle for some brief elucidatory remarks. A fundamental causal (or nomic) role is importantly connected to the fundamental laws of nature. These laws, it is often said, can be written in purely fundamental terms. The fundamental causal facts are, in effect, instances of these laws.¹⁸ Thus, the properties that play active roles in the fundamental laws of nature will be the properties that play fundamental causal (and nomic) roles.

Let's turn next to the second desideratum. The proposed account properly classifies each of the three examples as non-qualitative. It rules *being identical to Castor* as non-qualitative, since this property does not itself play a fundamental causal role, and does not supervene upon—and, hence, is not grounded in—the fundamental qualitative properties shared by Castor and Pollux. It rules *being actual* as non-qualitative, since this property is, as I will argue in Sect. 4, fundamental and does not ground causal powers. And it rules *being at absolute rest* as non-qualitative, since this property does not itself play a fundamental causal role, and does not supervene upon the fundamental qualitative properties shared by a 'resting' world and a 'boosted' world.

Let's turn now to the third desideratum. The causal account ensures that the fundamental qualitative properties are detectable. For in order to have causal powers, a property must be capable of affecting various objects. But if a property can affect various objects, there should be possible objects that are left differently affected by its presence than by its absence. And if there are such objects, that property must be detectable. Thus, a fundamental property can have causal powers only if it is detectable in principle.

The causal account does not, however, ensure that the fundamental non-qualitative properties are undetectable. For the causal thesis only prohibits fundamental non-qualitative properties from featuring in fundamental laws of nature, it doesn't prevent them from featuring in derived laws.¹⁹ Indeed, if there were fundamental haecceitistic properties, this would appear to be possible. For, to borrow an example from Michael Tooley (1977, p. 686), suppose that some world contains a garden—call it Hesperides—where all the fruit are apples. Different things happen to different fruits when people try to take them into Hesperides: some turn into apples, some turn into elephants, others are repelled by a mysterious force. It appears to be a *de re* law in this world that all the fruit in Hesperides are apples. But if so, the seemingly fundamental

¹⁸ Fundamental laws should be distinguished from derived laws which cannot be written in purely fundamental terms, but which can be somehow derived from fundamental laws. Similarly, fundamental causal facts should be distinguished from facts that merely underwrite true causal statements.

¹⁹ The related view that fundamental laws must be expressible without impure, non-qualitative predicates is a popular position, but is not without controversy. See Lange (1995, pp. 430–436, 2000, pp. 34–39) for critical discussion.

non-qualitative property *being Hesperides* will play a non-fundamental nomic role and should thus be detectable.²⁰

Let's turn finally to the fourth desideratum. The causal account can supply primitive predicates for a mighty language by taking these predicates to designate the properties that play the fundamental causal roles. A language containing these predicates which also allowed for complex infinitary constructions would appear to have the resources to designate all the non-fundamental qualitative properties as well.

I should add a few brief remarks before moving on. The causal account takes the fundamental qualitative properties to play various fundamental causal roles. But it does not require these properties to play a causal role at every world in which they are instantiated. Consider, for example, a world without a source of light that contains nothing but two objects exactly alike except that one is red and the other is blue. The properties *being red* and *being blue* do not play an active causal role in this world, but they might do so in other worlds. They are what David Lewis (2009, p. 205) calls *idlers* at the world in question, but only contingently so.²¹

Nor does this account require these roles to be played by the same properties at every world. It is, in this respect, intended to be neutral between quidditism and structuralism. Quidditists hold that worlds can differ qualitatively without differing structurally.²² They claim that distinct qualitative properties can play the same causal roles at different worlds. Structuralists deny this.²³ They claim not only that qualitative properties have their causal roles essentially, but that they are individuated by them.

²⁰ That the nomic role played by *being Hesperides* is non-fundamental can be established by considering another world—qualitatively indiscernible from the one described above—where Hesperides has been ‘replaced’ by Eden. It would seem to be a *de re* law in this other world that all the fruit in Eden are apples. But these two worlds would appear to have the same fundamental causal facts. Thus, while *being Eden* and *being Hesperides* play causal and nomic roles at their respective worlds, the roles they play are not fundamental.

²¹ The causal account does require the fundamental qualitative properties to play a causal role at some of the worlds in which they are instantiated. A fundamental property that was essentially an idler would be classed as non-qualitative. The causal account is thus incompatible with the view that qualia are both fundamental and essentially epiphenomenal. Thanks to an anonymous referee for pushing me on this point.

²² To be somewhat more precise, let's say that two worlds are *structurally isomorphic* iff there is a one–one correspondence between their parts that preserves the overall pattern of their fundamental qualitative properties and relations; and let's say that two worlds are *qualitatively indiscernible* iff there is a one–one correspondence between their parts that preserves not just the overall pattern of their fundamental qualitative properties and relations, but the fundamental properties and relations themselves. We can then define *quidditism about worlds* as the view that some qualitatively discernible worlds are structurally isomorphic. The quidditist will likely hold that the fundamental qualitative properties are individuated by basic qualitative suchnesses.

Quidditism should not be confused with *haecceitism about properties*, which holds that worlds can differ by a permutation or wholesale replacement of properties without differing qualitatively. The haecceitist believes that the properties that play the fundamental causal roles lack basic qualitative suchnesses and have only bare non-qualitative thisnesses. She must therefore deny the causal thesis. I don't take this to be a problem since I take quidditism to be far more plausible than haecceitism about properties. See Hildebrand (2016) for discussion. Note that Hildebrand calls these views *qualitative quidditism* and *bare quidditism*. I've adopted the terminology from Bricker (2017, pp. 39, 49 n 18).

²³ We can define *structuralism about worlds* as the view that no qualitatively discernible worlds are structurally isomorphic (or, alternatively, as the view that two worlds are structurally isomorphic only if they are qualitatively indiscernible). It is, so understood, simply the denial of quidditism. There are, as I see it, two views about properties that motivate structuralism: *strong causal essentialism about properties*—a view that Hawthorne (2001) calls *causal structuralism* and Hildebrand (2016) simply calls *structuralism*—which

Since the causal thesis only requires that the fundamental qualitative properties play a causal role at some world, it can be endorsed by quidditists and structuralists alike.²⁴

The account is also intended to be neutral between Humean and anti-Humean theories of laws and causation. The Humean takes the fundamental qualitative properties to be *occurrent* or *categorical* (that is, to be neither primitive propensities, brute causal powers, nor fundamentally modal properties). The Humean then attempts to reduce laws and causation to the overall distribution of these fundamental occurrent properties. The anti-Humean does not think the laws can be so reduced. She thinks more is needed, and will either deny that the fundamental qualitative properties are occurrent or else insist that there must be additional primitive connections between them.

3 The range of the non-qualitative

Let's turn now to the range of properties that should be classified as non-qualitative. The standard account classes as non-qualitative all those properties that somehow make direct reference to particular individuals. Our alternative account classes as qualitative all those properties that somehow enter into causal processes. There are, however, at least three important classes of properties that fall into neither of these camps, and have claim—independent of the causal account—to being non-qualitative.

There are, first, the *logical* properties such as identity and composition.²⁵ A characteristic feature of such properties is their 'formality'. There are, as John MacFarlane (2000) points out, three main ways to understand this formality. We might take it to be a kind of generality: the logical properties apply, without qualification, to any

Footnote 23 continued

holds that the fundamental qualitative properties are individuated by their causal roles, and *haecceitism about properties* which holds that the fundamental properties are individuated by bare non-qualitative thinsnesses. Both views tie a world's qualitative character to its overall structure, and both views hold that the most natural qualitative properties are individuated by their causal roles. But while the strong essentialist believes that these properties are perfectly natural, the haecceitist does not. It is because the haecceitist denies that there are fundamental qualitative properties that she must deny the causal thesis.

²⁴ The quidditist and the strong causal essentialist agree that the properties that play the fundamental causal roles have qualitative suchnesses. But they disagree about the connection between a property's playing a causal role and its having a suchness: the strong causal essentialist thinks that a property has a suchness because it plays a fundamental causal role, whereas the quidditist thinks that a property's qualitative suchness is independent of the causal roles it plays. This might suggest that while both the quidditist and the strong causal essentialist can accept the truth of the causal thesis, only the strong causal essentialist can take it to provide us with an explanation for why the properties that play the fundamental causal roles are qualitative.

I deny, however, that quidditists cannot take the causal thesis to be adequately informative. So while I am inclined to agree that the thesis that a fundamental property is qualitative because it has a basic qualitative suchness might provide a deeper metaphysical explanation of the nature of a fundamental qualitative property than the causal thesis, I don't think the concept of a basic suchness is terribly informative. I can gesture at it by giving various analogies, but I can't really help you acquire it if you lack it. I think the concept of playing a fundamental causal role is more informative. It is one that I could potentially help you to acquire. The causal thesis thus provides a kind of insight into the nature of the fundamental qualitative properties that the basic suchness thesis does not. The quidditist can, I think, accept the causal thesis, deny that it gets to the metaphysical heart of the matter, but still take it to be informative. Thanks to an anonymous referee for pushing me on this point.

²⁵ Bricker (1996, pp. 233–234, 2006, p. 49) and Hawley (2009, p. 102) take both identity and composition to be non-qualitative. Fine (1977, p. 138) appears to take identity as non-qualitative.

domain.²⁶ There would seem to be entities that not only lack intrinsic qualitative character, but extrinsic qualitative character as well (the pure sets, the *sui generis* numbers, and other abstracta are plausible examples of such things).²⁷ But, given that the logical properties apply to these entities, they cannot be qualitative.²⁸ We might instead take this formality as a kind of topic neutrality: the logical properties are indifferent to their subject matter and treat all individuals the same.²⁹ They don't introduce a special subject matter. But this suggests that they aren't qualitative, else they would usher in a qualitative subject matter. We might finally take this formality as a kind of abstraction: the logical properties take their objects in abstraction from their relations to the world.³⁰ But these properties, being detached from the world, should be free of its qualitative character. Thus, on any way of understanding their formality, the logical properties appear to be non-qualitative.

There are, second, the *mathematical* properties such as the membership and successor relations.³¹ The membership relation is not topic neutral. It introduces a special subject matter: it always relates things to sets. If the membership relation were qualitative, it would contribute to the qualitative character of the pure sets. But the pure sets do not seem to have any qualitative character: they do not seem to instantiate any qualitative properties or stand in any qualitative relations. The membership relation

²⁶ MacFarlane (2000) calls this '1-formality'.

²⁷ In order to maintain that some entities determinately lack all qualitative character, I must deny the commonly held assumption that the qualitative properties are closed under (strict) negation. For while the *sui generis* natural numbers lie outside the intension of, say, *being an electron*, they nevertheless instantiate its strict negation, namely, *being strictly a non-electron*. But although I must deny the letter of this assumption, I can still capture some of its spirit. For the property *being concrete and strictly a non-electron* is, I believe, appropriately grounded in the property *being an electron*. This is because, as I suggested in footnote 14 above, grounding should be understood in terms of global supervenience and comparative naturalness. But since global supervenience is defined on concrete possible worlds, *being concrete and strictly a non-electron* will be grounded in *being an electron*. This gives negation a kind of closure in the realm of the concrete: the anti-intension of *being an electron* defined on the concrete possible worlds, which we might call *being a non-electron*, would seem to be a qualitative property.

²⁸ The qualitative status of parthood leads to an antinomy. The thesis of this antinomy is that parthood is qualitative; the antithesis is that it is not. The alleged proof of the thesis is that a property is qualitative if it is preserved by duplication, and since parthood is preserved by duplication, it must be qualitative. The proof of the antithesis is that it is possible for there to be things that determinately fail to instantiate any qualitative properties or stand in any qualitative relations, but given that the parthood relation would apply to such things, it must be non-qualitative. This antinomy can be resolved in favor of its antithesis. Consider the 'proof' of the thesis. The best motivation for the premise that parthood is preserved by duplication is that it must be included in the definition of duplication itself: to say that two objects are *qualitative duplicates* is to say that there is a one-one correspondence between their parts that preserves all the fundamental qualitative (as well as all the mereological) properties had by their parts and all the fundamental qualitative (as well as all the mereological) relations between their parts. But, given this definition, the plausibility of the premise that a property is preserved by duplication only if it is qualitative turns on the plausibility of the auxiliary assumption that the mereological properties and relations are themselves all qualitative. This assumption is not, however, particularly plausible: the proof of the antithesis gives us good reason to think it false. Thus, a property or relation can be preserved by duplication—and can thereby contribute to the qualitative character of an object whose parts have that property or stand in that relation—without itself being qualitative. Thanks to an anonymous referee for pushing me on this point.

²⁹ MacFarlane (2000) calls this '2-formality'.

³⁰ MacFarlane (2000) calls this '3-formality'.

³¹ Bricker (2008, pp. 117–18, forthcoming) takes the mathematical properties to be non-qualitative. Carnap (1947a, p. 84) and Fine (1977, pp. 138, 177) appear to do so as well.

does not appear to be qualitative. Purely structural mathematical properties such as the successor relation hold between the *sui generis* natural numbers. But since these numbers appear to determinately lack all qualitative character, the successor relation does not appear to be qualitative. Thus, the mathematical properties appear to be non-qualitative.³²

There are, third, the *ontological* properties such as actuality and presentness.³³ A characteristic feature of such properties is that they are absolute: they do not appear to be concerned with how their objects are related to anything else, they carry a special non-relative metaphysical status. We tend to think, for example, that actual objects are importantly different from merely possible ones. We do not, as Robert Adams puts it, tend to think that ‘the difference in respect of actuality between Henry Kissinger and the Wizard of Oz is just a difference in their relations to us’ (1974, p. 215). Indeed, the difference between them seems to be intrinsic. But it is not thereby a qualitative difference. For a qualitative duplicate of Henry Kissinger—even an indiscernible such duplicate—might fail to be actual. The property of actuality does not appear to be qualitative. We also tend to think, perhaps somewhat naively, that present objects are

³² My argument turns on the plausibility of the claim that purely mathematical entities have no qualitative character whatsoever. I’ll consider two challenges to this claim. The first concerns a pure set’s cardinality. Two pure sets can have the same cardinality. So, for example, the singleton of the empty set, $\{\emptyset\}$, and the singleton of the singleton of the empty set, $\{\{\emptyset\}\}$, both have exactly one member. They are similar in this respect. If we thought that similarity must always be qualitative, we should say that these pure sets have qualitative character in virtue of their cardinality. But this strikes me as the wrong thing to say. For a set’s cardinality appears to be a purely quantitative, non-qualitative property. Two sets with the same cardinality thus appear to enjoy a kind of non-qualitative similarity. It is a mistake to think that similarity must always be qualitative. (Note that I am not here claiming that quantitative properties can never be qualitative. Some properties such as *having exactly 5 kg mass* strike me as both quantitative as well as qualitative, while other properties such as *having exactly 5 members* strike me as purely quantitative.)

The second challenge concerns an abstract *sui generis* geometrical object’s shape. An abstract geometrical object can have the same shape as a concrete possible object. But since the qualitative character of a solid gold cube is different from that of a solid gold dodecahedron, their shape properties would appear to be qualitative. I must, it seems, either give up on the claim that abstract geometrical objects lack qualitative character or else deny that the shape properties had by concrete possible objects are qualitative after all. If forced to choose, I would take the latter option. But maybe I don’t have to. A concretely possible object such as solid gold cube will have a property that might plausibly be thought of as a shape property in virtue of some pattern of the spatiotemporal relations between its parts. And, assuming that these relations are qualitative, this shape property will be qualitative as well. An abstract geometrical object will have a property that might also be thought of as a shape property in virtue of some pattern of the relations between its parts. And, assuming that these relations are non-qualitative, this shape property will be non-qualitative as well. Two objects, whether concrete or purely geometrical, can then be said to have the same shape when there is a mapping between them that preserves the relevant patterns of relations between their parts, call this mapping a *shape isomorphism*. Given these assumptions, I now have the resources to say everything I want to say. But what should I say about the property that is preserved by shape isomorphism? Is it some third somewhat less natural non-qualitative shape property? Or is it just the non-qualitative shape property had by purely geometrical objects? To put this another way: are the qualitative relations that underwrite qualitative shape properties themselves reinforced by non-qualitative purely geometrical relations or not? If not, there are three distinct shape properties here. If so, there are only two. I prefer to say that there are only two shape properties here: one qualitative and had only by concrete possible objects, the other non-qualitative and had both by concretely possible and purely geometrical objects. (Note that if spatiotemporal relations are non-qualitative, there will only be one, non-qualitative, shape property here.) Thanks to two anonymous referees for pushing me on these matters.

³³ Bricker (2001, pp. 29–31, 2006, pp. 49–50, 2008, pp. 122–125, forthcoming) takes actuality to be non-qualitative.

importantly different from both past and future objects. The present is like a spotlight that moves through time—endowing now this and now that object with a special ontological status. We don't, however, tend to think of this status as constituted by relations of cotemporality. For while Plato still bears relations of cotemporality to all the objects of his day, he no longer enjoys present existence. Nor should we think of the difference between present objects and past (or future) objects as qualitative. For imagine that we live in a two-way eternal recurrence world where history repeats itself every 10 trillion years. There will then be infinitely many past (and infinitely many future) duplicates for every presently existing thing. But since these past (and future) duplicates seem to be qualitatively indiscernible from their present counterparts, the property of presentness does not appear to be qualitative. Thus, the ontological properties appear to be non-qualitative.

My aim in this section has been to expand our intuitive, pre-theoretical conception of the non-qualitative as far as possible. A property, I have argued, might fail to be qualitative for a variety of positive reasons that are independent of the causal account: the logical properties fail due to their formality, the mathematical properties fail due to the special nature of their subject matter, and the ontological properties fail due to a combination of their non-relative status and their ability to divide even indiscernible duplicates. These properties are all negatively unified in this failure. But do they have anything in common beyond that? They might, for all I've said, just be a rag-tag band of properties without genuine unity.

4 Fundamentality and naturalness

The fundamental properties are sometimes said to be perfectly natural; they carve reality at the joints. These properties are supposed to play various roles. They are supposed to ground objective similarity, they are supposed to ground causal powers, and—more controversially—there are only supposed to be 'enough of them to characterize things completely and without redundancy' (Lewis 1986, p. 60). But we also learn that the perfectly natural properties are all supposed to be qualitative.³⁴ I don't take this narrow conception of naturalness to characterize the fundamental properties in general, but only the fundamental qualitative properties. The fundamental non-qualitative properties do not seem to ground—and they do not seem to be needed to ground—causal powers, and, as I hope to show, they can allow for some redundancy. They do, however, help to ground non-qualitative similarities. I shall take up each of these components in turn.

Let's start with the first component. Are there objective non-qualitative similarities? The haecceitist about individuals who denies overlap certainly seems to think so. She believes that there is a world with a qualitative history no different from our own where Socrates and Plato 'swap' their qualitative roles. At this world, Plato lives

³⁴ For Lewis, objective similarity is always qualitative. He thinks that the problem with unnatural properties is that '[t]hey pay no heed to the *qualitative* joints, but carve things up every which way' (1986, p. 59, emphasis added), and that the '[s]haring of [the perfectly natural, or sparse, properties] makes for *qualitative* similarity' (1986, p. 60, emphasis added). They help to give us 'a complete *qualitative* characterization of things' (1986, p. 60, emphasis added).

a life-history that is qualitatively indiscernible from Socrates' actual life-history, and Socrates lives a life-history that is qualitatively indiscernible from Plato's actual life-history. There is, on this view, an individual at our world and a numerically distinct individual at some other possible world who are non-qualitatively alike because they both enjoy the fundamental haecceitistic property *being Socrates*. This property corresponds to something like a haecceity: it is a kind of one over many, the enjoyment of which is both necessary and sufficient for being Socrates. Thus, given haecceitism without overlap, the fundamental haecceitistic properties appear to underwrite a kind of objective non-qualitative similarity.

I am no haecceitist. But I believe there are objective non-qualitative similarities, and will argue that they are underwritten by many of the properties mentioned in the previous section. I think, for instance, that actual objects are not only importantly different from merely possible ones, but importantly similar to each other as well. But actual objects are too qualitatively heterogeneous for their similarity not to spring from a basic source. This source cannot, however, be qualitative. For then an actual and a merely possible dollar would be guaranteed to differ in a basic qualitative respect and could never be qualitative duplicates. Actuality thus appears to underwrite a kind of non-qualitative similarity.

I also believe that there are non-qualitative similarities between ordered pairs of entities. Take, for example, the pair of the *sui generis* natural number two and itself, on the one hand, and the pair of my left arm and itself, on the other. I think these pairs resemble each other in an important respect: the number two is identical to the number two, and my left arm is identical to my left arm. The identity relation seems to be an important source of similarity between these pairs. But, as we observed above, the *sui generis* natural numbers do not appear to have qualitative properties, nor do they seem to bear qualitative relations to anything at all. So, if there is some kind of similarity here, it cannot be qualitative. The identity relation appears to underwrite a kind of non-qualitative similarity. (Similar considerations also apply to the parthood and composition relations.)

We might run arguments for the singleton and set membership relations as well. Suppose we believe in impure sets. Take the pair of the number two and its singleton, on the one hand, and the pair of my left arm and its singleton, on the other. These pairs resemble each other in an important respect. The singleton relation is an important source of similarity between them. Or take the pair of the plurality of *sui generis* natural numbers and the set of natural numbers, on the one hand, and the plurality of my body's atomic parts and the set of its atomic parts, on the other. These pairs also resemble each other in an important respect. The membership relation is an important source of similarity between them. But since the *sui generis* natural numbers do not themselves appear to stand in any qualitative relations, the singleton and membership relations appear to be sources of non-qualitative similarity.

I take these examples to show that there are objective non-qualitative similarities. Indeed, the properties in these examples have good claim to being among the ultimate grounds of similarity. And since it seems plausible to assume that a property is an ultimate source of similarity only if it is fundamental, there would thus appear to be fundamental non-qualitative properties. This result is intended to be independent of the causal thesis. It depends on only two things: first, a popular account of fundamentality

according to which a property is fundamental iff it is among the properties that ground objective similarity; and, second, the observation that the properties in question are, as argued in Sect. 3 above, non-qualitative. Does this show Lewis's characterization of naturalness is too narrow? Not quite. We also need to show that these fundamental non-qualitative properties are not apt to ground causal powers, and that they may admit of some redundancy.

Let's turn then to the second component. Are there fundamental properties that do not enter into any causal processes? I shall assume that a fundamental property can ground causal powers only if it is detectable in principle. For if a fundamental property plays a causal role—and thereby grounds a causal power—at some world, then it would appear to be detectable at that world: an observer or instrument should be capable of being affected in one way by the presence and in another way by the absence of that property. Indeed if we think, as David Lewis does, of physics as aspiring 'to give an inventory of natural properties' (1983, p. 27), then this project only makes sense if we take these properties to be detectable.³⁵ It should thus suffice to show that the proposed fundamental non-qualitative properties are undetectable.

It should be clear that actuality is undetectable. For actuality is plausibly *pervasive*: if any part of a world is actual, then every part of that world is actual. It is, as Bricker (2001, pp. 44–45) observes, unintelligible to suppose that we might find something non-actual if we just traveled to a remote enough corner of the world. But given the pervasiveness of actuality, nothing could be affected in one way by the presence of actuality and affected in another way by its absence. Actuality is thus undetectable.³⁶

It should also be clear that identity is undetectable. Let's focus on identity over time. I'll assume for the moment that material objects persist by enduring, that they are wholly present at every time at which they exist. Imagine that there are two molecule-for-molecule duplicate coffee mugs on my desk at all times from noon until one. But suppose that while one mug is the same throughout, the other is not. It is really just a continuous succession of distinct mugs. I contend that there would be no way to detect which mug persists for the entire hour and which does not. I could keep an eye or a hand constantly upon them, I could even monitor them with the most sensitive of instruments, but the results would be the same in each case. Nothing, it seems, could be sensitive to the presence or absence of identity from one moment to the next.³⁷ There would thus seem to be no way to detect identity over time. The real takeaway here is not that endurantism is false, but rather that our perceptual experience would be the same regardless of whether or not it were true. If we have reason to accept or reject endurantism, it would seem to have nothing to do with anything we could observe or detect even in principle. But given that endurantism is a view about strict numerical identity, the identity relation appears to be undetectable.

³⁵ But what about idlers: namely, 'those fundamental properties, if any, that are instantiated within the actual world, but play no active role in the workings of nature' (Lewis 2009, p. 205)? Are they qualitative? I guess it depends upon whether they *could* play an active causal role in the workings of nature. If they could but don't, that is no threat to their status as qualitative. But if they couldn't ground causal powers, it seems that they wouldn't count as qualitative.

³⁶ See Williams (1962, p. 751) for a similar argument.

³⁷ See Hume ([1739] 1888, pp. 253–254) for an argument along these lines.

It should be equally clear that parthood and composition are both undetectable (at least assuming, as we have, that they are fundamental logical relations). I will focus on composition. The Special Composition Question asks for the conditions under which some objects, the *x*s, compose something, *y* (see van Inwagen 1990). The only plausible, non-disjunctive answers to this question, given our assumptions, are nihilism (the view that the *x*s compose *y* whenever the *x*s are exactly one) and universalism (the view that the *x*s compose *y* whenever the *x*s exist). For assuming that composition is a logical relation, it must apply to any domain. But since composition applies to any domain, whatever informative, necessary, and sufficient conditions we might hope to give for when some objects compose something cannot themselves be qualitative (for these conditions are supposed to apply to objects that have no qualitative character whatsoever). And assuming that composition is also a fundamental relation, we cannot hope to grasp it merely by grasping the qualitative conditions under which concrete material objects compose something. For composition applies not only to concrete material objects, but to abstract mathematical objects as well, and anything we might plausibly say to account for when material objects compose a further object—such as when they are in contact, when they are fastened together, or when they constitute a life—is not also going to apply to mathematical objects such as the pure sets or the *sui generis* numbers. This would seem to rule out any plausible sounding moderate answers to the Special Composition Question. We are left, then, with either nihilism or universalism. I have been implicitly assuming that universalism is true. But whatever reason we have to decide between these views has, once again, nothing to do with anything we could observe or detect. For our perceptual experience would seem to be the same regardless of whether nihilism or universalism were true.³⁸ But if we cannot detect that, say, some particles arranged mugwise compose a mug rather than not, we cannot detect the presence rather than the absence of the composition relation. (Indeed assuming universalism, we can mirror the argument that actuality is undetectable. For any plurality of objects that we come across will compose something. But since composition always occurs, we cannot be differently affected by the presence or absence of the composition relation. It is undetectable.)

I also think that the singleton and set-membership relations are undetectable. Our perceptual experience would, I think, be the same whether or not there were impure sets. But if so, then we seem incapable of detecting the presence or absence of the singleton or set-membership relations. These relations thus appear to be undetectable.³⁹ (Indeed assuming that there are no impure sets whatsoever, these relations will again appear to be undetectable. For in this case, no part of any world will bear the singleton relation to anything at all. We would be incapable of detecting its absence rather than its presence. It would thus be undetectable in the relevant sense.)

Let's turn finally to the third component. Are there fundamental properties that allow for redundancy? The mereological relations of parthood, proper parthood, and overlap are all candidate sources of objective similarity. They are also interdefinable. But, as Theodore Sider (2011, pp. 217–222) argues, a non-redundancy requirement

³⁸ See Merricks (2001, pp. 8–9), Dorr (2002, Sect. 1.4.1), and Rosen and Dorr (2002, p. 155) for arguments along these lines.

³⁹ I take it that Maddy (1990) would disagree with this claim. For she thinks that we have the ability to detect certain impure sets.

on the fundamental would force us to make an arbitrary choice here. This would be an undesirable result. For objective similarity is not up to us in this—or, indeed, in any—way. The fundamental non-qualitative properties appear to allow for redundancy. But Sider’s argument also extends to properties that appear to be qualitative. The temporal relation *earlier than* and its converse *later than* both appear to be fundamental. They are also interdefinable. But taking only one to be fundamental is arbitrary, taking both is redundant.⁴⁰ Our choice of spatial distance relations is also caught between arbitrariness and redundancy: should we measure distances in meters, feet, or something else? Choosing only one is arbitrary, choosing them all is redundant. The fundamental qualitative properties appear to allow for redundancy as well.⁴¹ Redundancy appears to be unavoidable. Yet even if these properties allow for logical or modal redundancies, they might resist other forms of redundancy. If, for example, our catalog of fundamental qualitative properties were essentially causally redundant (and overdetermining), we would lack even defeasible reason to believe that only one property plays any given causal role. But whatever pressure there might be to say that the fundamental qualitative properties ground causal powers and hence form a causally minimal basis does not extend to the fundamental non-qualitative properties, since they are not themselves causally efficacious.

I think that the only thing it takes for a property to be fundamental is for that property to be an ultimate bearer of objective similarity. Objects that share these properties form broadly natural classes, which would appear to have a high degree of internal unity. This gives us a broad conception of naturalness. But there is a narrower one as well. Some fundamental properties not only make for objective similarity, but are also fit to play various causal roles. These are the fundamental qualitative properties. They correspond to the properties that Lewis often refers to as perfectly natural.

5 The unity of the non-qualitative

The picture developed in the previous section provides additional support for the causal thesis. But my aim is not just to unify the fundamental non-qualitative properties in their failure to ground causal powers, I also seek a positive characterization of their unity. This can be found in the source of their resistance to recombination.

The basic combinatorial idea is that ‘[a]ny pattern of instantiation of any fundamental properties and relations is metaphysically possible’ (Wang 2013, p. 52). The fundamental qualitative properties and relations appear to be subject to recombination. They are, by the causal thesis, apt to ground causal powers. But causation does not, by Humean assumption, involve necessary connections or exclusions. There might, however, be non-causal necessary connections and exclusions between fundamental qualitative properties and relations that are determinates of the same determinable.

⁴⁰ See also Sider (1993, Sect. 3.2.1).

⁴¹ I am assuming here that spatial, temporal, and spatiotemporal relations are all qualitative. I am, however, somewhat skeptical of this assumption. Spatial and temporal relations do not appear to play an active role in the workings of nature. And while the view that matter and spacetime causally interact (and hence that spatiotemporal relations play fundamental causal roles in general relativistic spacetime theories) might enjoy ‘common acceptance’, there are ‘reasons to regard [it] as questionable’ (Hoefler 2009, pp. 701–704).

Two problems arise for the basic combinatorial idea: the first involves exclusions of determinate properties, the second involves necessitations of determinate relations.

Let's start with the exclusion problem.⁴² The instantiation of a determinate property appears to necessarily exclude the instantiation of other determinates of the same determinable. So, for example, nothing could instantiate both the property *having exactly 5 kg mass* and the property *having exactly 1 kg mass*. But these properties appear to be fundamental: they appear to underwrite objective similarities. Any pattern of instantiation that admits coinstantiations of distinct determinate properties of the same determinable does not seem to be metaphysically possible. We can, however, maintain that possibility is preserved across patterns of instantiation that differ only by wholesale permutations, wholesale replacements, and wholesale eliminations of fundamental determinate monadic properties.

Let's turn next to the necessitation problem.⁴³ The instantiation of certain determinate relations appears to necessitate the instantiation of further determinate relations. So, for example, the determinate relations of spatial distance are symmetric and obey the triangle inequality.⁴⁴ But these relations appear to be fundamental: they appear to underwrite objective similarities. Any pattern of instantiation of fundamental relations of determinates of the same determinable that violates certain formal constraints does not seem to be metaphysically possible. We can, however, maintain that possibility is preserved by a pattern of instantiation that removes all fundamental determinates of the same determinable relation from an individual.

A fully worked-out theory of recombination would need to address these problems. It would provide us with the true principles of recombination. I shall not attempt to formulate such principles here. But such principles should be consistent with the claim that any pattern of instantiation of determinably-distinct fundamental qualitative properties and relations is metaphysically possible.⁴⁵ For there are no necessary connections or exclusions between determinably-distinct fundamental qualitative properties.

The fundamental non-qualitative properties are a different story. They appear to involve necessary connections and exclusions that have nothing to do with determinates or determinables. The fundamental haecceitistic properties don't appear to be determinates of any determinable. But they don't appear to be recombinable either. If they were, then, as Cowling (forthcoming, Sect. 1.3) points out, there would be worlds where *being Socrates* is enjoyed by thirty-three distinct individuals. But there are no such worlds. The fundamental haecceitistic properties are not alone in their resistance to recombination: actuality, identity, parthood, composition, singleton and set-membership all resist it as well, and the source of their resistance has nothing to do with determinates or determinables. Actuality is, as observed above, pervasive:

⁴² See Wang (2013, pp. 542–544) and Bricker (2017) for discussion of the exclusion problem. Wang argues that the principles of recombination should either be amended or else abandoned. Bricker attempts to tackle the problem head on by arguing that determinables rather than determinates are fundamental.

⁴³ See Wang (2013, pp. 539–541) for discussion of the necessitation problem.

⁴⁴ The triangle inequality tells us that, for any points x , y , and z , the distance between x and z is less than or equal to the sum of the distance between x and y and the distance between y and z ; or, more formally, that $d(x, z) \leq d(x, y) + d(y, z)$.

⁴⁵ We can say, roughly, that properties are *determinably-distinct* when they are not determinates of the same determinable. See Saucedo (2011, p. 246) for a more precise definition.

everything at a world is actual if anything is. It is simply unintelligible to suppose that there is a world where some things are actual and other things are not. Identity obeys a principle of indiscernibility: if objects x and y are identical, then x and y are (absolutely) indiscernible. It is unintelligible to suppose that there is a world where a duplicate of my wallet is identical to a duplicate of my cellphone.⁴⁶ Parthood is transitive. It is unintelligible to suppose that there is a world where a leg is part of a table and a particle is part of the leg, but the particle is not part of the table. The singleton relation appears to be generative: whenever something exists, there is singleton set of that thing. If that's right, then it would be impossible to imagine a part of a world that does not have a singleton.

These observations suggest that there is a unified phenomenon here. We can make good sense of this phenomenon if we take the fundamental non-qualitative properties to be those properties that impose especially strong constraints on their instantiation. They give rise to necessary connections and exclusions that have nothing to do with determinates or determinables, and thus are not subject to even the true principles of recombination. This yields the following:

The Necessary Connections Thesis: a fundamental property is *non-qualitative* if and only if it is not subject to the true principles of recombination.⁴⁷

We have arrived at a positive characterization of the fundamental non-qualitative properties.

A potential problem arises here.⁴⁸ Suppose that worlds are unified by fundamental qualitative external relations.⁴⁹ But, as noted above, we should be able to completely sever these relations from an individual. If, however, we take away all the fundamental qualitative external relations that connect my coffee mug to the rest of the world, the result should be a world where a coffee mug is externally isolated from a coffee pot. But there are no worlds where two things fail to stand in qualitative external relations (or chains of qualitative external relations) to each other. For, by assumption, worlds are unified by fundamental qualitative external relations. Recombination of the fundamental qualitative relations appears to take us from a possibility to an impossibility. The necessary connections thesis thus appears to be false.

The problem depends upon the claim that if there is no world at which the fundamental properties are arranged in a certain pattern, then it is not possible for the fundamental properties to be arranged in that pattern. I think this claim is false. But something very much like it is true. Instead, I accept the following: if there is no world *or plurality of worlds* at which the fundamental properties are arranged in a certain pattern, then it is not possible for the fundamental properties to be arranged in that pattern.⁵⁰ I grant that there is no world where a coffee mug is externally isolated from a coffee pot. But I contend that there is a plurality of worlds—namely, a

⁴⁶ See, however, Baxter (2014, pp. 247–249) for an argument to the contrary.

⁴⁷ Bricker (2006, pp. 49–50) endorses something like this thesis. He endorses the 'if' direction. I'm not sure whether he would also endorse the 'only if' direction.

⁴⁸ It is a transformed version of the island universe problem for modal realism. See Bricker (2001).

⁴⁹ This view is suggested by some remarks in Bricker (1996, p. 237 n 22, 2008, p. 131 n 12) and appears to be endorsed by Cowling (2012, p. 407).

⁵⁰ See Bricker (2001, 2006) for a defense of this move.

world otherwise exactly like our own which removes (duplicates of) everything except my coffee mug and a world otherwise exactly like our own which only removes (a duplicate of) my coffee mug—at which the fundamental properties are arranged in the desired pattern. So, when properly understood, the necessary connections thesis is not violated.

We can capture the dual unity of the qualitative/non-qualitative distinction if we accept both the causal and the necessary connections theses: the fundamental qualitative properties are unified by their aptitude to play various causal roles, while the fundamental non-qualitative properties are unified by the source of their resistance to recombination. This dual unity appears to be reinforced by the following:

The Humean Link: a fundamental property plays a fundamental causal (or nomic) role at some world if and only if it is subject to the true principles of recombination.

The plausibility of this link lends mutual support to the causal and necessary connections theses.

The positive account of the fundamental non-qualitative properties developed here, unlike the positive account of the qualitative properties developed above, is not intended to be metaphysically neutral. It is committed to the existence of worlds that differ qualitatively but not structurally. For assume that unit positive and unit negative charge are fundamental determinates of the same determinable. We have, as noted above, seen no reason to prohibit patterns of recombination whereby unit positive and unit negative charge switch their causal and nomic roles. There would thus seem to be worlds that differ from our own by a permutation of fundamental qualitative properties (see Lewis 2009, pp. 205–12). It thus fails to be neutral between quidditism and structuralism.

Its relationship to the debate between Humeans and anti-Humeans about laws and causation is more complicated. Some anti-Humeans will deny the Humean assumption that the properties that ground causal powers can be recombined. A causal essentialist might claim that what it is to be charge is to play various causal roles and that these roles are holistically interdefined. Some of the properties that ground causal powers would, on this view, be interdependent and thus not subject to recombination. The causal essentialist might thus deny the necessary connections thesis.

Other anti-Humeans can accept everything we have said—provided that they take their relation of necessitation to be non-qualitative. Suppose that, as things stand, there aren't any deep causal connections between any events. Our world is instead one where causal successions are nothing more than accidental regularities. The causal connections at our world are thin and non-oomphy. Now consider another world, otherwise just like our own, where these regularities are underwritten by irreducible relations of causal or lawful connection. These oomphy causal connections cannot be imposed upon the world wily-nilly. They must respect its regularities and thus resist recombination. I think that it is plausible to say, in this example, that our Humean world of accidental regularities is qualitatively indiscernible from the non-Humean world with irreducible causal connections. For there would be no way for us to tell which world we were in, these worlds look exactly the same from the inside: causal or lawful connections are no more qualitatively robust than accidental regularities.

We might take these necessary connections to provide the best explanation of some observed phenomenon, but they would not thereby be observable or detectable in any way. The fundamental qualitative properties thus appear to provide a Humean base that may sometimes be augmented with a non-Humean superstructure. The necessary connections thesis plausibly predicts that the irreducible causal connections that make up this non-Humean superstructure are non-qualitative relations.

Does this violate the Humean link? It will do so only if these irreducible causal connections are themselves apt to play causal roles. But these fundamental non-Humean relations between events do not seem to be causing—or even apt to cause—anything at all. For if they were, then they should be detectable. But it does not seem possible for there to be a device that would be differently affected by their presence or absence. The necessitation relation is not subject to principles of recombination, but neither is it apt to play causal roles. The Humean link has not been violated. I take this to be an interesting and potentially satisfying result.

6 Conclusion

Let us take stock. I have argued that the traditional understanding of the non-qualitative properties as haecceitistic is far too narrow. I have also argued that the dual-unity of the qualitative/non-qualitative distinction is nicely captured by the following Humean picture:

The Causal Thesis: a fundamental property is *qualitative* if and only if it plays a fundamental causal (or nomic) role at some world.

The Necessary Connections Thesis: a fundamental property is *non-qualitative* if and only if it is not subject to the true principles of recombination.

The Humean Link: a fundamental property plays a fundamental causal (or nomic) role at some world if and only if it is subject to the true principles of recombination.

I have not argued that this is the only way to capture the dual-unity of the distinction. But this Humean picture gains strong—albeit indirect—support given both the intuitive dual-unity of the distinction and the overall plausibility of the causal thesis.

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