MELLOR'S QUESTION: ARE DETERMINABLES PROPERTIES OF PROPERTIES OR OF PARTICULARS?

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ABSTRACT

One can distinguish two basic competing theories of determinables that address Mellor's Question, implicitly if not explicitly. On the *second-order theory*, determinables are second-order properties of determinate properties; on the *second-level theory*, determinables are first-order properties of the particulars with these determinate properties. Given that ontological parsimony is vital to metaphysics, it is of utmost importance which of the two theories is true. Firstly, I argue that the second-level theory offers the best explanation of the *explananda* (though the race is close), including the important but neglected phenomenon of "intermediate determinables". Secondly, by paying attention to intermediate determinables and instantiation of higher-order properties, I argue that the second-level theory also is more ontologically economical. For these two reasons, this theory is preferable.

1. INTRODUCTION: THE PROBLEM OF DETERMINABLES

Some properties, called "determinates," form groups, called "determinables," whose members are mutually incompatible in the sense that no particular object can have more than one of them at a time. Different determinates of the same determinable both resemble and differ from each other in the same respect. For instance, 2, 23, and 100 kg resemble and differ with respect to mass; 4, 56, and 127 centimeters resemble and differ with respect to length; and 1, 37, and 1003 °C resemble and differ in the respect of temperature. As for these determinate properties, so for the particulars which have them. Objects which weigh 2, 23, and 100 kg also resemble and differ in respect of mass, and similarly in the other cases.[1]

Determinates and determinables, and the relationship between them, give rise to a number of *explananda*, sometimes jointly known as "the problem of determinables." The resemblance and difference between determinates of masses, lengths, etc. (as well as the resemblance between particulars with these determinates) may be expressed by saying that they (or the particulars) are *both the same and different* in those determinable respects. Since this expression obviously seems problematic, if not contradictory, the determinables in respect of which particulars and determinates both resemble and differ also seem problematic. We must explain how it is possible for particulars or determinates to resemble and differ in the same determinable respects. Furthermore, particulars apparently always possess both determinates and determinables. But what then is the relation between a particular's possessing a determinate and the same particular's possessing the corresponding determinable? The following seems to hold. (1) What we might call the "top-down entailment": if a particular has a certain determinable, then it follows that it has one of the corresponding determinates, but no particular determinate is entailed.[2] (2) What we might call the "bottom-up entailment": if a particular has a certain determinate, then it follows that it has the determinable of this determinate. We want an explanation of these entailments. Note that the incompatibility of determinates is not included in any of these *explananda*, as I take it to be simply a stipulation.

So, the standard problem of determinables includes these four *explananda*: the resemblance and difference between particulars or determinates in the same determinable respects, the top-down entailment, and the bottom-up entailment. Furthermore, a fifth *explanandum* should be added, that of allowing for the phenomenon of what I call *intermediate determinables*, i.e. determinables that themselves are determinates of a more general determinable. However, this additional *explanandum* is best introduced in a separate section (section 3).

2. THE PROBLEM OF DETERMINABLES: TWO THEORIES

Theorists differ in what they consider to be fundamental to a theory of determinables and determinates: the respects determinates have in common or the respects particulars have in common. This difference goes hand in hand with the distinction between determinables as properties of properties and determinables as properties of particulars. I shall call the issue of whether determinables are indeed properties of properties or properties of particulars Mellor's Question. I do so in recognition of the fact that D. H.

Mellor very clearly has formulated the problem of determinables as this question (1995, chapter 16; Maurin and Persson 2000). However, one can focus on different aspects of Mellor's Question, so to speak. Mellor himself is mainly concerned with the relationship between laws of nature and determinables vs. determinates. By contrast, my own examination of the issue here attends especially closely to the "ontological order aspect" of Mellor's Question, i.e. to whether determinables are first-order or higher-order properties. As I shall explain in the next section, this focus is a consequence of my interest in Armstrong's metaphysics of (higher-order) properties, combined with a conviction that ontological parsimony is of utmost importance.

Using terminology from Newman (1992, chapter 5), corresponding to the first option for answering Mellor's Question, the *second-order theory* (e.g., Prior 1949; Mellor 1995, chapter 16) explains the resemblance of particulars with mass not by the property mass but by means of the second-order property of being a mass, which all its determinates have in common; and similarly for other determinables. By contrast, corresponding to the second option, the *second-level theory* (e.g., Newman 1992; Funkhouser 2006) claims that determinables are properties of particulars, not of determinates.[3] Hence, on this theory, there is no such property as being a mass. But then it must explain what different masses have in common in some other way. As we shall see, this can be done by maintaining that determinates (e.g., 2 kg) stand in a certain *sui generis* relation to their determinable (e.g., having mass).

Armstrong is mostly skeptical about determinables, but it is nonetheless interesting to consider if he construes them in the second-order or the second-level fashion. He mainly invokes the notions of determinables and determinates in two cases: in connection with his discussion of the resemblance of universals (e.g., 1978, II, chapters 21-22; 1997, section 4.1) and in the context of his discussion of laws of nature (e.g., 1997, chapter 16). In the first case, he vacillates between the two approaches, at times interpreting determinables in the second-order fashion (e.g., 1978, II, p. 106) and at other times in the first-order fashion: "Properties [of particulars] such as having length, having mass and having color are determinables" (1997, p. 48). However, he also leaves a door open for the second-order approach: "[W]hen two things have different lengths, then there is [a determinable] that both the things, *or perhaps* both the lengths, have” (ibid., p. 50, my emphasis). By contrast, when examining laws of nature, he unambiguously goes second-order, as it were: he is clear that being a mass “is a determinable, and the individual mass-universals are determinates falling under that determinable” (1983, p. 114). On a historical note, Armstrong’s stance changed during his middle-period (mid-1970s to late 1990s). In the beginning, he rejected determinables entirely – whether construed in the first-level or the second-order manner 1978 (II, chapters 21-22). But by the time of his (1983), he was not sure he was right in this. He eventually accepted them, in the manner of the second-order theory, in at least one case, namely that of functional (determinable) laws of nature (1997, p. 246).

An important terminological proviso is required at this point. Strictly speaking, the notion of “determinable” as an ontological term is not neutral between the two theories. On the second-order theory, “the determinable” is a property of determinate properties; on the second-level theory, “the determinable” is a property of particulars with determinates. This difference is like black and white. If the former theory is correct, there are no such things as “determinables of particulars”; if the latter is correct, there are no such things as “determinables of determinates”. This contrast between the two contestants can perhaps be brought out by means of two notions. One is the notion of attribution of determinable features – where “determinable features” is taken as a merely heuristic term picking out data and *explananda*. The other is the concept of truthmaking, a concept I shall occasionally invoke in this paper in any case. One might put it as follows: there are (i) statements that attribute determinable features to particulars, such as “This rod has length,” and there are (ii) statements that attribute determinable features to determinates, such as “9.8 kg is a mass.” On the second-order theory, the truthmakers of (i) are the particulars’ having determinates, say, the rod’s having a length of 56.2 cm, which instantiate a second-order property, called “the determinable” (being a length). Truthmakers of (ii) are instantiations of this second-order property by one of its determinates (such as 9.8 kg’s instantiation of being a mass). By contrast, on the second-level theory, the truthmakers of (i) are the instantiation by particulars of a first-order property, likewise called “the determinable” (having length); and the truthmakers of (ii) are the particulars’ instantiating determinate properties which stand in a certain *sui generis* relation to this first-order property. Consequently, one might argue that expressions which wrongly imply that "determinable" is neutral between the two candidate theories should be changed. For example, the subtitle of this paper might thus be rephrased to something like "Do Truthmakers of Statements of Determinable Features Involve Either Properties of Properties or Properties of Particulars?" In any case, such inelegant reformulations are fortunately unproblematic in our context and can, for the sake of simplicity, be taken as read, both in the title and elsewhere in the paper.

However, this terminological point reveals that the two theories share a common lingo indirectly, as it were: each of them is translatable into the semantic language of truthmaking. We can therefore allow for a considerable measure of flexibility when discussing them. For example, one second-level theorist, Johansson (2000), occasionally even adopts expressions of *the second-order theory*, such as "all color-determinates have something in common, namely the ontological determinable of color" (p. 108). Taken literally, this statement is flatly inconsistent with the second-level theory. But as Massin (2013) points out, this usage should here be seen as merely a useful abbreviation of what, in effect, are the second-level theory's truthmakers of (ii).

3. ARMSTRONG'S REALISM, MELLOR'S QUESTION, AND LEWIS'S RAZOR

My general approach is realist with regard to properties, including determinables. Determinables are not just predicates, nor are they just concepts. The sense of realism at issue can be elucidated by appealing to the familiar and plausible view that properties fall into sparse and abundant ones (Lewis 1983). The former properties carve reality at its joints and are relatively few in number; the latter correspond by definition to any predicate (and so are numerous). There are, of course, abundant determinable properties, but they are not relevant for the metaphysical purposes of this paper. Thus, when I speak of determinables I mean *sparse* determinable properties, and I shall generally take this as implied unless the specific contexts benefits from making it explicit. In Armstrong's terminology, the distinction between sparse and abundant properties corresponds to the difference between "first-class properties" on the one hand and "second- and third-class properties" on the other (1997, section 3.9). Another notion that can plausibly be invoked in this context is Lewis's distinction between natural and unnatural properties, which, roughly speaking, we can take to be co-extensional with sparse and abundant properties, respectively.[4] A familiar example that illustrates this distinction well is the contrast between being green and being grue (i.e., either green if examined on or before 2500 A.D. or blue otherwise). Lewis maintains that naturalness of properties comes in degrees, with "perfectly natural" properties at one end of a spectrum, and gerrymandered and gruesome properties at the other end. As we shall see in the following section, if this is correct, it may be useful when it is unclear if a putative property is sparse or abundant.

In accordance with the distinction between sparse and abundant properties, there is no one–to–one correspondence between predicates and properties. As Armstrong says:

> Given a predicate, there may be none, one or many [sparse properties] in virtue of which the predicate applies. Given a [sparse property], there may be none, one or many predicates which apply in virtue of that property. (1978, II, p. 9)

Accordingly, one cannot "read off" the sparse determinable property from a predicate (or concept), read off, for instance, that there is such a determinable as length from the fact that there is the predicate "length" (or concept "length"). However, for our purposes it is sufficient just to *assume* that determinables which I use as examples are real – or more precisely, assume that they are *bona fide* sparse determinables – since we are not here trying to establish which determinables there are.

Given this, it is perhaps not surprising that some realists about determinates are nevertheless non-realists about determinables. As we have already seen, early in his middle-period, Armstrong is (1978). One of his main reasons for being so is his view that if determinates had a determinable in common, they would be identical and different in the very same respect, which he thinks is impossible (II, p. 106). If correct, this may be a serious problem for the second-order theory, as we shall see below (section 6). Other philosophers, such as Lewis (1986), hold that real properties, the properties that carve reality at the joints, are "highly specific" (p. 60) and hence reject determinables as such properties.[5]

Someone of a realist bent might be inclined to treat determinables as disjunctions of their determinates. The top-down entailment would of course be easy to explain if this were correct. But in my view, this is not a viable position, for two reasons. Firstly, I do not think there are any (sparse) disjunctive properties. Secondly, even if there were, they would be unable to explain resemblance and thus could not be determinables. For example, even if particulars with temperatures of 31 °C and 250 °C had a property of being 31 °C or 250 °C in common, that would not explain their resemblance.

The fact, as I take it to be, that there are no disjunctive properties finds support in a number of arguments in the literature, including Armstrong (1978; 1997), Mellor (1995) and Meinertsen (2018). Space does not permit rehearsal of these arguments here, except for one of them, which one might call "Armstrong's argument from lack of commonality." It deserves to be summarized here, for two reasons. Firstly, it lends itself particularly well to the current topic; secondly, it has been vehemently opposed by a proponent of disjunctive properties, Louise Antony (2003). Armstrong's argument is as follows:

> [D]isjunctive properties offend against the principle that a genuine property is identical in its different particulars. Suppose *a* has property P but lacks Q, while *b* has Q but lacks P. It seems laughable to conclude from these premises that *a* and *b* are identical in some respect. Yet they both have the "property", *P or Q*. (1978, II, p. 20)

Analogously, by this argument, if a determinable is construed as a disjunctive property with its determinates as its disjuncts (e.g., mass as the disjunction of all determinate masses) the determinable is not a real property (i.e., it is merely abundant), since the disjuncts are not identical in some respect.

However, Antony maintains against Armstrong that there *is* (in some cases) "commonality" – something identical – between the particulars that possess each disjunct of a disjunctive property. She considers the example of cows and bulls. Obviously, the predicate "cow or bull" applies to all cows and bulls. However, in German, the noun "*Kuh*," although the counterpart of the word "cow," can (also) be used to denote either a cow or a bull. But, as she rightly points out, "surely the mere fact that English speakers have only a (complex) disjunctive term to do what German speakers can do with a primitive term has no bearing on the relation between the properties the two terms express" (2003, p 10). And in her view the property they express, the respect in which they are identical, is the respect of species membership, i.e. they both possess the property of being a *Bovidae Bos taurus* (being a domesticated bovine). And similarly in many other cases, she implies: there is a "real commonality" between the particulars possessing the disjuncts.

But Antony's argument is a strawman fallacy. Armstrong would not deny that *a* (a cow) and *b* (a bull) have something in common in virtue of which "cow or bull" (or "*Kuh*") applies to each of them, viz. being a domesticated bovine. But the premise in his argument is, as the quoted passage demonstrates, that "*a* has property P but lacks Q, while *b* has Q but lacks P". And this is reasonable: intuitively, *P or Q*, being a complex property, can only be shared by *a* and *b* if *a* does *not* (completely) lack Q and *b* does *not* (completely) lack P. By contrast, in Antony's example, the property of being a domesticated bovine is *common* to *a* and *b*. Of course, the bull has a property of "being a bull" and the cow may be said to lack it, while the cow has the property of "being a cow" and the bull may be said to lack it, but these are merely *abundant* properties. To claim that they are sparse, as Antony might do, would probably be to beg the question against Armstrong.

Moreover, as mentioned, Armstrong's argument from lack of commonality is just one among several arguments against disjunctive properties.[6] So, all in all, it seems clear that realists are right to deny a treatment of determinables as disjunctive properties. In addition, the rejection of these properties may be bad news for the second-order theory since, as we shall see below (section 5), it may be a risk of commitment to them.

The issue of disjunctive (and other abundant) properties vs. sparse properties is intimately related to the topic of *ontological economy*. Let me therefore finish this section with some remarks on it. As indicated previously, my concern with Mellor's Question to a large extent springs from an interest in the metaphysics of properties found in much of Armstrong's work (1978; 1983; 1997), combined with a belief that ontological economy is key to deciding between competing metaphysical theories. On Armstrong's metaphysics, which gives a universal-realist account of (sparse) properties, it is of great importance whether or not there are (sparse) higher-order properties, once the more basic question of whether or not there are (sparse) first-order properties has been settled. I agree that this is indeed important, and for our purposes the most relevant reason for this is that, roughly, sparse properties are ontologically costly whereas abundant ones are not. The view that there are no higher-order properties was known as "elementarism" in Gustav Bergmann (1957), but since he failed to distinguish between sparse and abundant properties, his actual arguments for elementarism are not useful in the present context. However, if elementarism is reinterpreted as a view about sparse properties, it is an appealing position, for it seems to be the most ontologically parsimonious theory. The reason for this is two-pronged as follows. (1) Properties of different orders arguably belong to different ontological kinds or categories. This is prima facie due to the facts that (i) the order of a property is part of its basic or fundamental nature, such that no property is of one order in one instantiation and of a different order in another instantiation – this consequence is Armstrong's Principle of Order Invariance (1978, II, pp. 141-43); and (ii) an ontological kind or category is a classification of entities based on their basic or fundamental natures. (2) When it comes to ontological economy, we should in my view endorse "Lewis's Razor" on which (sparse) kinds or categories of entity, as opposed to instances of those kinds or categories, carry the decisive ontological cost (Lewis 1973). So, other things being equal, a theory that is not committed to (sparse) higher-order properties is preferable. Note that the "other things being equal"-qualification is required, since it is only if an "elementarist" candidate theory explains the *explananda* as well as a "non-elementarist" competitor that the former is preferable. In a nutshell, given Lewis's Razor and Armstrong's realism about properties, Mellor's Question is imperative.

4. INTERMEDIATE DETERMINABLES

As mentioned above, the problem of determinables includes, or ought to include, the phenomenon of intermediate determinables as an *explanandum*. They are such a neglected issue that they deserve a separate section.[7]

Consider the property red (being red, redness). It is a color and hence presumably a determinate of color. But the different shades of red (scarlet, crimson, etc.) are determinates of red. Hence, it seems to be both a determinate and a determinable. Similarly for green, blue, yellow, etc. By contrast to these, the determinables we met in section 1 (mass, length, temperature, etc.) and other physical quantities seem not themselves to be determinates relative to a determinable of a higher order or level, since they are not incompatible (cf. Johnson 1921). They can therefore be called "absolute determinables." On the other hand, it may be claimed that each of the determinates we have seen could be determinables of even more determinate properties. But it is certainly not obvious that there are such hierarchies of properties linked by the relation between determinates and their determinables. In any case, quite a few theorists believe that there are "absolute determinates," as they are often called since Johnson (1921.), that is, determinates which are not themselves determinables (e.g., Newman 1992; Armstrong 1997). They denote them with expressions like "fully determinate" (Newman 1992, p. 102), "one meter exact" and "absolutely precise shade of color" (Armstrong 1997, p. 48). Accordingly, if an object weighs exactly 2.14 kg, then 2.14 kg in mass is said to be an absolute determinate. Any determinables in between an absolute determinate and its absolute determinable I shall call "intermediate determinables."

To accommodate intermediate determinables we must modify the view stated above that all determinates of a common determinable are mutually incompatible (section 1), because, it may be claimed that, for instance, scarlet and red are both determinates of color but not incompatible. The reason is that they are not at the same level of determinateness (Searle 1959).

However, it seems to me that the example with red and scarlet just given is not entirely correct. I agree that colors seem in some objective way to divide into more than two levels. But as Newman (1992, p. 110) points out, the term "a color," as used in ordinary language, is ambiguous: it can stand both for one of the colors red, green, blue, etc. and for a *shade* (absolute determinate) of these. To be precise, let us call the former "spectral colors." Hence, on the second-order theory, the three-tiered structure of colors is something like this:

(i) Absolute determinates: scarlet, crimson, bottle-green, cobalt, and all the other shades,

(ii) intermediate determinables: (being a) red, (being a) green, (being a) blue, etc.,

(iii) absolute determinable: (being a) spectral color.

On the second-level theory, the absolute determinates are obviously the same as on the second-order theory, but the intermediate and absolute determinables are different:

(ii*) Being red, being green, being blue, etc.,

(iii*) being spectral colored.

While colors thus clearly illustrate the phenomenon of intermediate determinables on both theories, two provisos about them should be mentioned. Firstly, it might be disputed that colors have a natural clustering and therefore intermediate determinables. For instance, it seems that the spectral colors shade into one another, thus making the extensions of “blue,” “green,” “red,” etc. arbitrary in that we decide which shades are to be included in them (cf. Elder 1996). However, in my view this is not a fatal objection, since the overlap of spectral colors does not affect the existence of paradigmatic shades. Secondly, the ontological status of colors is of course problematic, because they are secondary qualities. But this fact affects the topic of intermediate determinables no more than other ontological disputes where philosophers often cite colors and other secondary qualities as examples of genuine properties (such as the problem of universals). To be sure, the nature of secondary qualities might spell trouble for some aspects of these discussions. Fortunately, however, this complication does not detract from the value of the argument of this section: all we need here is to show which structure obtains *if* there are intermediate determinables. And since colors, even if they are only a kind of toy example, at least suggest that there could be, a theory of determinables and determinates ought to allow and be able to explain them.

The case for intermediate determinables might still be stronger if they could be illustrated by primary qualities. But, as indicated above, there seems to be no intermediate determinables among primary qualities. Consider for instance the determinables mass, temperature, and length mentioned earlier. An apparent intermediate determinable of any of these properties, being 2–3 kg, for example, with the absolute determinate 2.14 kg, say, seems to be just a sub-set of its determinates. Thus, I do not think we should maintain that the predicate “2–3 kg” corresponds to a determinable.

Someone might object that being 2–3 kg seems to have the distinctive character of genuine determinables. That is, it seems to meet the condition of possessing (i) the definitional mutual incompatibility of (same-level) determinates under the determinable and giving rise to (ii) the five *explananda* for a theory of determinables (section 1). Firstly, a particular certainly can possess at most one value within the range 2–3 kg, so the definitional condition is met. Secondly, the (conditions corresponding to the) *explananda* seem to be met too, as follows. Resemblance and difference of determinates or particulars in a determinable respect are satisfied, since the specific values between 2–3 kg or particulars with them seem to both resemble and differ in a determinable respect: precisely the respect of being 2–3 kg. The top-down entailment holds, since, in a similar fashion, any particular with the property of being 2–3 kg must have some determinate value, but the property does not entail any particular value in the range. Next, being 2–3 kg also exhibits the bottom-up entailment: a particular with one of these determinate values in its range possesses it. Finally, it allows for intermediate determinables: trivially, any sub-range of 2–3 kg, such as 2.4–2.5 kg, is a further intermediate determinable with being 2–3 kg as *its* determinable.

However, two replies can be made in response to this objection. Firstly, it seems arbitrary to single out 2–3 kg rather than any of the other infinitely many – presumably uncountably many – ranges of mass. True, as mentioned in the previous section, naturalness of properties comes in degrees, with perfectly natural properties at one end of the spectrum and “gerrymandered and miscellaneous” properties at the other (cf. Lewis 1983, p. 346). Perhaps being 2–3kg is just a determinable with a low degree of naturalness, close to the “gerrymandered and miscellaneous”-endpoint? However, I think that properties at this end of the spectrum are not sparse. Being 2–3 kg and its likes are *too* arbitrary to count as a sparse determinable, and hence it is not relevant to our purposes. Secondly, even if this reply is unsatisfactory, the property fails to be sparse for another reason: it is explanatorily redundant, since it accomplishes no explanatory task that is not already carried out successfully by its absolute determinable, i.e. mass. For example, the resemblance and difference of determinate values within the range of 2–3 kg is already explained by mass; and similarly for the other *explananda*. It seems highly implausible that a property redundant in this sense is sparse.

Someone might instead object that determinables such as mass and charge, which I have treated as highest-level determinables, *themselves* are intermediate determinables, since they are determinates of the determinable *physical property*. But this objection fails too. Firstly, mass and charge clearly seem to be at the same level of determinateness, and yet they are not incompatible; hence, by definition, they are not determinates (intermediate determinables) at the same level. No explanation of why the appearance of same-levelness is deceptive seems available. Secondly, and more importantly, even if *per impossibile* they were determinates at the same level, there would be no plausible candidate for a determinable for them. For *physical property* is a *genus* with mass and charge as *species*. The genus-species relationship is different from the relationship between determinables and determinates. The reason is that a species can be defined *per genus et differentium*, such as being a man as the conjunction of being a human and being rational. In other words, being an instance of a species is being something in addition to being an instance of the genus: being a man is being rational in addition to being an animal. And, *pace* Fales (1990, chapter 9), being an instance of a determinate is not anything in addition to being an instance of the determinable. For example, being a particular with a determinate mass is not something in addition to being a particular with mass.

5. THE SECOND-ORDER THEORY

Let us recapitulate the *explananda* of a theory of determinables and determinates: the bottom-up entailment, the top-down entailment, and the combination of resemblance and difference in what appears to be a single respect for both particulars and determinates. In addition, we want to allow for the possibility of intermediate determinables. Keeping in mind that only relatively brief explanations are required for our purposes, let us now see how the second-order theory fares with these *explananda*.

It can explain the bottom-up entailment. If a particular instantiates a determinate, it is true that it has the corresponding determinable. The truthmaker of this truth is that the particular instantiates a determinate which instantiates the determinable. So, a particular has a determinable not in the sense of instantiating it, but only in the derivative sense of instantiating a determinate which in turn instantiates the determinable. And since this is the only way in which a particular has a determinable, it cannot have a determinable without having one of its determinates, and hence the top-down entailment is also explained.

Next, corresponding to this derivative sense of having a determinable, the explanation of resemblance in a certain respect for particulars is made in the following way: they do not have a determinable in common, but instead it is true of each of them that it has a determinate which instantiates a certain determinable.

The difference of particulars in a certain respect amounts to the difference of their determinates in the same respect. The latter is just the difference of determinates (of a given determinable). However, this difference in turn presupposes the difference of properties *simpliciter,* and hence their criterion of identity. And providing this is a difficult job; in fact, it is probably impossible, as it seems any such criterion presupposes the identity of properties. Indeed, it seem that, as Armstrong puts it, “sameness and difference of property are far too fundamental to be defined” (1978, II, p. 46). Fortunately, since this fact is common to second-order and second-level theories, we need not discuss the difference of determinates in what follows.

Finally, the resemblance of determinates of a given determinable is explained simply by their having a second-order property – the determinable – in common.

An objection to the second-order theory concerns its attempt to explain the respects of similarity and difference between particulars: this attempt fails, it might be claimed, as the derivative property of the form “having a determinate which instantiates a determinable” is not a sparse property. For on one plausible interpretation it amounts to having *one or another* determinate which instantiates a determinable, and since “one or another determinate which instantiates a determinable” refers to a disjunction of determinates, the derivative property is plausibly a disjunctive property. But as we saw above (section 3), there are no disjunctive properties.

However, a proponent of the second-order theory might reply that it is not committed to disjunctive properties. For instance, they might hold that all there is to the theory’s explanation at this point is an existentially quantified statement along the lines that particulars x and y resemble in determinable respect D if and only if there are determinate properties $\textsc{d}$ and $\textsc{d}'$ such that x has $\textsc{d}$ and y has $\textsc{d}'$ and there is a second-order determinable property D such that $\textsc{d}$ and $\textsc{d}'$ have D. And, the reply continues, there is no quantification over disjunctive properties in this statement. But while I think this response looks attractive, I believe that a full assessment of its ontological underpinning requires identification of the truthmakers of such statements. It would take us too far afield to pursue this task here. But at least we *can* conclude that it is unclear how to interpret the second-order theory at this point.

Finally, let us examine if the second-order theory can handle intermediate determinables. One might suspect that it cannot without contradicting a version of the Principle of Order Invariance. Consider the truths (1) “scarlet is a color,” (2) “red is a color,” and (3) “scarlet is a red.” (3) is made true by red’s being a second-order property. One might think that (1) and (2) are made true by color’s being possessed both by the first-order property scarlet, and thus being second order, and by the second-order property red (being a red), and thus being third order. If so, the theory conflicts with our Principle of Order Invariance. On the other hand, if the color in the truthmaker for (1) and the color in the truthmaker for (2) are distinct properties, there is no conflict.

In fact, we can see that the second possibility is the actual one when we recall the ambiguity of “color” mentioned in the previous section and formulate (1) and (2) univocally: (1*) “scarlet is a shade of spectral color” and (2*) “red is a spectral color.”

The truthmaker of (1*) is scarlet's being a red and the truthmaker of (2*) is red's being a spectral color. The properties instantiated are of second and third order, respectively. Since any theory which allows intermediate determinables has to distinguish these properties, it is not an objection to the second-order theory that it must do so too.

6. THE SECOND-LEVEL THEORY

The second-level theory claims that it is the particulars with different determinates which all instantiate a corresponding determinable, which is said to be a second-level property. For example, all particulars with masses instantiate the determinable mass. In other words, determinables are claimed to be properties of particulars, not of determinates. Hence, on this theory, there is no such property as being a mass.

A formulation of a plausible second-level theory which, as required for our purposes, clearly reveals which kinds of entity it is committed to is that of Andrew Newman (1992, chapter 5). The theory posits a *sui generis* relation between determinates and determinables. I shall follow Newman (pp. 113ff) in naming it with the Scholastic term *essential subordination*. Since it holds between first-order properties, it is a second-order relation. As Newman argues, it is essential, since a determinate could not be the property it is without standing in this relation to its determinable. For instance, scarlet could not be what it is without standing in it to being red; and being red could not be what it is without standing in it to being spectral colored. Conversely, a determinable could not be what it is without standing in (the converse of) this relation to each of its determinates. For example, being spectral colored could not be what it is without standing in (the converse of) it to being red.

Newman instructively contrasts essential subordination with the more deflationary relation of "accidental subordination". This may serve to dispel a worry that its use is "ad hoc" or an *obscurum per obscurius*, or both, so I shall give some brief examples of his analysis here. At one point, he shows how the two relations differ modally (1992, pp. 113-115). Accidental subordination is extensional: it can be represented by a universal generalization about particulars. A true (statement of) accidental subordination, such as "All swans in the Northern Hemisphere are white," might have been false and might be false in the future. In contrast, essential subordination is non-extensional: it is involved in necessarily true statements, which, while they entail universal generalizations, are best understood as expressing a relationship of essential subordination between properties. His example is “All whales are mammals.” The properties related by essential subordination in this case are not determinates and determinables, of course, but natural kinds. Thus, essential subordination can do work independently of the problem of determinables and hence is not “ad hoc”.

Some of the above features also allow us to show that essential subordination is not transitive (for color properties). Adapting Newman's example slightly, consider these two arguments:

(P1) For all *x*, if *x* is scarlet, then *x* is red
(P2) For all *x*, if *x* is red, then *x* is spectral colored
∴ For all *x*, if *x* is scarlet, then *x* spectral colored.

This argument is about particulars – it is a case of accidental subordination of colored particulars – and it is valid. Indeed, scarlet particulars are red and are spectral colored. Thus, accidental subordination is transitive. Contrast this with the corresponding argument for essential subordination:

(P1*) Sub(scarlet, being red)
(P2*) Sub(being red, being spectral colored)
∴ Sub(scarlet, being spectral colored).

This argument is about essential subordination between color properties. Despite the fact that it corresponds to the first argument, it is invalid: scarlet is a shade of red, but it is not a spectral color. Accordingly, essential ordination is not transitive (for color properties). Not only is this result significant in itself, the two arguments also jointly provide a salient case of the clarity of essential subordination. In line with this, I do not think its use in the second-level theory inevitably is a case of explaining the obscure with the more obscure, as little as I think it is “ad hoc”.

Recall now the first four *explananda* which we need satisfactory accounts of: the bottom-up entailment, the top-down entailment, and the combination of resemblance and difference in what seems to be a single respect for both particulars and determinates. Consider first the bottom-up entailment. Because essential subordination is essential in the way shown, a determinable entails a disjunction of its determinates. Since on the second-level theory this disjunction is a disjunction of determinates of particulars which resemble by instantiating a single determinable, it follows that when a particular has one of these determinates, it has the corresponding determinable. Hence, the bottom-up entailment is explained.

The explanation of the top-down entailment is this: since the determinable stands in the (converse of the) relation of essential subordination to each of its determinates, it follows that when a particular has a determinable, it has one of its determinates.

Resemblance of particulars in a certain respect is explained by their possessing the determinable corresponding to their determinates. Their difference in a certain respect is, as on the second-order theory, trivially explained by their determinates being different. Thus, they are not really identical and different in the same respect, but identical in one respect and different in another.

Contrast this with the second-order theory. As we saw, it enters uncertain waters when explaining the resemblance of particulars: either it is committed to unreal properties (disjunctive properties) or it requires an analysis whose truthmakers are unclear. In either event, it introduces a disagreeable-looking dichotomy between the case of determinates and the case of particulars, since it only explains the former with an ontologically noteworthy entity; the particulars do not have anything literally in common.

How does this theory explain the resemblance of determinates when their determinables are not properties of them? As Newman suggests, it can be done by their standing in the relation of essential subordination to the same determinable. Now it might seem that the property they have in common – being essentially subordinate to a certain determinable *D* – is a controversial one. Is it not of the same boat of gerrymandered-like properties as the property of having one or another determinate instantiating a given determinable, which, as we saw, the second-order theory, on one interpretation, uses to explain the resemblance of particulars with different determinates of a determinable? But this is not so. The property of being essentially subordinate to *D* is a *relational property* and therefore in a relevant sense nothing over and above the relation and the relatum *D* (cf. Armstrong 1997, p. 92). Thus, this relational property can provide a perfectly viable explanation of the resemblance of determinates.

At this point, the contrast with the second-order theory with regard to explanatory power is striking. As mentioned above (section 3), it has seemed to Armstrong, for instance, that this theory attempts the impossible when explaining the resemblance and difference of determinates. More specifically, Armstrong complains that:

> [N]ot only does redness resemble the other colors in being a color, it also differs from them in color. Redness and blueness differ as colors. The property in which they are supposed to resemble each other is the very thing in which they differ. This seems impossible. Things cannot differ in the respect in which they are identical. The conclusion must be that the resemblance of the colors is not a matter of their having a common property. (1978, II, p. 106)

I am inclined to agree with Armstrong that there is indeed something problematic, perhaps even impossible, about determinates differing and resembling in the same respect – if this respect, as on the second-order theory, is a property shared by them. (Of course, on Armstrong's universal-theory, a shared (sparse) property is "one and the same thing" in a very literal sense, so to speak, a fact which makes the issue look particularly problematic to him.) In happy contrast, the second-level theory has no such apparent difficulty. For it explains the phenomenon by holding that the resembling determinates, scarlet and crimson, say, resemble by both being subordinate to red and differ by being different shades of red. They are identical in one respect and different in another – just like the particulars are.

As to our final *explanandum* concerning intermediate determinables, as we saw in detail above (section 4), the second-level theory also does well at this step. It is of course compatible with such determinables, since it would simply say that there could be determinables of more than one level. In the case of colors, there would be a determinable of, for instance, scarlet, namely, red.

Finally, let us consider essential subordination with respect to ontological economy. Essential subordination is arguably an internal relation, which means it shares the following features with other internal relations (Meinertsen 2018). Roughly, an internal relation is a relation that is entailed by its relata. More precisely, a relation is internal if and only if it is logically impossible for its relata to coexist without the relation holding between them. Common examples of internal relations are being darker than holding between navy and cobalt, resemblance holding between red and orange, and being larger than (or more than) holding between 10 kg and 9 kg. Briefly, I believe that internal relations are reducible in the sense that they do not exist at the truthmaker level, i.e. they are not constituents of entities that make true the truth-bearers (sentences, statements, propositions) that express them. Thus, truths that purport to refer to them, such as “navy is darker than cobalt,” “red resembles orange,” and “10 kg is more than 9 kg” are made true by truthmakers that do not include them as constituents. In our parlance of “sparse” and “abundant,” it perhaps amounts to saying that *no* internal relation is sparse. At any rate, the view is equivalent to Armstrong’s position that internal relations are supervenient (in his sense of “supervenience”) and hence “nothing over and above” their relata and “an ontologically free lunch” (1997). Accordingly, essential subordination is “an ontological free lunch”. Specifically, the second-level theory does not commit us to an ontological kind included in the accountancy of Lewis’s Razor.

Someone might object that even if I am right that essential subordination is not an ontological cost, it is nonetheless an *ideological* cost. I agree with the common view that ideological parsimony is a virtue, in science as well as in metaphysics, and there may well be important connections between ontological and ideological costs (Cowling 2013). But for our purposes here, I restrict myself to only considering ontological parsimony, that is, to Lewis’s Razor. It is the subject of future research to compare and contrast our two candidates with regard to ideological parsimony.

7. CONCLUSION: FINAL ACCOUNTS

Let us close by summarizing the main differences between the two theories with regard to explanatory power and ontological economy. As to the former, it is a drawback of the second-order theory that it is unclear which ontology it is committed to in its explanation of the resemblance of particulars. Unlike this, it is true, the theory is crystal clear when it comes to the explanation of the resemblance of determinates – but there, according to Armstrong, it has an air of impossibility to it. By contrast, however, the second-level theory explains *both* cases clearly and without difficulties.

As to ontological economy (the number of ontological kinds), things are a bit more complicated. I am not sure if properties of different levels belong to different ontological kinds, like their cousins of different orders do (section 3). But I am inclined to hold that they do not, although I do not know how to demonstrate it. Suppose for a start, that they do, though. Granted this and the fact that the number of orders is identical with the number of levels, these parts of the two theories cannot be used to decide between them on grounds of economy, since both include of course particulars and determinates. Assume, however, as I think we should, that only properties of different orders, not of different levels, belong to different ontological kinds. If so, the second-order theory is the most unparsimonous at the outset. Allowing for just one level of intermediate determinables makes it costlier still. Worse, it gets progressively more uneconomical with each new level of intermediate determinables (and we at least want to allow for the possibility of such additional levels).

For these two reasons – better explanation and better ontological economy – we should prefer the second-level theory. Other things being equal, we should, unlike Mellor himself, hold that the answer to Mellor's Question is that determinables are properties of particulars.

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NOTES

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[1] The distinction between determinables and determinates holds for relations as well as properties. However, I shall follow the custom of discussing only properties and assume that, unless specified otherwise, what I say holds *mutatis mutandis* for relations.

[2] This entailment of course does not hold in every case if, as some philosophers maintain, there are determinables *without* determinates, as it were. An argument for such entities might be the need to account for the existence of vague properties (Elder 1996), the metaphysical indeterminacy of quantum mechanics on some interpretations (Bokulich 2014) or metaphysical indeterminacy in general (Wilson 2013). At any rate, it is beyond the scope of the present paper to consider these putative "determinables."

[3] A third approach, which we might call the "Bigelow-Pargetter theory' (Bigelow and Pargetter 1990, section 2.4), is a combination of these theories in that it explains the resemblance of particulars in the second-level fashion and the resemblance of determinates in the second-order fashion. Intuitively, this theory should only be resorted to if either of the two first options fails.

[4] Lewis does not quite consider "natural" to be co-extensional with "sparse' (1986, pp. 60-61n. 44), but his reasons for this can be ignored here.

[5] For an excellent criticism of this view, see Wilson (2012).

[6] One of the most promising of these is perhaps the argument that disjunctive properties do not exist at the truthmaker level. Roughly, speaking, from the point of view of truthmaker theory, there is never a need to postulate disjunctive properties, only their atomic disjuncts, since the predication of a disjunctive predicate is made true by these disjuncts "separately', as Mulligan, Simons, and Smith put it (1984, p. 299).

[7] Jessica Wilson includes the phenomenon, which she calls "relative, levelled determination," in her extensive list of features of the determinable-determinate relation (2017), but does not devote any special attention to it.

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