PRE-REFEREEING DRAFT OF MUCH-REVISED PAPER FORTHCOMING IN *AMERICAN PHILOSOPHICAL QUARTERLY*. PLEASE DO NOT CIRCULATE OR QUOTE.

Mellor's Question: Are Determinables Properties of Properties or of Particulars?

Bo R. Meinertsen

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 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] 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.

(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.

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 this in recognition of the fact that D. H. Mellor very clearly has formulated the problem of determinables as this question (1995, Ch. 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

[2] This entailment of course does not hold in every case, 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, cf. e.g. Elder (1996), or the metaphysical indeterminacy of quantum mechanics on some interpretations, cf. e.g. Bokulich (2014). At any rate, it is beyond the scope of the present paper to consider these putative 'determinables'.

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, Ch. 5), corresponding to the first option for answering Mellor's Question, the *second-order theory* (e.g. Prior 1949; Mellor 1995, Ch. 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] An example of a prominent second-level theorist is Armstrong: 'properties such as having length, having mass and having color are determinables' (1997, p. 48).[4] 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 they stand in a certain *sui generis* relation to their determinable.[5]

---

[3] A third approach, which we might call the 'Bigelow-Pargetter theory' (Bigelow and Pargetter 1990, sec. 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] Armstrong turns to the second-order theory in one special case, though, namely that of functional (determinable) laws of nature (ibid., p. 246).

[5] Note that 'determinable' as an ontological term is not neutral between these 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 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, e.g. 'This rod is 56.2 centimeters long', and there are (ii) statements that attribute determinable features to determinates, e.g. '9.8 kg is a mass'. On the second-order theory, the truthmakers of (i) are the particulars' having determinates, such as indeed 56.2 cm, which instantiate a second-order

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. Some realists about determinates are nevertheless non-realists about determinables. For instance, Armstrong (1978, II) is. 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 (ibid. p. 106). He thinks it is impossible, I take it, because he believes it is contradictory. However, as we shall see below, it is not contradictory. Other philosophers, such as Lewis (1986), hold that the properties that carve reality at the joints are 'highly specific' (ibid. p. 60) and hence reject determinables as such properties.[6]

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

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 title 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 understood, both in the title and elsewhere in the paper.

The two theories thus 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 important second-level theorist (Johansson 2000) occasionally even adopts expressions *of the second-order theory*, e.g. '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 be seen as merely a useful abbreviation of what, in effect, are the second-level theory's truthmakers of (ii).

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

if this was correct. But disjunctive properties cannot be respects of similarity and therefore are not real. For first, any property can be put into a disjunction with another property, as in, for instance, 'being a toe or being circular'. But it surely seems implausible that this predicate should apply to particulars – toes and circular objects – in virtue of a real property possessed by them.[7] Second, even if disjunctive properties were real, 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.

This realism extends to what Lewis (1983) calls 'sparse' or 'natural' properties. That is, I do not postulate a one–to–one correspondence between properties and predicates (or concepts). This holds for all kinds of predicates (or concepts), not just disjunctive ones. Therefore, one cannot read off the determinable property from a predicate (or concept), e.g. read off 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 the reality of the determinables which I use as examples, since we are not here trying to establish which determinables there are.

As indicated above, my concern with Mellor's Question to a large extent springs from an interest in the metaphysics of properties found in Armstrong (e.g. 1978; 1997; 2010), combined with a belief that ontological economy is a 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 simply that 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

[7] Moreover, as I have argued elsewhere (Meinertsen 2018), from the point of view of truthmaker theory, there is never a need to postulate disjunctive properties, only their atomic disjuncts: the predication of a disjunctive predicate is made true by these disjuncts 'separately', as Mulligan *et al* put it (1984, p. 299).

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-fold. Firstly, properties of different orders arguably belong to different ontological kinds or categories, or at least that is what I shall assume. Secondly, when it comes to ontological economy, we should in my view endorse 'Lewis's Razor' on which (sparse) types (kinds, categories) of entity, as opposed to tokens, carry ontological cost. So, other things being equal, a theory that is not committed to (sparse) higher-order properties is preferable. To put it simply, 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 intermediate determinables as an *explanandum*. They are such a neglected issue that they deserve a separate section.

Consider the property red (redness, being red). It is a color and hence presumably a determinate of color. But the different shades of red, i.e. 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 are not themselves 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 (ibid.), 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 that all determinates of a common determinable are mutually incompatible (Section 1), because, it may be claimed, e.g. scarlet and red are both determinates of color but not incompatible. The reason is that they are not at the same level of determinateness.

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. Let us to be precise 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 other 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 (compare Elder 1996). However, in my view this is no 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.[8]

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 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.

[8] The case for intermediate determinables might still be stronger if they could be illustrated by primary qualities. But there seems to be no (realist) 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, e.g. 2 to 3 kg, with the absolute determinate 2.14 kg, say, seems to be just a sub-set of its determinates.

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). It is, however, difficult to explain. Someone could of course object that difference (and identity) of determinates should be taken as primitive. But it seems to me that, in general, assertions that a certain metaphysical phenomenon is primitive rather than explainable should be a last resort only. So, briefly, how might it be explained? First, it might be claimed that the incompatibility of determinates explains their difference, but the former arguably presupposes the latter and so cannot explain it. Second, one might instead invoke the fact that determinate quantities are ordered. For instance, 12 kg in mass is twice as much as 6 kg in mass, three times as much as 4 kg in mass, etc. However, an ordering of properties clearly presupposes their difference, and therefore cannot explain it. A third attempt is this: if one's ontology allows properties to have constituents, the difference may be explained by means of their different constituents. For example, if, as in the kinetic theory, the temperatures are construed as complexes with masses and velocities as constituents, these different masses or velocities might explain their difference. However, this presupposes the difference of the constituents, which raises the same question and sets off a vicious regress that can only be stopped if some determinates differ *simpliciter*. A fourth and promising strategy is to see why properties which are not necessarily incompatible, e.g. temperature and mass, are different. They are so in virtue of standing in different causal relations, that is, by bestowing different causal powers on the particulars which have them (cf. Fales 1990, Ch. 8). Similarly, determinates of a common determinable, say, 99°C and 100°C, have different causes and effects. For instance, the latter, unlike the former, may cause water to boil at atmospheric pressure. This and other differences among their causal relations explains their difference. And so in general: no two properties have identical sets of causal relations. Note that these above arguments and conclusions are common to the second-order and second-level theories. Since the fourth and successful attempt is a general theory of the difference of properties and hence of determinates, 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.

However, 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 unreal. 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, there are no disjunctive properties. This seems to be a strong objection, but assessment of how much weight it carries will have to wait till we see in the following section how the second-level theory does in comparison.

Can the second-order theory handle intermediate determinables? One might suspect that it cannot without contradicting a version of Armstrong's Principle of Order Invariance (1978, II, pp. 141-43), namely that a universal is of the same order in each of its instantiations. This says that no universal can be instantiated both by particulars and properties, or by properties of different orders. One need not share Armstrong's view that properties and relations are universals to find this principle appealing, and I shall assume that it is true.

Does the second-order theory violate this principle? Let us look at a color example: 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.

Besides the Principle of Order Invariance, I also endorse the existence of the contentious relation of instantiation between any property or relation and its instances. Let us therefore investigate how this relation fits in with order invariance. To apply order invariance to relations requires some special terminology. Following Armstrong (1978, II), we can say that if there are second-order properties or relations, the first-order properties and relations which have them will be particulars *relative* to them and will hence be ‘second- order particulars’. (First-order particulars are what we normally just call ‘particulars’ and are absolute particulars.) Second-order properties and relations will be third order particulars if they have third order properties or stand in third order relations; and so on. Hence, the order *n* of a relation is identical with the order *n* of the particulars that it links. The Principle of Order Invariance of relations can now be stated in two forms: (1) a relation is of the same order *n* in all of its instantiations or (2) if a relation is of order *n* in a certain instantiation, then all its relata in that instantiation are particulars of order *n*.

As they stand, neither (1) nor (2) apply to instantiation, for the sense of order of a relation presupposed by them is not defined for instantiation, since it always relates relata of different orders. Even if such a sense is defined, as we shall do presently, instantiation would obviously violate (2). Since I know of no argument for (2), I shall therefore reject it.

So, let us consider (1). A revised version of it applicable to instantiation can be obtained by defining order for instantiation as follows. Instantiation is first order if it relates first-order particulars to second-order ones, second order if it relates second-order particulars to third-order ones, and so on. Substitute this sense of order into (1), and it follows that the second-order theory has to include at least two kinds of instantiation. And in general, it has to include as many kinds as there are orders of properties.

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). The theory posits a *sui generis* relation between determinates and determinables. I shall follow Newman (ibid., pp. 113ff) in calling it *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.[9]

Recall now the *explananda* which we need some 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 this way, 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.

[9] Essential subordination is arguably an internal relation and hence, on a common view, reducible. I am not sure whether or not this view is correct. In any case, for the purposes of this paper, I shall consider it to be a *bona fide* non-reducible relation, and I shall therefore assign it to its own ontological kind.

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.

How does this theory explain the resemblance of determinates when their determinables are not properties of them? As Newman (ibid.) 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 as unreal as that of having one or another determinate instantiating a given determinable*,* which we saw the second-order theory 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 indeed a relational property and therefore in a relevant sense nothing over and above the relation and the relatum *D* (cf. Armstrong 1997, p. 92). However, if the relation at issue (essential subordination) and the determinable *D* are real, this combination of them can serve as the respect of resemblance and as such is a real property.

As to our *desideratum* concerning intermediate determinables, the second-level theory also does well at this point. 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, viz. red.

Finally, observe that since essential subordination is a second-order relation, the instantiation that links it to its relata must, as we saw in the previous section, be of second order. Given the Principle of Order Invariance, it follows that the second-level theory has to include two kinds of instantiation.

7. Conclusion: final accounts

Let us take stock. Obviously, it is a drawback of the second-order theory that it explains the resemblance of particulars with different determinates with an unreal property (although it does explain the resemblance of different determinates with a real one). By contrast, however, the second-level theory explains *both* cases with a real property.

As to ontological economy (the number of ontological kinds), things are a bit more complicated. We saw that the second-order theory has to include at least two different kinds of instantiation if the Principle of Order Invariance is true. In addition, it includes determinables and hence properties of second or higher order. If it allows intermediate determinables, it will need as many kinds of instantiation as it has orders of properties. The second-level theory, in contrast, by the Principle of Order Invariance, requires only one kind of instantiation (since its determinates and determinables are both first-order properties) and a *sui generis* relation – essential subordination. Its intermediate and absolute determinables are of different levels but the same order.

However, I do not know whether properties of different orders and of different levels belong to different kinds, but I am inclined to hold that the former, unlike the latter, do. Assume for a start, however, that the latter do too. 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. So, given instantiation and the Principle of Order Invariance, then if there are no intermediate determinables, the second-level theory is actually the costliest. But if there *are* intermediate determinables, the balance changes: if there is only one level of them, the theories will be equally costly. And if there is more than one level, the second-order theory is the dearest. Since we want to allow for the possibility of more than one level of intermediate determinables, the second-level theory seems best from an economical point of view. Furthermore, if it is assumed that only properties of different orders, not of different levels, belong to different kinds, the second-level theory is the most economical as soon as we allow one level of intermediate determinables. Indeed, given this assumption, this result of the ontological bookkeeping does not even depend on the existence of the controversial instantiation relation: even if I am wrong and there is no such relation, the assigning of ontological kinds to orders but not levels secures a victory to the second-level theory.

For these two reasons – better explanation and better ontological economy – we should prefer the second-level theory. Other things being equal, we should thus hold that the answer to Mellor's Question is that determinables are properties of particulars.[10]

References

Armstrong, D. M. (1978) *Universals and Scientific Realism*, 2 vols., Cambridge: Cambridge University Press.

Armstrong, D. M. (1997) *A World of States of Affairs*, Cambridge: Cambridge University Press.

Armstrong, D. M. (2010) *Sketch for a Systematic Metaphysics*, Oxford: Oxford University Press.

Bergman, G. (1957) 'Elementarism', *Philosophy and Phenomenological Research* 18, 107-114.

Bigelow, J. and Pargetter, R. (1990) *Science and Necessity*, Cambridge: Cambridge University Press.

Bokulich, A. (2014) 'Metaphysical Indeterminacy, Properties, and Quantum Theory', *Res Philosophica* 91, 449-75.

Elder, C. (1996) 'Realism and Determinable Properties', *Philosophy and Phenomenological Research* 56, 149-59.

Fales, E. (1990) *Causation and Universals*, London: Routledge.

Funkhauser, E. (2006) 'The Determinable–Determinate Relation', *Noûs* 40, 548-69.

Johansson, I. (2000) 'Determinables as Universals', *The Monist* 83, 101-21.

Johnson, W. E. (1921) *Logic, Part I*, Cambridge: Cambridge University Press.

Lewis, D. (1983) 'New Work for a Theory of Universals', *Australasian Journal of Philosophy* 61, 343-77.

Lewis, D. (1986) *On the Plurality of Worlds*, Oxford: Blackwell.

Maurin, A.-S. & Persson, J. (2000) 'Realistic Metaphysics: An Interview with D. H. Mellor', *Theoria* 67 96-113.

Massin, O. (2013) 'Determinables and Brute Necessities', in C. Svennerlind, J. Almäng, R. Ingthorsson, Eds., *Johanssonian Investigations: Essays in Honour of Ingvar Johansson on His Seventieth Birthday*, Heusenstamm: Ontos Verlag, 388-420.

Mellor, D. H. (1995) *The Facts of Causation*, London: Routledge.

Meinertsen, B. R. (2018) *Metaphysics of States of Affairs; Truthmaking, Universals, and a Farewell to Bradley's Regress*, Singapore: Springer.

Mulligan, K., Simons, P. and Smith, B. (1984) 'Truth-Makers', *Philosophy and Phenomenological Research* 44, 287-321.

Newman, A. (1992) *The Physical Basis of Predication*, Cambridge: Cambridge University Press.

[10] For helpful remarks on earlier drafts of this paper, I am grateful to Andrew Newman and an audience at Fudan University, including Stephan Schmid and Benjamin Schnieder. I am especially indebted to Hugh Mellor for detailed comments and discussions. This paper is dedicated to his memory.

Prior, A. (1949) ‘Determinables, Determinates and Determinants’, *Mind* 58, 1-20, 178-94.

Wilson, J. (2012) ‘Fundamental Determinables’, *Philosophers’ Imprint* 12, 1-17.