

THE PUZZLING NATURE OF MATERIAL OBJECTS:
A STUDY OF CO-LOCATION

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ABSTRACT

My goal in this dissertation is to analyze the question, *why is co-location a problem for the metaphysics of material objects?* I believe that the existing literature on the topic identifies three possible answers to this question: Either, (i) co-location is a problem because it violates the no-coincidence principle, or because (ii) co-location violates the claim that the best available explanation for the relationship between objects that share the same empirically discriminable properties is the relationship of numerical identity, or finally because (iii) co-location violates the thesis of microphysical determination. I argue that (i), (ii), and (iii) are not sufficient reasons to think that co-location is metaphysically problematic, and that a denial of these assumptions does not warrant a rejection of co-location. I maintain that, instead, if co-location is a problem, it is so in virtue of violating a more basic assumption. Co-location is a problem for the view that the individuation and persistence conditions of any given material object is completely and solely determined by the physical or material properties of such an object. I advance reasons to believe that the latter view is fundamental in the sense that (i), (ii), and (iii), are consequences of it, and that co-location is in conflict with (i), (ii) and (iii), because it questions the basic physicalist view that provides the conditions for (i), (ii), and (iii). The fact that (i), (ii) and (iii) depend on the belief that physical properties exhaust the individuation and persistence of material objects, explains why they are not good reasons against co-location: They cannot establish that co-location is a problem for an account of material objects because they depend on the belief that co-location denies. Therefore, (i), (ii), and (iii) provide no more than three different ways of begging the question against co-location. I argue that, in order to show that co-location is a problem, we must show that physicalism with respect to material objects is the correct, or at least

the most plausible, metaphysics of material objects, and this is something that neither (i), (ii), or (iii) can show. This statement of the relationship between co-location and anti-colocation reasons is also a contribution to the discussion of co-location.

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DEDICATION

To Jerry, David, Phil, and Miriam: I have learned so much about philosophy by seeing you do it.

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CHAPTER 1

INTRODUCTION: WHY WORRY ABOUT CO-LOCATION?

The notion of co-location refers to the possibility of two or more numerically distinct material objects that share exactly the same physical parts at a time.¹ The issue of whether co-location is possible has been a central topic in contemporary discussions of the metaphysics of material objects, and for many, the possibility of co-location is problematic insofar as it is supposed to contradict widely held intuitions about the nature of material objects. However, as I hope to show in the following pages, it is in fact quite hard to determine what the exact conflict between co-location and a coherent theory of material objects is. Not surprisingly, as it is usually the rule in philosophy, the devil is in the details.

My general goal in this dissertation is to analyze the question, *why is co-location a problem for the metaphysics of material objects?* I believe that there are three possible answers to this question: Either, co-location is a problem because (i) it violates the metaphysical principle known as the no-coincidence principle, or the claim that two or more material objects cannot share the same set of material parts simultaneously, or because (ii) co-location violates the claim that the best available explanation for the relationship between objects that share the same empirically discriminable properties is the relationship of numerical identity, or finally because (iii) co-location violates the thesis of microphysical determination. The conflicts between, on one hand, co-location and, on the other, (i) no-coincidence, (ii) identity as the best explanation, and

¹ I follow Rea's (1997b) characterization of 'microphysical structure' as "the total set of intrinsic properties and relations exemplified by the parts of that object" (367). I discuss the notion of 'intrinsic properties' in chapter 4.

(iii) microphysical determination, have been widely discussed in the existing literature.

Generally speaking, such conflicts are held by many philosophers to provide reasons to reject co-location. However, in spite of the significant number of papers written on these issues, it is not clear (to me, at least) why we should prefer these assumptions over colocation. Thus, my initial position with respect to the problematic status of co-location is a negative one: I do not find (i), (ii), and (iii) to be convincing reasons to think that co-location is metaphysically problematic, and I do not believe that a denial of these assumptions warrants a rejection of co-location.

Accordingly, my first specific objective in this dissertation is to argue that it is not true that co-location is a problem in light of (i), (ii), and (iii): While it is true that colocation conflicts with these claims, a denial of (i), (ii), (iii) does not by itself show that colocation is a problem. Hence, a denial of (i), (ii), and (iii) does not provide sufficient reasons for rejecting co-location.

This is not to say that co-location is not a problem at all. In tandem with my negative position, I advance a positive view about the nature of the problem of colocation. My second specific objective is to show that co-location is not a problem because it violates assumptions (i), (ii), and (iii), but because it violates a deeper presupposition. Co-location is a problem for the view that the individuation and persistence conditions of any given material object is completely and solely determined by the physical or material properties of such an object. The latter view is fundamental in the sense that (i), (ii), and (iii), are consequences of it. Ultimately, co-location is in conflict with (i), (ii) and (iii), because it questions the necessary and sufficient conditions for the truth of (i), (ii), and (iii).

My third objective is to argue for a view of the connection between (i), (ii), and (iii). I believe that they all depend on the belief, sometimes tacit, that physical properties fully determine individuation and persistence. In this respect, notice that the relationship between (i),

(ii) and (iii) has received less attention than their analysis as separate reasons against co-location. Although they are typically understood as reasons to reject co-location, rarely if ever there has been an account of what (i) the no-coincidence principle, (ii) the idea of identity as the best explanation, and (iii) microphysical supervenience have in common *qua* (seemingly) unnegotiable features of a theory of material objects. Furthermore, the fact that (i), (ii) and (iii) depend on the belief that physical properties exhaust the individuation and persistence of material objects, explains why they are not good reasons against co-location: They cannot establish that co-location is a problem for an account of material objects because they depend on the belief that co-location denies. Therefore, (i), (ii), and (iii) provide no more than three different ways of begging the question against co-location. In order to show that co-location is a serious metaphysical problem, we must show that physicalism with respect to material objects is the correct, or at least the most plausible, metaphysics of material objects, and this is something that neither (i), (ii), or (iii) can show.

Now, a word about the structure of my discussion. In chapter 2, I articulate the problem of co-location as a conflict between co-location and the no-coincidence principle. I argue that stating the problem in these terms is not very informative. I argue further that this conception of the problem seems plausible because of the apparent self-evident nature of no-coincidence. But the principle seems self-evident because it is interpreted as involving an unacknowledged appeal to a claim of *exclusive* part possession. I maintain that this latter claim depends on two assumptions: First, the assumption that the individuation and persistence conditions of any material object depend ultimately on the general kind 'material object.' Second, the assumption that the individuation and persistence conditions of any material object are determined by the physical properties of the object. I then show that a more informative way of understanding the

problem of co-location is to conceive of it as a conflict between co-location and the view that material properties are the only determinants of individuation and persistence conditions.

However, if no-coincidence depends on the claim that physical properties exhaustively determine the metaphysics of material objects, then we need a warrant for this claim.

With this in mind, I move on to consider in chapter 3 a type of anti-colocation strategy that attempts to motivate the belief that material objects are identical to the quantities of matter that constitute them. I call this, *the argument from the normative primacy of identity*. I believe that this type of argument does not provide a plausible reason to believe in the identity of constituting and constituted object. This is the case because it presupposes the view that the correct metaphysics of material objects must involve the assumption that the relationship of material constitution is the relationship of identity, and this is under question in view of the problem of co-location.

Subsequently, in chapter 4, I introduce the thesis of microphysical determination as the view that many or even all of the *intrinsic qualitative properties* of the object supervene on the microphysical structure of the object. Microphysical determination promises independent support for the no-coincidence principle insofar as it seems to bolster the belief that the relationship between the constituted and constituting object must be one of identity. This claim, if true, would allow us to preserve the no-coincidence principle and avoid co-location. *Alas*, in spite of the promise of microphysical determination, I show in chapter 5 that arguments based on determination do not offer decisive reasons against co-location. Friends of co-location can coherently endorse a weaker version of the claim of supervenience, co-location friendly supervenience or CFS, that is compatible with co-location. In chapter 6, I defend CFS from arguments that demand an explanation of the non-categorical differences and similarities

between objects presumed to be co-located. These arguments are supposed to provide support for the assumption that the best explanation for the empirically discriminable properties of a certain object at a certain time is that there is only one object composed of a set of microphysical parts occupying a particular location in space at that time. If we deny this belief, we would either have a very hard time trying to explain non-categorical differences in a coherent manner, or we would simply be at a lost for explanatory resources. In spite of the heated rhetoric, I maintain that friends of co-location can defend their position successfully.

Finally, in chapter 7, I claim that the anti-co-location position faces a very serious problem: Microphysical determination is a thesis that reflects a commitment to a physicalist metaphysics of material objects, and not a thesis that provides independent reason in favor of physicalism. Consequently, if microphysical determination is not a reason in favor of a physicalistic account of macroscopic material objects, then it cannot justify the microphysical dependence of non-categorical properties. Furthermore, since we need physicalism in order to establish the no-coincidence principle, microphysical supervenience is not a reason to warrant no-coincidence. Finally, I argue that co-location is more than a problem involving the denial of microphysical determination. Co-location is the problem of accommodating the nature of non-categorical properties into a general metaphysics of material objects.

CHAPTER 2

CO-LOCATION AND THE NO-COINCIDENCE PRINCIPLE

In this chapter, I claim that a common characterization of the problem of co-location consists of a conflict between the possibility of co-location and the widely held principle known as *the no-coincidence principle*. I argue that stating the problem in these terms does not explain why we should believe that co-location is metaphysically problematic. I propose that this characterization of the problem may seem plausible because of the apparent self-evident nature of no-coincidence, but appearances notwithstanding, the principle is far from self-evident. I argue that for the principle to preclude co-location, it must be interpreted as involving an unacknowledged appeal to a claim of *exclusive* part possession. I think that this latter claim depends on the assumptions that (i) the individuation and persistence conditions of any material object depend ultimately on the general kind ‘material object,’ and this claim must be understood as the view that (ii) the individuation and persistence conditions of any material object are ultimately determined by the physical properties of the object. Finally, based on this analysis, I claim that a more informative way of understanding the problem of co-location is to conceive of it as a conflict between the possibility of co-location and the view that material properties determine individuation and persistence conditions. If this is true, then a warrant for the no-coincidence principle would depend on the truth of the ‘physicalist’ or ‘materialist’ view of individuation and persistence.

Material Constitution and Numerical Identity

The notion of material constitution refers to the relationship between an object and the quantity of matter of which it is made (Baker, 1997; Evnine, 2010; Paul, 2010). In the case of a particular bronze statue *s* and a particular quantity of bronze *b*, we might conceive of *s* as an object *constituted* by *b* at a certain time, and claim that *b* constitutes *s* in the sense that *b* is the material out of which *s* is made.²

Material constitution is sometimes characterized as a relationship between two objects; a *constituting* object, or the quantity of matter that serves as a constituting basis, and a *constituted* object or the type of object that we typically identify under an ordinary-object sortal such as ‘car,’ ‘tree,’ ‘passport,’ ‘human body,’ and so on. However, some philosophers (which I discuss throughout this paper) believe that it is deeply problematic to think that the relationship of constitution is something other than the relationship of *numerical identity*.

In this respect, there are significant disagreements about the assumption of identity as an initial intuitive characterization of constitution,³ but, at least to first impressions, the assumption that constitution is identity has an appealing epistemic advantage: Identity allows for a straightforward explanation of why we experience *s* as having properties that are in turn

² Admittedly, some may think that the use of the sortal ‘quantity’ in reference to the bronze that constitutes the statue is an awkward choice, but as Zimmerman (1995) points out, “philosophers and linguists have been forced to introduce technical terms or give special meanings to familiar sortals in order to find terms that will apply to the referents of [mass expressions such as ‘the water,’ ‘the bronze,’ and ‘the wood’ amongst others] throughout the whole of their existence” (57). Zimmerman himself objects to the use of the term ‘quantity,’ and proposes to adopt the expression ‘mass’ instead (56-58, and fn.15). See Burge (1975) and Cartwright (1975) for alternative constructions of the sortal ‘quantity.’ In any case, in what follows I assume that the referents of expressions such as ‘the quantity of bronze’ are concrete material objects, or what we may also call *substantial individuals* (Lowe, 2002, 59).

³ In fact, my dissertation can be interpreted as a sustained attack to the idea that the conditions for material constitution are the conditions for numerical identity.

associated with the kind of thing that *b* is.⁴ For instance, the color, density and texture of bronze, are properties that *s* has in virtue of being constituted by *b*, and at the time in which *b* constitutes *s*, we cannot really tell one object apart from the other. In view of this, we may assume that, insofar as our capacities for empirical discrimination do not support the belief that expressions such as '*s*' and '*b*' refer to numerically different objects, the best way to explain why the referent of '*s*' has the same properties as the referent of '*b*' at a certain time is to assume that they are not two objects but only one.

Along these lines, Thomson (1998) points out that constituting and constituted objects “plainly stand in some intimate relation to each other –they currently occupy the same place, they currently have the same shape, size, color, texture, smell, and so on and on. In what relation do they stand to each other if not identity?” (150). David Lewis (1986) echoes this belief with reference of persons and their constituent quantities of matter, “[i]t seems for all the world that there is only one [person in a specific location in space]” (218); and Harold Noonan (1988) maintains that:

[...] to say [that a quantity of plastic and a toy boat are more than one and the same object] would manifest a bad case of double vision - there is manifestly just one entity there, which we can refer to indifferently either as 'a piece of plastic' or as 'a boat'. (222)

⁴ I do not intend to provide a systematic account of the notion of 'property,' but I think that it is reasonable, and perhaps unquestionable, to assume that whatever a property turns out to be, we typically appeal to the concept of 'property' in order to characterize objects in our discourse. In other words, at the very least, properties are *predicables* of objects (Swoyer and Orillia, 2014). See Armstrong's (2005), Field (2003), and Nef (2010) for useful summaries of some of the defining issues related to the metaphysics of properties.

In short, the best explanation of the fact that we perceive only one object is that, indeed, there is only one object *there*. The fact that the relationship of material constitution is the relationship of identity explains the unity between ‘constituting’ and ‘constituted objects.’

Nonetheless, appearances can be deceiving. Unfortunately for the view that constitution is identity, it seems that objects such as *b* and *s*, in spite of sharing the same empirically discriminable properties, do not share *all* of their properties, and this would mean that they are not identical in spite of being qualitatively indiscernible at the time in which *b* constitutes *s*. In order for the quantity of bronze to be identical to the statue, and more generally, for constitution to be identity, the relationship between these objects must meet a condition expressed by a principle known as *the Indiscernibility of Identicals*. This expresses the necessary condition that a relation must satisfy in order to be one of identity: If any two objects, *x* and *y*, are identical, then, for any property *F*, *x* has *F* if and only if *y* has *F*. The following argument shows that *b* and *s* do not meet this condition:

- i) There is a quantity of bronze *b* that exists at time t_1 . The quantity of bronze *b* continues to exist at time t_2 ;
- ii) At t_2 , a sculptor creates a statue *s* out of *b*. *s* did not exist at t_1 , but it exists at t_2 ;
- iii) If (i) and (ii) are true, then at t_2 *b* and *s* have different historical properties.
- iv) If (iii) is true, then in view of (PII) the relationship between *b* and *s* cannot be the relationship of numerical identity.
- v) But if *b* and *s* are not identical, then at t_2 *b* and *s* are two different objects that share the same matter.
- vi) Therefore, distinct material objects can be made up of the same matter at a single time.

The argument relies on the assumption that *b* and *s* differ in their *historical properties*, or in properties that depend on what has happened to an object in the past (Lowe, 2002, 61). Premises (i) and (ii) seem unproblematic, but they imply that *b* existentially precedes, and is not destroyed by, the creation of *s* at t_2 . So, *b* and *s* differ in their historical properties at t_2 (Baker, 1999; Lowe, 2002; Sider, 2001; Wasserman, 2014), and if this is true, then *b* and *s* do not have all of their properties in common and for this reason *b* cannot be identical to *s*. A variation of this argument is frequently used to show that objects such as *b* and *s* can differ in their *persistence conditions*, or those conditions in virtue of which an object can and cannot survive certain types of change (Lowe, *Ibid.*). Imagine that the sculptor decides to destroy *s* at time t_3 and save the constituent quantity of bronze. In this case, although *s* was destroyed, the quantity of bronze *b* that the sculptor used in order to create *s* survived the destruction of *s*. So, although *b* and *s* seem to be identical at t_2 , they instantiate different persistence conditions and this means that they do not meet the conditions of numerical identity.

The argument from the explanatory capacity of identity may seem initially plausible in view of our everyday perceptual experience of macroscopic material objects, but an appeal to explanation based on perceptually available properties is problematic insofar as it does not take into account that historical properties and persistence conditions do not seem to be, not necessarily in any case, perceptually available properties. Now, if it is true that *b* and *s* have different historical properties, and persistence conditions—properties which furthermore are not necessarily perceptually available—*b* and *s* are concrete macroscopic material objects that in spite of being numerically different, share all of the same empirically discriminable properties. They are co-located entities.

The problem of co-location as the violation of the no-coincidence principle

Individual material objects coincide with particular regions of space and this is unproblematic, but it seems odd to claim that two concrete material objects such as the statue and the quantity of bronze can share the same empirically discriminable properties, including the property of occupying the same space at the same time. What exactly is the problem with this possibility? After all, many counterintuitive theoretical claims are true and understood to be unproblematic in the general context of our systematic theorizing about the world.

Perhaps, as Amie Thomasson (2007) points out, co-location is problematic because it contradicts a widely held metaphysical principle that Thomasson, following Sidelle (2002), calls the *no-coincidence principle*.⁵ We can distinguish two versions of this principle, a *spatial* version and a *mereological* version:

The spatial version of the no-coincidence principle (SNCP): If A is a material object and B is a material object, and A is not identical to B, then A and B cannot occupy the same space at the same time.

The mereological version of the no-coincidence principle (MNCP): If A is a material object and B is a material object, and A is not identical to B, then A and B cannot, simultaneously, be composed of exactly the same parts, at some level of decomposition (Thomasson, *Ibid.*).⁶

These two versions of the principle are not equivalent. On one hand, if we understand co-location as involving the possibility of two material objects (or more) occupying the same region of space at the same time, then co-location is a problem in the sense that it denies SNCP, for the

⁵ Wiggins (1968) calls a variation of the same principle, the *S* principle:

Principle S: Two things cannot *completely* occupy the same place or exactly the same volume (or exactly the same subvolumes within exactly the same volume) for exactly the same period of time. (90)

I prefer to use Thomasson's label since it readily provides an explicit description of the intended aim of the principle: To rule out the possibility of coincidence from a theory of material objects.

⁶ See also Sidelle: "There cannot be two material objects wholly located in the same place at the same time (some prefer: No two objects can wholly consist, at a time, of just the same parts)" (119).

latter is intended to be a necessary constraint on the capacity of any material object to relate to a region of space that is already a relatum in a relation of occupancy with a different object at a certain time: If SNCP is true, then two or more objects cannot have the same relation of occupancy in the same region of space at the same time. This constraint is supposed to hold whether the objects in question share the same parts at some level of decomposition or not. On the other hand, if we understand co-location as a type of *mereological*, or parts-whole relationship,⁷ co-location would occur when two different objects (or more) happen to have a part-whole relationship to the same set of material or physical parts, at some level of decomposition (Merricks, 2001, 39; Sider, 2001, 141).⁸ Thus, the problem of co-location would be the problem of violating MNCP, or the necessary constraint on the capacity of any material object to relate to a set of parts that is, at some level of structural organization, a relatum in a part-whole relationship with a different object at a certain time. Now, although these principles are not equivalent, mereological co-location entails spatial co-location. Arguably, if two objects can have the same microphysical structure at a certain time as a result of sharing exactly the same parts simultaneously, then those two objects must share the same location in space as well.⁹

⁷ Here I follow Aquile Varzi's (2014): "Mereology... is the theory of parthood relations: of the relations of part to whole and the relations of part to part within a whole."

⁸ The qualification 'at some level of decomposition' is meant to ensure that the principle rules out even instances of objects that can be understood to have different parts at the macroscopic level. To think that they do is not sufficient to think that they are numerically different objects that share all of their parts. If they are numerically different, then there must be a level of physical decomposition at which they have different parts. For instance, we can say that although it might be true that, at a certain time, object *s qua* statue of a human figure has parts such as a 'head' and a 'torso' that *b qua* mere quantity of matter lacks, it is also true that the microstructure of *b* is the same microstructure of *s*. Then, the principle would rule that these are numerically identical objects and not colocated.

⁹ According to Sider, "let us say that objects *coincide* at a time iff (1) they share the same spatial location at the time, and (2) there is some class of parts of which each is composed. (It is plausible that the first clause is redundant, given the second clause" (141). Additionally, we can interpret one of Wiggins' examples as an illustration of how complete microphysical overlap leads to spatial co-location:

Accordingly, if the aim of the mereological version of no-coincidence is to preclude the possibility of complete microphysical overlap, by virtue of applying a restriction to the mereological structure of the object, and spatial co-location is a result of microphysical overlap, then the mereological version of the principle ipso facto serves to preclude the possibility of spatial co-location. So, from this point on, when I use the expression ‘co-location,’ or sometimes ‘coincidence,’ I mean mereological co-location, and when I use the expression ‘the no-coincidence principle,’ or sometimes simply ‘no-coincidence,’ I use it to refer to the mereological anti-co-location principle.

The connection between co-location and no-coincidence

Now, pretty clearly the no-coincidence principle is opposed to co-location, and if we are inclined to believe in the former we are inclined to deny the latter, and vice-versa. But why should we favor no-coincidence over co-location? After all, the assumptions that lead to the violation of no-coincidence seem unproblematic. So much so that Alan Sidelle (2002) puts the point in terms of the conflict between common sense intuitions about the existence of macroscopic material objects and their persistence through time, and the metaphysical principle of no-coincidence:

Much recent work in this area has been guided by puzzles that aim to show that not all of our ordinary views about what there is, and how things persist through change, can be true together with strongly held theoretical views. One central such view I call ‘The No Coincidence Thesis’ [...]. This principle conflicts with our everyday judgments that there are both ordinary objects—sweaters, trees and

A certain tree T stands (leafless, suppose) at a certain spot at time t1 and occupies a certain volume v1 at this time t1. *All and only v1 is also occupied by the aggregate W of the cellulose molecules which compose the tree. Indeed it is their occupation of v1 which precisely determines that the volume which the tree occupies is v1.* The tree T and the cellulose molecules W are thus in exactly the same place at the exactly the same time. (90) (My emphasis)

cows—and ‘constituting’ objects—pieces of yarn and wood, maybe aggregates of cells or quarks— combined with our views about how these things move through time, which, more theoretically, underlie our views about the persistence conditions for these sorts of things. Since the ‘macro’ objects [i.e., the constituted objects] can go from existence while the constituting objects persist, and more generally, since the histories traced by each can differ, an object and its ‘constituting’ object cannot, in general, be identified, so we are committed to coinciding objects. (118)

Many philosophers agree with this characterization of the conflict (Burke, 1992; Thomasson, 2007; Wiggins, 1967); however, I would like to suggest in the remainder of this paper that the anti-co-location literature has been unsuccessful in producing an effective explanation of *why* this conflict should lead to a rejection of co-location. A full explanation of why a violation of the no-coincidence principle is problematic for a metaphysics of material objects seems to be a requirement for explaining why we must reject co-location, and stating the no-coincidence principle is, at best, only a starting point for explaining why co-location is metaphysically troublesome: Since the no-coincidence principle can be understood as a formalization of the assumption that co-location between two or more material objects is metaphysically impossible, arguing against the possibility of co-location is simply to defend the truth of the no-coincidence principle, and vice versa.

This means that since co-location and no-coincidence are two sides of the same coin, it is insufficient for an explanation of the problem of co-location to say that co-location is metaphysically problematic because it violates the no-coincidence principle. To say this is simply to maintain that we must reject co-location because we believe it to be impossible, but why do we believe that co-location is impossible? Why should we consider no-coincidence to be a principled reason, or at least a good reason, against co-location at all? More often than not the presumed contribution of no-coincidence is taken for granted. For example, Michael Burke

(1992) says that we simply should reject co-location on the grounds that it "... multiplies entities and... it is at odds with the commonsensical principle of one thing to a place" (13). Burke believes that the no-coincidence principle requires no further elaboration, and it is only because many of the alternative accounts have serious problems of their own that we may be tempted to endorse a metaphysics of co-location (Ibid.). Sidelle even argues that no-coincidence is typically understood as a plausible desideratum for any acceptable theory of material objects. Any such acceptable theory must show how to avoid co-located entities, or must provide a coherent explanation of how co-location is possible, but unproblematic, in light of our intuitions about no-coincidence (119). But in spite of the popularity of the principle, it is not immediately obvious whether the principle is justified.

I suspect that many simply presuppose that no-coincidence is justified because of the belief that the no-coincidence is a consequence of an important truth concerning the individuation and persistence conditions of the entities that fall under the kind 'material object;' that is to say, a truth about the conditions that allow us to make synchronic and diachronic judgments of identity concerning material objects (Oderberg, 1996, 147).¹⁰ This truth consists of the view that the nature of the individuation and persistence conditions of material objects is such, that they ensure the impossibility of co-location. Specifically, for the no-coincidence principle to work as an exclusion principle against co-location, we need to assume that the claim of part possession included in the no-coincidence principle entails the claim of *exclusive* part

¹⁰ An object without individuation conditions lacks the required credentials to enter our inventory of reality. A red thing *simpliciter* may not be part of a plausible ontology, but a red hot air balloon may be: the expression 'the red thing' does not provide the kind to which the thing in question belongs, and without the kind we do not have individuation conditions. On the other hand, the expression 'the red hot air balloon' does; the thing in question belongs to the kind 'hot air balloon;' the individuation conditions for this object are those associated with the kind 'hot air balloon.'

possession—this is the claim that only one object can be composed by a certain set of parts at a given time. But for this interpretation to be true, two beliefs about the instantiation of individuation and persistence conditions of material objects must hold, namely that (i) the individuation and persistence conditions of any material object, regardless of the sub-kind to which it belongs, depend ultimately on the general kind ‘material object.’ Furthermore, this claim must be understood to mean that (ii) the individuation and persistence conditions of any material object at the time that the object exists are ultimately determined by the material or physical properties of the object at such a time. We can borrow Thomasson’s articulation of the mereological version of no-coincidence in order to articulate the relevant clause:

The mereological exclusive version of the no-coincidence principle (MENCP): If, (i) the individuation and persistence conditions of material objects depend ultimately on the general kind ‘material object,’ and (ii) such conditions are ultimately determined by material properties, then, if A is a material object and B is a material object, and A is not identical to B, then A and B cannot, simultaneously, be composed of exactly the same parts, at some level of decomposition.

Only with assumptions (i) and (ii) in place can we go from the claim that A and B are non-identical material objects to the claim that it is *impossible* for A and B to share exactly the same parts at some level of decomposition at a time: if we do not assume (i) then we would need to accept that individuation and persistence may depend on the different subclasses to which material objects belong (e.g. bronze statue vs. quantity of bronze; wood chair vs. quantity of wood, and so on), in which case it would be fine for the statue to have different individuation and persistence conditions than those of the quantity of bronze. This ultimately would lead to co-location. And if we do not assume (ii) we would need to concede that, at the very least, individuation and persistence may depend on properties that are not consistent with the view that material properties and properties that depend on physical properties, exhaust the nature of

objects (e.g. the statue may have properties that do not depend on its physical properties, such as, perhaps, properties of authorship and style), and this also would lead to co-location.

The revised conflict between co-location and no-coincidence

In view of this analysis, I believe that foes of co-location should argue that the problem of co-location is a challenge to a certain view about the individuation and persistence conditions of material objects. Ultimately, it would seem that if we are to believe in the no-coincidence principle we would need to be committed to a metaphysics that favors material properties over any other kind of property. This is not, of course, unreasonable, for after all, there might be something to the fact the objects in question are *material* objects. If they are, indeed, material, it must be because they are constituted in some essential way of material properties. Material properties seem to be essential to these objects at least in the sense that we classify certain objects as material or physical only to the extent that we can predicate material or physical properties of them. The contentious point in this initial approximation concerns the very notion of ‘the physical.’ If we assume that we have an understanding of what the physical *is*, and if we assume that on the basis of such an understanding we have a clear sense of the conditions that would make a property ‘physical;’ physical properties would simply be properties that meet the condition of being physical. The correct characterization of these conditions is a matter of

contention,¹¹ but there is widespread agreement that an appropriate notion of the physical will be able to accommodate at least some of the properties that we commonly identify as physical.¹²

Now, if no-coincidence depends on the claim that physical properties exhaustively determine the metaphysics of material objects, then there is a question concerning the use of this form of no-coincidence against co-location. Is it really true that physical properties exhaust the nature of material objects? The claim is not self-evident, and it would seem that it falls short as a principled basis for no-coincidence, so what are the reasons for believing it? In fact, the type of arguments that generates the problem of co-location can be interpreted broadly as an objection to the view that physical properties determine individuation and persistence conditions: Objects *b*

¹¹ The relevant literature acknowledges two possibilities and, their respective variations, for understanding the conditions that make a property a physical property. These are (1) *the theory based-conception of the physical*, and (2) *the object-based conception of the physical*. In this respect, Daniel Stoljar (2014) tells us that:

The theory-based conception: A property is physical iff it either is the sort of property that physical theory tells us about or else is a property which metaphysically (or logically) supervenes on the sort of property that physical theory tells us about [...]. According to the theory-based conception, for example, if physical theory tells us about the property of having mass, then having mass is a physical property. Similarly, if physical theory tells us about the property of being a rock — or, what is perhaps more likely, if the property of being a rock supervenes on properties which physical theory tell us about — then it too is a physical property.

The object-based conception: A property is physical iff: it either is the sort of property required by a complete account of the intrinsic nature of paradigmatic physical objects and their constituents or else is a property which metaphysically (or logically) supervenes on the sort of property required by a complete account of the intrinsic nature of paradigmatic physical objects and their constituent [...]. According to the object-based conception, for example if rocks, trees, planets and so on are paradigmatic physical objects, then the property of being a rock, tree or planet is a physical property. Similarly, if the property of having mass is required in a complete account of the intrinsic nature of physical objects and their constituents, then having mass is a physical property. (<http://plato.stanford.edu/entries/physicalism/#10>)

¹² Some of these include appearance, texture, color, odor, melting point, boiling point, density, solubility, polarity, position in space, shape, size, and weight.

and *s* instantiate exactly the same physical properties, yet they are numerically different objects with different persistence conditions. This use of the argument for co-location suggests that co-location is in fact a symptom of a very deep problem that goes beyond issues of mereology or spatial occupancy. The appeal of the no-coincidence principle depends on a tacit acceptance of the physicalist view consisting of the claims that (i) the general kind ‘material object’ determines the individuation and persistence conditions of material objects, and on the view that (ii) material properties are the ultimate determinants of the nature of material objects. This view may ground no-coincidence, but they are in need of justification themselves. No-coincidence is a consequence of these beliefs and it is only as reliable as they are. Now, the argument for co-location questions no-coincidence *because* it questions (i) and (ii): The argument shows that the individuation and persistence conditions of material objects at a given time do not depend on physical properties alone, and this result generates co-location: The argument accomplishes this by showing that even if the complete set of physical constituents of one of the objects is the exact same set of physical constituents of another object, the objects in question still differ in individuation and persistence conditions. An interest in a view of material constitution as numerical identity makes perfect sense in view of the constraints that (i) and (ii) demand of a theory of material objects. To argue that constitution is identity is to argue that since material objects are exhaustively constituted by the physical properties of their associated quantities of matter, they are nothing more than such quantities of matter. Their individuation conditions are those of their constituent quantities of matter.

We can state the same point in two different ways, either we say that without independent reasons for believing in (i) and (ii), arguments that rely on no-coincidence in order to question the possibility of co-location beg the question against co-location, or we say that without

independent reasons for believing that material constitution is identity, anti-co-location arguments based on this belief, beg the question against co-location. In either case we are not justified in believing that co-location is impossible by simply stating the no coincidence principle, we need to argue for it.

A guiding thought for the discussion to come

In the remainder of this paper, I defend the claim that the problem of co-location is better understood as the problem of denying the physicalist view of individuation and persistence. The way I argue for the view is to show that assuming that the problem with co-location has to do with intuitions about the logical principle of numerical identity, or with the claim that the basic microphysical properties of material objects determine individuation and persistence are question begging. Indeed, the question-begging nature of anti-colocation arguments is a recurrent theme in this paper. I believe that there is a systematic failure to these arguments and it has to do with an unacknowledged reliance of physicalist intuitions. I discuss the use of the principle of numerical identity in anti-colocation arguments in the next chapter, and the thesis of microphysical determination (also known as microphysical supervenience) in the subsequent three chapters.

CHAPTER 3

NUMERICAL IDENTITY AND THE METAPHYSICS OF CONSTITUTION

Some philosophers believe that it is unintelligible to deny that the relationship between an object and its constituent quantity of matter is the relationship of identity. They insist that there cannot be two or more objects that share the same parts at a time but only one. We might even say that they believe that any systematic theorizing about material objects ought to be guided by the assumption that constituting and constituted objects are identical; and if they are not, then metaphysical atrocities will follow. Peter Van Inwagen's (1981) denial of what he calls 'the doctrine of arbitrary undetached parts (or DAUP for short) is partly an example of this strategy.¹³ I hope to show that Van Inwagen's argument is mistaken for a very simple reason, he does not give any thought to the possibility that the relationship between constituting and constituted objects is not the relationship of identity. He presupposes that constituting and constituted objects are identical on the grounds that this hypothesis is the best in order to preserve the logical constraints of the principle of numerical identity. However, I believe that it is far from clear that a certain metaphysics of constitution as identity is plausible on the grounds of an alliance to logic as a standard of intelligibility in our theorizing about material objects. We

¹³ DAUP states that the parts that compose material objects are themselves concrete material objects numerically distinct from each other and from the objects that they compose.¹³ Accordingly, to say that DAUP is false is simply to deny the existence of what some may consider to be specific instances of material objects: "the northern half of the Eiffel Tower, the middle-two thirds of the cigar Uncle Henry is smoking, and the thousands (at least) of overlapping perfect duplicates of Michelangelo's David that were hidden inside the block of marble from which... Michelangelo liberated the David" (Ibid.). Roughly, as Van Inwagen sees it, the problem with DAUP is that, if the thesis is true, then it would be in conflict with the principle of the transitivity of identity. Since a denial of transitivity is incoherent, we must reject DAUP.

cannot rule out co-location on the grounds of the logic of identity since we do not know whether material constitution is identity. This is exactly how I think we should not argue against co-location: We should not presuppose the relationship that is at issue in view of the puzzles of constitution and, ultimately, in view of co-location.

Due to limitations of scope, I leave aside the details of Van Inwagen's master argument in favor of a close inspection of his anti-co-location argument. This is a sub-argument that helps establish the case against DAUP. Consider the possibility of co-location between two material objects, 'Descartes' and an object consisting of Descartes minus his left leg, let us call this 'D-minus:'

If DAUP is true, then at any moment during Descartes' life, there was a thing [...] that was his leg at the moment. Let us pick some moment, call it t_0 , during Descartes' life, and let "L" designate the thing that was his leg at the moment. There also existed at that moment, according to DAUP, a thing we shall call D-minus, the thing that occupied at t_0 the region of space that was the set-theoretic difference between the region occupied by Descartes and the region occupied by L. Obviously, Descartes and D-minus were not the same thing (at t_0), since, at t_0 , they were differently shaped [i.e., they had different properties]. Now suppose that at t (shortly after t_0), L and D-minus became separated from each other [...] It would seem that after this episode [...] D-minus still existed. The survival by D-minus of its separation from L is not a formal consequence of DAUP. Still, how can we avoid this conclusion? It seems simply true, an inescapable consequence of the requirement of DAUP that the undetached parts of material objects be themselves, in the same sense, material objects [...]. It would seem that after this episode, Descartes still existed. One can, after all, survive the loss of a leg. (80)

Descartes and D-minus are not identical before time t , and are not co-located in a problematic way because they do not share exactly the same microphysical structure before t (co-location is only a problem if there is complete microphysical overlap). However, if the object that we have called Descartes loses his left leg at t and if D-minus remains unaffected in view of the assumption that Descartes' left leg is a proper part of Descartes but not of D-minus (D-minus

is an object consisting of Descartes minus his left leg before t and after t), then we have the following result:

[...] if both, Descartes and D-minus survived the severance of L from D-minus at t , what was the relation between them immediately after t ? Only one answer is possible: they were then identical. If they were not, then we should have to admit that there was a time at which they were two material objects having the *same* size, shape, position, orientation, attitude, mass, velocity (both linear and angular), and color [i.e. a time when Descartes and D-minus were co-located]. Someone *might* say this, I suppose, but I should not understand him and I suspect that no one else would either. (81)

That is, Van Inwagen believes that if we claim that Descartes and D-minus are two numerically different objects completely co-located right after t , we would be committed to an unintelligible proposition. So, the alternative is to accept that Descartes and D-minus are identical after t .¹⁴ We can summarize the argument in the following way:

- i) Descartes is a Material Object that exists at t_0

¹⁴ The complete argument against DAUP is not relevant for my present purposes, however, in the spirit of interpretative and expository precision, the remaining steps of the argument are as follows:

Our argument has led us to this conclusion: that there was a time at which Descartes and D-minus were identical. And, as we have noted, there was an earlier time at which they were not identical. But if this is correct, then there was once an object that had earlier been two objects which is a plain violation of the principle of the transitivity of identity. (81)

Thus, our *reduction* has been accomplished, and we must conclude that there was never any such thing as D-minus. Therefore, DAUP is false, for DAUP entails that there was such a thing as D-minus. (82)

[...] L does not exist either: there was never any such thing as Descartes' left leg. We need only one premise to reach this conclusion, namely that if L existed, D-minus did too. And this premise seems quite reasonable, for it would seem wholly arbitrary to accept the existence of L and to deny the existence of D-minus [...]. If these things existed, they would be things of the same sort. Each would be an arbitrary undetached part of a certain man. (Ibid.)

- ii) (By DAUP), both L and D-minus are numerically different concrete material objects that compose Descartes at t0
- iii) D-minus does not have the same shape as Descartes at t0
- iv) (Implicit Intermediate Conclusion) Thus, D-minus does not share all of the same properties with Descartes at t0
- v) (Implicit Assumption) The indiscernibility of identicals: If any two objects, x and y , are identical, then, for any property F , x has F if and only if y has F .
- vi) (Intermediate Conclusion) Therefore, D-minus is not identical to Descartes at t0
- vii) Since D-minus is a concrete material object numerically different from Descartes, it survives the severance of L from Descartes at t
- viii) Since human beings can survive the severance of a limb, Descartes survives the severance of L at t
- ix) (Intermediate Conclusion) Hence, either D-minus is identical to Descartes after t, or they are two numerically different objects co-located after t
- x) If Descartes and D-minus were not identical, then it must be the case that after t they were two material objects that had the *same* size, shape, position, orientation, attitude, mass, velocity (both linear and angular), and color. In other words, they would be co-located objects.
- xi) The possibility of co-located objects is unintelligible.
- xii) (Intermediate Conclusion) Thus, Descartes and D-minus are not co-located
- xiii) (Final Conclusion) Thus, D-minus is identical to Descartes after t

For the sake of the discussion, I accept premises (i) to (x) without inspection. My real interest concerns premises (xi), (xii), and the conclusion at (xiii).

The consequent of the hypothetical claim in (x), 'it must be the case that Descartes' and D-minus are co-located objects after t,' is negated by (xii), and this in turn seems to derive from (xi). However, it is not immediately clear why the unintelligibility of co-location, if true, is

sufficient to negate the possibility of co-location between Descartes and D-minus.¹⁵ This is a key move in Van Inwagen's argument, for he can only conclude that Descartes and D-minus are identical after ruling out co-location, but how can affirming the unintelligibility of co-location lead to the negation of that possibility?

I am inclined to believe that the inference from unintelligibility in (xi), to the negation of co-location in (xii) is not valid. The move is not a deductive inference at all, but a non-demonstrative one. Otherwise, it would be hard to understand why Van Inwagen, after presupposing the indiscernibility of identicals in (v), does not claim that the possibility of two objects sharing the same perceptible properties is false in virtue of contradicting such a principle. What he claims instead is that such a possibility is unintelligible:

I shall simply dismiss any objection that involves the contention that it was possible for Descartes and D-minus to have been numerically distinct material objects having the same momentary physical properties. (I would not go so far as to say that such objections are not to be heard. I dismiss them because I cannot understand them and therefore have nothing to say about them) (84).

¹⁵At an earlier stage of his discussion, Van Inwagen expresses the same reasoning in a general form:

Only one answer would seem to be possible: identity. 'Each' is a material object, after all, and 'they' now have the same boundaries, and, in fact, share all their 'momentary' physical properties. Someone *might* say that [objects] O and O-minus are two material objects that now have the same size, shape, position, weight, orientation in space, linear velocity, angular velocity, and so on, these two objects being numerically distinct simply in virtue of their having different histories. But this I cannot conceive of; if the meaning of 'material object' is such as to allow the conceptual possibility of this, then I do not understand 'material object' and therefore do not understand DAUP. (78)

This statement of the argument is, however, no more illuminating than the specific argument against the co-location of Descartes and D-minus.

The conclusion of the argument is non-demonstrative in the sense that it depends on an inference to the best explanation involving identity and co-location.¹⁶ Identity and co-location work as competing explanation for the question of why Descartes and D-minus seem to have all their ‘momentary’ physical properties in common. Now, if this argument is non-demonstrative, then Van Inwagen needs a method for showing that identity is the best explanation for the (apparent) indiscernibility between Descartes and D-minus. So the question is, how does he determine that identity is a better explanation for indiscernibility than co-location? The answer is that Van Inwagen appeals to intelligibility in order to determine which of the two explanations is the best available.

In this respect he says that “if the meaning of ‘material object’ is such as to allow the conceptual possibility of [co-location], then I do not understand ‘material object’” (78). In view of this, I believe that the assumption of no-coincidence would be important for preserving the meaning of ‘material object,’ at least to the effect that no-coincidence would ensure that the

¹⁶ I follow Gilbert Harman’s (1965) classic characterization of inference to the best explanation as a type of inference in which “one infers, from the fact that a certain hypothesis would explain the evidence, to the truth of that hypothesis” (89). Harman seems to have in mind a notion of inference to the best *available* explanation:

In general, there will be several hypotheses which might explain the evidence, so one must be able to reject all such alternative hypotheses before one is warranted in making the inference. Thus one infers, from the premise that a given hypothesis would provide a “better” explanation for the evidence than would any other hypothesis, to the conclusion that the given hypothesis is true. (Ibid.)

For instance:

When a detective puts the evidence together and decides that it must have been the butler, he is reasoning that no other explanation which accounts for all the facts is plausible enough or simple enough to be accepted. When a scientist infers the existence of atoms and sub-atomic particles, he is inferring the truth of an explanation for various data which he wishes to account for [...]. Or, to take a different sort of example, when we infer from a person's behavior to some fact about his mental experience, we are inferring that the latter fact explains better than some other explanation what he does. (Ibid.).

meaning of ‘material object’ would be such as to forbid co-location; and for this to be the case Descartes and D-minus must be identical, for only then no-coincidence can be preserved. So if, the notion of material object is to be intelligible, no-coincidence must be respected and the relationship between Descartes and D-minus must be the relationship of identity. Therefore, identity must be the best explanation for the relationship between Descartes and D-minus.

We can restructure Van Inwagen’s (sub-) sub-argument in the following terms:

- i) Either D-minus is identical to Descartes after t , or they are two numerically different objects co-located after t . So:
 - ii.i) Explanation 1, ‘identity:’ Descartes and D-minus are not two objects but only one. For this reason they have the same size, shape, position, orientation, attitude, mass, velocity and other perceptible physical properties after t . Arguably, in this case it is true that $(x = y) \leftrightarrow (Fx \leftrightarrow Fy)$.
 - ii.ii) Explanation 2, ‘co-location:’ Descartes and D-minus are two objects that have the same perceptible physical properties after t in virtue of sharing the same microphysical structure. In this case it is not true that $(x = y) \leftrightarrow (Fx \leftrightarrow Fy)$, and yet they share exactly the same perceptible properties.
 - iii) In view of the normative primacy of the principle of numerical identity, we can make sense of explanation 1, but not of explanation 2. Explanation 1, ‘identity,’ is a better explanation than ‘co-location’ for the fact that Descartes and D-minus share the same properties after t .
- iv) Therefore, it is not the case that Descartes and D-minus are co-located.
- v) (Final Conclusion) Thus, D-minus is identical to Descartes after t .

In short, Van Inwagen believes that the relationship between the objects in the example is the relationship of identity, and that this is the best of the available alternatives on the grounds that it respects a certain intelligibility constraint in our accounts of material objects.

Now, for Van Inwagen the intelligibility constraint is given by the logical principle of identity. Not in vain, he maintains that we should take logic as a regulative ideal in our discourse about reality, and that it is better to leave logic alone and tinker with metaphysical and

epistemological assumptions that may conflict with the principle of numerical identity (8). Thus, for Van Inwagen the claim that Descartes and D-minus are identical is intelligible because it respects the logical standard of the principle of numerical identity; that is to say, the relationship between Descartes and D-minus meets the conditions: $x=y \leftrightarrow \forall F(Fx \leftrightarrow Fy)$, and for this reason we should endorse this position.

Van Inwagen might be correct in thinking that a violation of the principle of numerical identity is troublesome from the point of view of discursive intelligibility, but considering that he believes that in cases of conflict we should leave identity alone and tinker with metaphysical and epistemological assumptions, it is not clear why he believes that we should reject a metaphysics of co-location. In other words, even if we agree with Van Inwagen that logic must be a regulative standard with respect to metaphysics, it does not seem necessary to suppose that in order to meet that standard, we must maintain that Descartes is identical to D-minus. After all, numerical identity is a matter of logic and the relationship between the objects in question is a matter of metaphysics. Even by his own assumption, we can tinker with the latter in order to respect the normative character of the former. The move is not uncommon in discussions of material constitution. To this effect, Sidelle points out that we can always handle conflicts between different intuitions or theoretical constraints by some combination of ascription of mistake to us, with some explanation of our confusion, and a scheme of paraphrase or re-description for our judgments concerning material objects; “in each case, to use Quine’s figure, the leading idea can meet our desiderata by ‘making accommodations elsewhere in the system’” (120). Accordingly, if our account finds a way of establishing the coherence of the co-location friendly alternative, then identity does not need to be the best explanation for the relationship between Descartes and D-minus.

Van Inwagen has very little to say against this point. Many believers in co-location will question his argument by pointing out that it is possible to articulate an intelligible version of co-location. A way of doing this is to endorse the view that constitution is a kind of metaphysical unity that is not necessarily an instance of numerical identity (Baker, 2000, 2007; Johnston, 1992; Wiggins, 1968). There are difficulties with these views (Sidelle, 2002), but Van Inwagen (2002) does not directly engage the constitution alternatives, nor tries to show that identity is the most plausible explanation for the similarities between objects presumed to be co-located. For instance, in a review of Baker's *Persons and Bodies: a Constitution View*, he simply tells us that:

I have only one major objection to the book: I can't bring myself to take seriously the idea that constitution is real. It seems to me as obvious as anything can be that if a piece of plastic becomes a driver's license, that's like a man's becoming a husband: entirely a matter of a pre-existent thing's acquiring a new legal status. It seems equally obvious to me that there is nothing numerically distinct from me that is spatially coextensive with me. And Baker's strenuous, extended, and very intelligent efforts to convince her readers that there are good reasons to believe these things move me not at all; I retain a complacent, unworried conviction that these things that seem obvious to me deserve to seem obvious to anyone who considers them. Well, that's philosophy. (141)

Even if we were to consider this response satisfactory, Van Inwagen still has not said why we should prefer the view that the relationship between objects and their parts is identity. The problem is that while we may agree with him that we must guide our theorizing by the principle of numerical identity (and other logical constraints), this by itself does not suffice for the conclusion that, in view of the normative primacy of the principle of numerical identity, we should prefer the view that the objects in question are identical over the view that they are indistinguishable but non-identical. Specifically, in view of possible differences in historical properties and persistence conditions, the advocate of co-location does not need to agree that material constitution must be identity. An argument that moves from the normative primacy of the logical principle of identity to the conclusion that the objects in question must be identical

fails to address the metaphysical question, can objects that share the same parts instantiate different historical properties and persistence conditions? And in order to answer in the negative, we must appeal to some view about the metaphysics of material objects. Appeals to the logical principle of identity miss the point; in fact, the logic of identity is not at issue at all in this discussion.

Identity, supervenience and (metaphysical) determination

If we want to settle the issue concerning the nature of the relationship between constituting and constituted object, we need a metaphysical reason in favor of the view that material constitution is likely to be the relationship of identity. The thesis of microphysical determination is supposed to provide such a reason. Furthermore, anti-co-location intuitions involving microphysical determination have been so central to contemporary discussions of material objects that the problem of co-location is often sketched in terms of a violation of the thesis of microphysical determination. This articulation implies that the substantial metaphysical confrontation involves the opposite sides of co-location and microphysical determination.

Below I try to show that although microphysical determination can be used as the basis of some important anti-co-location intuitions, microphysical determination is not the reason why co-location is a problem. I articulate the claim of microphysical determination in chapter 4, and I explain how the claim is used in anti-co-location arguments in chapter 5. Later, I advance and defend my counter claims in chapters 5 and 6. I argue that although microphysical determination is supposed to provide support for the view that the individuation and persistence of material objects is determined by microphysical properties, it partially depends on such a view. I think in fact, that the best way of understanding the contribution of microphysical supervenience in favor

of physicalism is as part of an argument to the best explanation that bootstrap the physicalist case. Since, as I maintain, this is the case for microphysical determination, it also begs the questions against co-location. Moreover, this result supports my main claim: co-location is a problem related to the view that individuation and persistence of material objects is fully determined by physical properties, and any strategy that presupposes the latter, falls short as a reason against co-location.

CHAPTER 4

MICROPHYSICAL DETERMINATION AND METAPHYSICAL UNITY

In Chapter 2, I argued that we should interpret the no-coincidence principle as a consequence of a thesis that gave metaphysical priority to the physical properties of the object. With this latter, more basic, physicalist belief in force, co-location between numerically different material objects would be impossible on the grounds that the individuation and persistence conditions of material objects depend exhaustively on material properties. So far, I have argued that the appeal to no-coincidence does not give us sufficient reasons for rejecting the possibility of co-location. Roughly, I have claimed that advancing no-coincidence against co-location is question begging on the grounds that no-coincidence presupposes a connection between identity and the relationship of material constitution. I have also argued that an appeal to the logical principle of identity is not a sufficient reason against co-location either: The principle of numerical identity, by itself, does not say much about the type of metaphysics that would reject co-location

In this chapter, I explore a type of claim that, arguably, could provide the upper hand to the foes of co-location. I am referring to the thesis of *microphysical determination*, or the view that many or even all of the *intrinsic qualitative properties* of the object are determined by the microphysical structure of the object (Rea, 1997b, 367). This is a complex doctrine and I spend the bulk of this chapter elaborating on the different elements that come together in it. I leave a close examination and evaluation of anti-co-location arguments based on microphysical supervenience pending until chapters 5 and 6.

Supervenience and microphysical determination

The claim of supervenience *simpliciter* says that a set of properties *A* co-varies in relation to a different set of properties *B*. This co-variance may obtain between any two sets of properties *A* and *B*, whether or not such sets involve microphysical properties. In general, “*A*-properties supervene on *B*-properties if and only if a difference in *A*-properties *requires* a difference in *B*-properties—or, equivalently, if and only if exact similarity with respect to *B*-properties *guarantees* exact similarity with respect to *A*-properties” (McLaughlin and Bennett, 2014). Supervenience does not necessarily say that the co-variance between *A* and *B* is a type of dependence. It is only when we discuss the thesis of microphysical supervenience, or what I call microphysical determination, that notions of dependency or determination complement the idea of co-variance. According to this stronger claim, at least some of the microphysical properties of any material object are fundamental in the sense that they determine the instantiation of other types of property.¹⁷ This means that although not all microphysical properties may be fundamental, it would still be the case that if a property is fundamental in the sense of providing a base for other properties, then such a property must be a microphysical property.

An important reason for incorporating the claim of determination into accounts of supervenience and material objects, is that so understood, supervenience promises to become a very attractive explanatory claim, entailing that the reason *why* macroscopic material objects instantiate certain properties is because those properties ultimately depend, in some important sense, on the microphysical structure of the object (Kim, 1998). In other words, microphysical supervenience, if true, would explain why we seem to find certain properties in material objects, and why changes in such properties seem, at least in many important cases, to co-vary with

¹⁷ I use the expressions ‘microphysical properties,’ ‘microstructure,’ ‘microphysical structure’ and ‘microphysical parts’ interchangeably throughout the remainder of the paper.

changes in the microphysical structure of the object. Eric Olson (2001) provides a good articulation of this idea in the context of a discussion of mental and biological properties:

If a complex material object can think, we expect it to think by virtue of the sorts of parts it has and the way in which they interact. Having the right microstructure—in the right surroundings and with the right history and laws of nature, we might add—ought to suffice for a material thing to think, if such a thing could ever think [...]. This is no doubt the idea which has led so many philosophers, rightly or wrongly, to think that mental and biological properties supervene on microstructure, or at any rate are nomologically correlated with it or caused by it. (354)

Microphysical determination is not the innocent relationship of co-variance, but a relationship that anchors the properties of the object to a metaphysical hierarchy in which the nature and characteristics of the presumably fundamental microphysical properties determine everything else (or at least many important aspects of everything else). Kim has called this picture of a world of different hierarchically stratified levels, which are ultimately grounded on microphysics, the *layered model of the world* (15). According to this:

The bottom level [...] consist[s] of elementary particles, or whatever our best physics is going to tell us are the basic bits of matter out of which all material things are composed. As we go up the ladder, we successively encounter atoms, molecules, cells, larger living organisms, and so on. The ordering relation that generates the hierarchical structure is the mereological (part-whole) relation: entities belonging to a given level, except those at the very bottom, have an exhaustive decomposition, without remainder, into entities belonging to the lower levels. Entities at the bottom level have no physically significant proper parts. (Ibid.)

Furthermore, each level is supposed to exemplify a series of interconnected properties, activities, and functions that may or may not be determined by the interconnected properties, activities, and functions of the previous level:

It is part of this layered picture that at each level there are properties, activities, and functions that make their first appearance, or “emerge,” at that level (we may call them the characteristic properties of that level). Thus among the characteristic properties of the molecular level are electrical conductivity, inflammability, density, viscosity, and the like; activities and functions like metabolism and

reproduction are among the characteristic properties of the cellular and higher biological levels; and consciousness and other mental properties make their appearance at the level of higher organisms. (16)

Putting aside details about the applications of supervenience in discussions of the mind body problem, and leaving aside issues concerning whether determination holds between some or all metaphysical levels, or between all or some properties across levels (and so on), it is fair to say that a version of the layered model of the world or other is often assumed as a backdrop to discussions of material objects and co-location at least to the extent that intuitions about the layered model together with intuitions about determination are used to explain why we should expect the basic level of microphysics to determine the properties in the ‘upper levels’ of the metaphysical hierarchy: the layered model together with the claim of microphysical determination explain or at least bootstrap the intuition that many of the properties of material objects must be related to the basic microphysical constitution of the object.¹⁸ Ultimately, microphysical determination explains why certain sets of properties supervene on others and this in turn explains why colocation is impossible.¹⁹

¹⁸ To this effect, Kim says that,

Not surprisingly, supervenience theses [i.e. claims of determination], when applied to the layered model, turn into claims of *mereological supervenience*, the doctrine that properties of wholes are fixed by the properties and relations that characterize their parts. A general claim of macro-micro supervenience then becomes the Democritean atomistic doctrine that the world is the way it is because the microworld is the way it is. (18)

¹⁹ I owe this articulation of the relationship between properties, supervenience, and determination to Mark Moyer (in personal conversation).

Microphysical determination and intrinsic qualitative properties

In chapter 2, I argued that accepting the assumption that material objects can instantiate distinctive historical properties and persistence conditions leads to co-location, but now it seems that we can reject co-location if we maintain that the microstructure of the object exhaustively determines the instantiation of other types of property, including those types that are problematic insofar as they lead to co-location. I have proceeded without saying much about the relationship between the cluster of problematic properties that leads to co-location and the set of properties assumed to be determined by microphysics, but the question is important insofar as the argumentative utility and success of microphysical determination for purposes of precluding the possibility of co-location depend in good measure on the characterization of supervenient properties. Ideally, if we are going to maintain that microphysical properties are base properties, the properties that we characterize as supervenient properties must be the kind of property that we can reasonably assume to necessarily depend on microstructure.

Let us consider first some of the most common differences in property-instantiation that indicate that objects such as the statue *s* and the quantity of bronze *b* are co-located. I have already said that objects could instantiate different historical or temporal properties: *b* existed at *t*₁ but *s* did not. I also said that they could instantiate different persistence conditions: *b* could survive melting but *s* cannot. Additionally, they could differ in sort or kind: *b* is a quantity of bronze while *s* is a statue (Wasserman, 2014). Wasserman characterizes this cluster of problematic properties as being *non-categorical properties*, or properties that include “all of the various ways that a thing *was*, *will*, *would*, *could*, or *must* be” (Ibid.).²⁰ From this point on, I

²⁰ Similarly, Karen Bennett (2004) uses the term 'sortalish properties' to refer indiscriminately to (a) persistence conditions, particularly modal properties like being essentially shaped about like so, (b) kind

follow Wasserman's use of 'non-categorical properties' to refer to the cluster of properties that generate the possibility of co-location.

The incorporation of microphysical determination into assessments of co-location allows for a characterization of microphysical properties as what traditionally has been known as *categorical properties*. Now, I do not claim that microphysical properties are categorical properties, but that insofar as they are supposed to determine at least some of the properties that are usually identified as non-categorical, they play a role that categorical properties are traditionally thought to play. I am certainly not arguing that microphysical properties are properties that are necessarily "in the object itself, permanently manifesting themselves and whose instantiation do not depend on any other kind of property" (Bird, 2007, 66). The point to note is that philosophers that favor anti-co-location arguments based on microphysical determination typically distinguish between the categorical and non-categorical, at least to the extent that they suppose that the non-categorical requires an appropriate metaphysical base. So, to the extent that microstructure is supposed to be metaphysically basic, and to the extent that microphysical properties are supposed to determine non-categorical properties, the microstructure of the object plays one of the roles that categorical properties are expected to play.

Does microstructure really determine non-categorical properties? It seems to me that whether the microstructure of the object provides sufficient conditions for the determination of non-categorical properties or not depends on whether non-categorical properties can be

or sortal properties, and (c) properties that things have partially in virtue of their instantiation of properties in categories (a) or (b) (341-342).

characterized as *intrinsic qualitative properties*, or as being fully dependent on intrinsic qualitative properties. The latter is a complex notion that requires unpacking.

I begin with the notion of ‘intrinsic.’ The question of how to characterize intrinsic properties is a heated one, but it seems that a notion of intrinsicness useful for claims of microphysical determination must be characterized by having a strong modal force. Specifically, to say that a property *I* is ‘intrinsic’ must make a difference with respect to whether it is possible for the microstructure of the object to fully determine *I* or not. If it is possible for the microstructure of the object to not determine *I*, then co-location is possible, for this would imply that two objects can have the same microstructure and differ with respect to their capacity to instantiate *I*. Therefore, if we want to avoid co-location, we need a notion of intrinsicness that ensures the microphysical determination of *I*. An alternative way of making the latter point is that microphysical determination is supposed to ensure absolute metaphysical determination, but for this to be the case, it needs to be constructed as involving supervenient properties that are intrinsic in a specific sense.

I think that the relevant sense of intrinsicness is associated with what Sider (1996), and Dunn (1990), call the *metaphysical criterion* for intrinsicness. According to this, a property of any given object is intrinsic at a certain time if and only if it is instantiated by virtue of that object *only*, or more specifically for purposes of microphysical supervenience, by virtue of the microstructure of the object only. The property ‘mass’ seems to be intrinsic in this sense insofar as the mass of any object can be completely determined by the specific microstructure that constitutes such an object at a certain time.²¹ The same point applies to other physical properties

²¹ The qualification ‘at a certain time’ is important insofar as properties that are typically characterized as intrinsic run the risk of not qualifying as such without it. If the microstructures of objects *can* change their qualitative properties, then they are no more intrinsic than other properties. The microstructure of a given object *A* will change its mass when passing through a Higgs Boson field. So it would be

such as ‘condensation point,’ ‘shape,’ and ‘density:’ the microphysical properties and relations that characterize any material object at a given time are sufficient for bringing about the instantiation of these properties. In contrast, the microphysics of the object does not seem to be sufficient or necessary for instantiating the property ‘being five feet from City Hall.’ Instead, the instantiation of the latter depends as much on City Hall as it depends on the location of the object: ‘Being five feet from City Hall’ is an *extrinsic property* at least in the sense that the microstructure of the object does not exhaustively determine the instantiation of said property.

Now, I suspect that, in order for the thesis of microphysical determination to effectively block the possibility of co-location, it must presuppose that non-categorical properties cannot in fact lead to co-location because they are intrinsic in the strong modal sense of the metaphysical criterion. If this is not presupposed, they may not actually supervene on microstructure. And this reintroduces the possibility of objects that share the same microstructure but differ with respect to some of their non-categorical properties. This can happen even if we use a criterion of intrinsicness that is not as modally strong as the metaphysical criterion. For instance, if we characterize intrinsic properties in terms of the *syntactical criterion for intrinsicness*, or the view that intrinsic properties are non-relational properties of the object (Sider, 2). We should reject the syntactical criterion on the grounds that it allows for properties that although can be considered ‘intrinsic’ are not intrinsic in the relevant ‘co-location-forbidding’ sense:

Suppose that my father is extremely dignified. Because of his stern demeanor, he has the property of being respected by me. In a sense, this is in virtue of himself, since he is so dignified. But of course, it is only because of certain facts about me as well that his dignity inspires my respect. It would be possible for him to remain as dignified as he in fact is and have me disrespect him. Even if there is a psychological law of nature that necessitates my respect as a result of his dignity, we do not take this implication to be metaphysically necessary. Analogous things

problematic to simply say that the particle has mass, but has mass at t_1 . Since the possibility of change is in the cards, it is important to temporally qualify properties even if they do not change for the whole history of the subject (I owe this observation to Gerald Vision in private conversation).

are true in the case of non-Humean causation. In some sense, a may cause b purely because of a, but this is not the sense relevant to the metaphysical criterion, roughly because the non-Humean will not claim that it would be metaphysically impossible for a to occur without causing b. More likely the claim is that particular cases of causation are independent of the laws of nature, or [...] independent of the existence of other objects. (Ibid.)

While the capacity of a to cause b might be nomologically necessary in virtue of the physical laws that regiment our universe, it is not metaphysically necessary for a to cause b, insofar as we can conceive of different possible universes with different physical laws altogether in which a fails to cause b. So, even if there is a sense in which a instantiates the property in question intrinsically insofar as it does it in a non-relational way, ‘causing b’ is not an intrinsic property of a according to the metaphysical criterion: With the latter in force, ‘causing b’ is extrinsic, not intrinsic. In the language of microphysical determination, this would mean that it is possible for the microstructure of a to fail to determine the property ‘causing b.’

Accordingly, anti-co-location claims that appeal to microphysical determination cannot characterize the cluster of problematic properties as being intrinsic in the sense of the syntactical criterion. If our aim is to show that co-location is metaphysically impossible because of how the modality of the properties in question is fixed by the microphysical structure of the object, these properties must be understood as being *always* determined by microstructure. We know that intrinsic properties of the non-relational variety do not behave in this way with respect to microphysics, so this cannot be the kind of properties that many have in mind when they appeal to microphysical supervenience as a metaphysical barrier against co-location.

Intrinsic properties in the metaphysical criterion sense are *qualitative*, and intrinsic properties in the syntactical criterion sense are *non-qualitative*. Intrinsic qualitative properties seem to be properties that do not involve any particular object, and their instantiation does not

require any concrete object. Indeed, I take it that this is why Sider uses the term ‘non-qualitative’ in relation to properties that *do* concern particular objects:

My reason for wanting to distinguish the metaphysical and syntactic criteria [...] involves “haecceities”, or “identity properties”; that is, properties like being identical to Ted. These properties seem non- relational, and hence intrinsic according to the syntactic criterion, at least on a sense of ‘relational’ that may be elaborated as ‘involving relations to other things’. But according to the metaphysical criterion [...], identity properties are extrinsic for they may differ between duplicates. (4)

Thus, we have it that qualitative properties include such non-specified properties as mass, location in space, having an atomic number and having a shape, amongst others, while non-qualitative properties include the aforementioned haecceities or identity properties. Ultimately, the notion of qualitative intrinsicness promises a relevant notion of intrinsicness for anti-co-location arguments based on supervenience.

Anti-co-location discussants appeal to microphysical determination because they are concerned with properties that must be metaphysically necessary in view of the microphysical structure that constitutes the object, regardless of the context (or possible world) in which that object exists, and these are the so-called intrinsic qualitative properties. We find evidence of this assumption in some typical argumentative strategies where the emphasis is clearly on whether intrinsic qualitative properties are always determined by virtue of a given object or by virtue of the object *and* something else. Consider Sider’s example from discussions of mental content in the philosophy of mind:

[...] individualism, the doctrine that is supposed to be refuted by Twin Earth examples and by Tyler Burge’s case of arthritis and tharthritis, is naturally construed as the doctrine that what one believes is determined by one’s intrinsic properties—persons with exactly the same intrinsic properties must have the same beliefs. If identity properties were intrinsic, Individualism wouldn’t be refuted by Twin Earth examples, for those examples typically involve two distinct persons (a person and his Twin), and the only person that would have the same intrinsic properties as a given person would be that very person. (5)

Humberstone's (1996) characterizes 'qualitative properties' as properties that any possible pair of microphysical duplicates must necessarily share, or (what amounts to the same) properties that are *duplication preserving* (Weatherson and Marshall, 2014). Characterizing qualitative properties as duplication preserving calls attention to the necessary connection of intrinsic qualitative properties to the basic microphysical structure of the object. To say that qualitative properties are duplication preserving is to say that every time we have a certain microphysical structure arranged in a certain way, we also have certain specific qualitative properties. We can say that the duplication preserving characterization of qualitative properties allows for emphasis on the assumption that objects that share the same fundamental microphysical nature cannot fail to instantiate the same intrinsic qualitative properties.

There is a connection between Sider's and Humberstone's respective uses of 'qualitative.' If a property is intrinsic and qualitative in the sense of being non-specified, then it must be the kind of property that perfect microphysical duplicates cannot fail to share. If an object instantiates the property 'having a mass of five hundred pounds' then if there is a perfect microphysical duplicate of that object, such a duplicate must also instantiate a mass of five hundred pounds. The same is not the case with properties that are intrinsic but are non-qualitative in the sense of making reference to particular objects, times, or locations. Suppose that object A and object A^* are perfect duplicates. Object A has the intrinsic property of 'being self-identical with A ' while A^* lacks this property: A^* is self-identical with A^* but not with A . So, if we adopt the notion of properties that are intrinsic qualitative in the sense of being properties instantiated by virtue of the object only, and that also happen to be duplication preserving, we thereby accept the notion of properties that are intrinsic qualitative in the sense of being non-specified. This

obtains insofar as only non-specified intrinsic properties seem to be candidates for duplication preservation in cases of microphysical duplication.

At any rate, if the claim of microphysical determination is understood as involving intrinsic qualitative properties, and non-categorical properties are intrinsic in this sense, then co-location should be impossible. But for this to be the case, we must presuppose or argue for the view that categorical properties are intrinsic in the qualitative sense. If they are not, then the claim of microphysical supervenience needs to ensure that at least they must be completely determined by intrinsic qualitative properties.

Microphysical determination as strong individual supervenience

Essentially, I have argued that a commitment to the belief that the individuation and persistence conditions of material objects are determined exhaustively by the physical properties and relations instantiated by the object, requires an understanding of microphysical determination as a form of *strong individual supervenience*, or simply *strong supervenience*. Consider Kim's (1987) articulation of the strong supervenience claim in terms of possible worlds.²² Let A and B be two sets of properties:

For any worlds w_j and w_k , and for any objects x and y , if x has in w_j the same B-properties that y has in w_k , then x has in w_j the same A-properties that y has in w_k . (317)

We can also articulate this claim in terms of: *A strongly supervenes on B just in case cross-world indiscernibility in B entails cross-world indiscernibility in A*. Kim believes that only strong supervenience guarantees world-to-world stability for the correlations between a certain set of base properties and a certain set of supervenient properties. Anything weaker than strong

²² Kim says that he borrowed this definition from an unpublished paper by Brian McLaughlin (Ibid.).

supervenience would be consistent with co-location. To drive this point home, consider one of Kim's articulations of weak supervenience:

Necessarily, for any x and y, if x and y share all properties in B, then x and y share all properties in A - that is, indiscernibility in B entails indiscernibility in A. (315)

According to Kim, the difference between strong and weak versions of supervenience is that in the case of strong supervenience, the indiscernibility in the sets of properties A or B is cross-world, while in the case of weak supervenience is only intra-world. We can compare the two versions of supervenience directly in the following terms:

Strong supervenience: A properties strongly supervene on B properties if and only if for any x at any world and any y at any world, x and y have the same A properties only if they have the same B properties.

Weak supervenience: A properties weakly supervene on B properties if and only if for any world w, and any x and y at that world, x and y have the same A properties only if they have the same B properties.

In other words, strong supervenience says to compare any two objects, where these can be at different worlds, whereas weak supervenience says to compare two objects that are world-mates.²³ Therefore, weak supervenience “does not guarantee stability across worlds for the correlations between supervenient properties and their base properties” (Kim, 317), and for this reason it fails to capture any interesting sense of metaphysical determination or dependency between supervenient properties and their base properties. This means further that, if we do not construct microphysical determination as strong supervenience it would be possible for material objects to share one common microstructure and yet instantiate different non-categorical properties, and this re-opens the door to the possibility of co-location. So, if we want to fence off co-location, we must understand microphysical determination as a form of strong supervenience.

²³ I owe these definitions of strong and weak supervenience to Mark Moyer (in private conversation).

In what follows I continue using the expression ‘microphysical determination,’ to designate the relevant relationship that is at issue in arguments against collocation, and by ‘microphysical determination’ I mean a form of strong supervenience.

No-coincidence and determination:

The story so far concerning no-coincidence, co-location and microphysical determination is the following: In chapter 2, I argued that the no-coincidence principle, the claim that only one material object can be constituted by a certain set of microphysical parts at any given time, is expected to provide a reason for rejecting co-location. I also argued that in order for the principle to do this, it must provide an exclusion clause based on specific considerations about the conditions of individuation and persistence of material objects. Specifically, for the no-coincidence principle to work as an exclusion principle against co-location, we need to interpret the no coincidence principle as involving a particular belief about the instantiation of individuation and persistence conditions of material objects: The Individuation and persistence conditions of any material object, regardless of the sub-kind to which it belongs, must depend exhaustively on the material properties of the object. Accordingly, in view of the interpretation of no-coincidence as involving this belief, I maintained that the viability of this version of the no-coincidence principle is tied to the truth of the belief that physical properties are the ultimate determinants of the metaphysics of material objects. However, this belief is in need of justification, and we cannot use the no-coincidence principle as a reason against co-location without a justification for this latter belief. Without independent reasons for believing in the principle, arguments that rely on no-coincidence in order to question the possibility of co-location between an object and its associated quantity of matter, would beg the question against co-location. The apparent virtue of microphysical determination is that it may provide

independent support for the no-coincidence principle insofar as it bolsters the belief that the relationship between the constituted and constituting object must be one of identity. Once this assumption is established, we can preserve the no-coincidence principle and avoid co-location: If microphysical determination is true, co-location between two or more material objects must be metaphysically impossible, for the objects in question must have all their intrinsic qualitative properties in common at a certain time, but this is simply to say that they must be identical with respect to their intrinsic qualitative properties.

The problem of co-location and microphysical determination

We can see how this may affect our position with respect to the problem of co-location: if we believe that the claim of microphysical determination is true, then we need to reject co-location. Dean Zimmerman (1995) articulates the problem of co-location in terms that strongly suggest that the violation of some relevant form of microphysical determination is unacceptable, making the dichotomy explicit:

What is so bad about coincident objects? The fundamental problem is this: if both my body and this mass of cells are physical objects that, though momentarily coincident and indiscernible, differ in their persistence conditions, then there are two objects exactly alike in every empirically discriminable intrinsic respect, one of which has the stamina to withstand pressures and survive changes that the other cannot. Should not two physical objects constructed in precisely the same way out of qualitatively identical parts have the same capacities for survival under similar conditions? (87)

In other words, Zimmerman believes that co-located material objects are problematic because objects that are constructed out of qualitatively identical parts should have the same persistence conditions, and co-location denies that such a relationship holds between the parts in question and persistence conditions. Zimmerman does not say that the relationship at issue is microphysical determination, but I believe that we can infer this from his discussion (see below).

So, it would seem that the interesting dichotomy is not between co-location and no-coincidence (after all putting the issue in those terms is simply to state that the possibility of co-location is incompatible with the impossibility of co-location), but between co-location and the claim of microphysical determination. Indeed, determination promises to give an independent reason to think that the best characterization of the relationship between constituted and constituting object is the relationship of numerical identity. As Sider (2001) puts it, “if we are given two material objects with the same microscopic parts, the pressure is on to identify them” (141). The upshot of this reasoning is that it is perhaps better to articulate the problem of co-location not in terms of a violation the no-coincidence principle, but in the apparently more informative terms of a violation of the claim of microphysical determination. If microphysical determination is true, then it is not possible for objects constituted by the same microphysical parts to be co-located. If we endorse the opposite, and believe that co-location is true, we will need to rethink basic beliefs about the metaphysics of the layered picture of the world. Specifically, to echo a point I made in chapter 2, it would not be possible for the individuation and persistence conditions of material objects to be determined by physical properties that can themselves be explained in terms of the basic microphysical structure of the object. Ultimately, the assumption goes, since microphysical determination must be true, the claim of co-location cannot be, and we must reject it accordingly. I develop the details of this reasoning in the next chapter.

CHAPTER 5

THE ARGUMENT FROM MICROPHYSICAL DETERMINATION

My aim in this chapter is to flesh out the ways in which the claim of microphysical determination is used as a reason against co-location. I call this family of arguments *the argument from microphysical determination*. I believe that variations of this argument consist of a *reductio ad absurdum*, involving the apparently incompatible assumptions of co-location and microphysical determination. For instance, Rea points out that if we assume both, co-location and microphysical determination, we would have a very puzzling possibility involving intrinsic qualitative properties such as the mass of the statue/quantity of bronze pair. The quantity of bronze and the statue are two numerically different objects in virtue of having different persistence conditions, but they are co-located in virtue of sharing the same microphysical structure.²⁴ If the statue weights eight pounds, we have that, as per determination, the mass of the statue depends on the statue's microphysical structure. Since the quantity of bronze has the same microphysical structure, the quantity of bronze must also weight eight pounds, but if this is true, they should have a combined mass of sixteen pounds. This is clearly not the case, but why not? The situation seems to be this: there is a certain sets of qualitative properties that we are able to discriminate empirically. In turn, this properties seem to be closely associated with each one of the presumed co-located objects. If this is the case, then we must maintain that if co-location is possible, and we have two or more objects where we would otherwise think there is only one, such properties would be 'doubled up.' However, the properties in question are not actually

²⁴ The following discussion is an adaptation of Rea's Socrates/Lump example.

doubled up. Hence, it would be absurd to think that co-location is possible. Lewis illustrates this reasoning in his discussion of co-location and identity:

It reeks of double counting to say that here we have a dishpan, and we also have a dishpan shaped bit of plastic that is just where the dishpan is, weighs just what the dishpan weighs (why don't the two together weigh twice as much?), and so on. This multiplication of entities is absurd on its face [...] (252)

As Lewis states, if the statue and the quantity of bronze are two objects co-located and not only one, why do not the two together weigh twice as much? Similarly, Zimmerman (1995) challenges us to consider a case involving his own body and the mass of cellular tissue that constitutes it, two objects exactly alike in every empirically discernible feature:

[M]y living body and its constituting mass of cellular tissue are both made of physical parts so propertied and related that any whole made of such parts must weigh 140 pounds. But then how can it be so easy to lift both of these 140-pound physical objects at once? (87)²⁵

In this chapter, I argue first that counterexamples against co-location that are based on the claim that microphysical duplicates must share the same physical properties are the wrong type of determination-based argument against co-location. Friends of co-location would never deny that objects that share the same microstructure can fail to instantiate the same physical properties, so the arguments fail. Second, I claim that friends of co-location can coherently endorse a claim of *co-location friendly supervenience*, or CFS for short. A significant component of my analysis involves the arguments of Zimmerman (1995) and Burke (1992). I maintain that, although it might not be evident at first sight, they both presuppose a form of microphysical

²⁵ Zimmerman himself does not claim that material objects are identical with quantities of matter, or more specifically, identical to entities that also fall under the category of concrete material objects. He in fact rejects this possibility, but provides a theory of 'masses' that is supposed to account for the similarities between the properties of objects and constituent quantities of matter. However, the point is that Zimmerman also uses the unnecessary multiplication of properties as a reason to reject co-location.

determination. Since their anti-collocation moves try to establish the view that microphysical duplicates cannot differ in sortal properties, and that friends of co-location must explain why microphysical duplicates would differ with respect to those properties, I maintain that a way of countering their anti-co-location stance is to offer pro-co-location explanations of differences in sortal properties. In turn, I propose to base these explanations on CFS. The theme that certain anti-co-location strategies are question begin on the grounds that co-location is a deep problem that challenges a physicalist view that is presupposed by the proposed strategies returns at this point, in connection with my initial defense of CFS. I expand on this discussion in chapter 6.

Microphysical determination and physical intrinsic qualitative properties

I think we can reconstruct the central reasoning illustrated by Rea's mass-duplication example along the following lines. Suppose that we believe that co-location cannot be true on the basis of our loyalty to microphysical determination, and in order to generate an absurd result, we assume that co-location is true. In view of this, foes of co-location may maintain that:

- i. (Assumption 1) Co-location: Statue *s* and quantity of bronze *b* are numerically different objects in virtue of instantiating different persistence conditions but they are co-located at *t*₁ in virtue of being wholly composed by the same microstructure *M*.
- ii. (Assumption 2) Microphysical determination: Intrinsic qualitative properties are determined by microstructure.
- iii. (Intermediate conclusion 1) Mass is an intrinsic qualitative property and, for this reason, it must supervene on the microstructure of the object. Microstructure determines mass. (iii)
- iv. The microstructure *M* that composes *s* determines an *a*-mass of eight pounds
- v. The microstructure *M* that composes *b* determines a *b*-mass of eight pounds
- vi. (Intermediate conclusion 2) If *s* and *b* are numerically different objects and each of them has a mass of eight pounds then, their combined mass must equal sixteen pounds. (i, iv, v)
- vii. Objects *s* and *b* have a combined mass of eight pounds, not sixteen pounds.

- viii. (Intermediate conclusion 4) Objects s and b have a combined mass of sixteen pounds and a combined mass of eight pounds. (vi,vii)
- ix. (Final conclusion) Contradiction: Numerically different objects s and b have a combined mass of sixteen pounds and do not have a combined mass of sixteen pounds. (viii)

In view of the previous line of reasoning, the advocate of co-location would need to consider the possibility that either object s and object b are not numerically different objects, or the possibility that it is not true that each of them has a mass of eight pounds. Of course, the first disjunct, *s and b are not numerically different objects*, is effectively a denial of co-location in favor of microphysical determination, so positions sympathetic to co-location are unlikely to endorse this possibility. On the other hand, the disjunct, *it is not true that each of the objects has a mass of eight pounds*, could preserve co-location, but it would also require an explanation. Specifically, the question at issue is, on the assumption that microphysical determination allows for explanation, how is it possible for two (numerically different) objects to have the same microstructure and still differ in intrinsic qualitative properties?

Friends of co-location may respond that, in matters concerning *physical* intrinsic qualitative properties, a denial of microphysical determination may not be necessary. Rea himself believes that there might be an intuitive and straightforward answer to the particular case involving mass. According to Rea, the advocate of co-location should reply that co-located objects such as s and b do not have a combined mass of sixteen pounds simply because co-location clearly requires that they *share* the very same mass of eight pounds. Modifying Rea's account slightly in order to accommodate our working example, the claim is that,

There are only [eight pounds] of stuff in the region occupied by the two objects, and so it stands to reason that if both objects are composed of the same stuff, if they share all of their material parts, then they will share their height, mass, shape, and so on as well (368).

Rea favors Zimmerman's (1995) version of this reply for the particular problem involving mass-duplication cases. Presumably, the reply also works for any problematic case involving duplication of physical intrinsic qualitative properties, insofar as it asserts that the microphysical structure at issue, on which physical intrinsic qualitative properties supervene, is 'shared' in cases of co-location: Sameness of microphysical structure entails sameness of physical intrinsic qualitative properties, but it does not entail duplication of such properties whatsoever. Now, Zimmerman's reply depends on the notion of a "complete decomposition S of an object x:"

Every member of S is a part of x, no members of S have any parts in common, and every part of x not in S has a part in common with some member of S. (Ibid.)

The utility of the mereological notion of a complete decomposition is that it clarifies and limits the set of objects that we ought to consider in order to determine the mass of any material object to those that are part of exactly *one* complete decomposition of the object. With this definition in place, Zimmerman then proceeds to express a co-location-friendly response to mass-duplication cases:

x has mass n iff there is a complete decomposition S of x such that the sum of the masses of the members of S is n. Thus if [object s] has a mass of [eight pounds], then so does [object b] and so does the sum, [s + b]. There are (at least) two objects in the region filled by [s] and [b], but the object that is their sum still has a mass of only [eight pounds] since every complete decomposition of that object will be such that the sum of the masses of its members is [eight pounds]. (Ibid)

To paraphrase Rea, the mass of any material object is supposed to be equal to the sum of the masses of the members of *one* complete decomposition of that object. Indeed, the notion of a complete decomposition ensures that the mass of whatever fills a particular region of space is not to be determined by adding together the masses of all of the objects that we may presume to

coincide in a particular location (e.g., the mass of the statue plus the mass of the quantity of bronze), but by assessing the complete decomposition at issue in that region of space (Ibid.). Therefore, we do not need to accept the claim that, in view of microphysical determination, co-located objects, if real, must double up their weight. They share the same 'stuff;' one and the same quantity of matter, which in turn determines the mass that the statue and the quantity of bronze share. So, although for Lewis an endorsement of co-located objects might seem as "double counting," co-location does not need to lead to the multiplication of properties, and this means that, at least on these grounds, it is not "absurd on its face."

I am sympathetic to Rea's response, but I would like to add a point that he fails to notice or acknowledge explicitly: This example makes for the wrong argumentative fodder against co-location. In fact, it misses the problem of co-location altogether! Advocates of co-location can still maintain that the thesis of microphysical determination is true for all physical intrinsic qualitative properties without contradiction. Co-located objects are puzzling because they are non-identical objects in spite of having exactly the *same* physical make up. The problem is not to explain why they do not differ with respect to their physical qualitative properties—they do not differ physically because they share the same microstructure—the problem is to understand why their non-categorical properties fail to behave in the same way as their physical properties, and whether they should behave in such a way. If we look at the relationship between the microphysical structure that the two objects share, and properties such as mass, location in space, and atomic number, we can characterize such a relationship as meeting the strong modal requirement of microphysical determination: same microstructure, same physical intrinsic qualitative properties in all possible worlds. So if we are inclined to believe in microphysical determination with respect to *physical* intrinsic qualitative properties, we need not fear the

possibility of co-location; and vice versa, if we are sympathetic to co-location we may still maintain that the microstructure of material objects, co-located or not, always determines at least some important instances of intrinsic qualitative properties. Co-location is simply not a problem involving the instantiation of physical properties.

We can say that an appeal to a *reductio* based on intuitions involving doubling up of physical intrinsic qualitative properties is not the right way of testing the coherence of co-location (or of microphysical determination for that matter). This is the case because the result of the ‘doubling up’ argument depends on a misunderstanding of what the claim of co-location entails for the properties of the objects at issue. It is a mistake to think that according to the claim of co-location, the numerical non-identity of co-located objects entails the numerical non-identity of the microphysical structure related to such objects. In other words, co-located objects are presumed to share one and the same microphysical structure that serves as a common supervenience base for all objects presumed to be co-located at a certain time, not two numerically different microphysical bases.

Non-categorical properties and microphysical determination

So far I have discussed a puzzle that arises for properties that are unquestionably physical and that we may be tempted to accept as being microphysically dependent without much argumentation. The anti-co-location crowd will also insist that, in view of microphysical determination, the possibility of co-location entails problems for a coherent account of the instantiation of non-categorical properties.

Consider sortal properties, or properties that are expressed by count nouns such as ‘statue,’ ‘table,’ ‘cat’ and ‘quantity of bronze’ amongst others.²⁶ Since sortal properties are presupposed to be determined by the object’s microphysical properties, and since the object that we identify under the sortal ‘quantity of bronze’ has the same microphysical structure as the object that we identify under the sortal ‘statue,’ then the object that falls under ‘quantity of bronze’ must also fall under ‘statue.’ But if this is the case, then we would encounter problems with the persistence conditions of co-located objects: Either the quantity of bronze *b* is a statue with different persistence conditions than statue *s*, or *b* has the same persistence conditions as *s* and it does not survive being transformed into a bronze chest. Neither of these options is acceptable, for if we choose the first, we would need to conclude that statues sometimes can survive becoming different objects. Alternatively, if we choose the second option, we would need to conclude that although the quantity of bronze co-located with the statue *is* an instance of a quantity of bronze, it does not only have the persistence conditions associated with such objects but also those associated with bronze statues (368). Along this line of reasoning, Trenton Merricks (2001) has argued that puzzles involving persistence conditions and microphysical duplicates are reason enough to object to co-location (but not to microphysical determination). The claim is that microphysical duplicates, in virtue of sharing the same basic microstructure, do not really have different persistence conditions:

Presumably, that the microstructure of one dog is qualitatively identical to the microstructure of the other implies that one could survive some misadventure, such as being squashed as flat as a pancake, if and only if the other could. Similarly, some philosophers object to co-location of the statue and the lump since it seems like their qualitatively (because numerically) identical microstructure should rule out their having different persistence conditions. And because co-located objects are invariably supposed to differ in persistence conditions, we have here a reason to object to co-location itself.
(39)

²⁶ Sortal properties provide principles of identity in the sense that they allow us to count objects (Swoyer and Orilia, 2014).

Although somewhere else Merricks (1998) argues against the thesis of microphysical determination, the point at issue in this paragraph is consistent with anti-co-location intuitions based on such a claim. Objects with the same microphysical structure must always have the same non-categorical properties. Merricks is not fully explicit as to why we should reject co-location on these grounds, but it seems reasonable to speculate that he tacitly assumes some kind of determination relation that is able to ensure that objects with the same microphysical structure do not differ in their persistence conditions. Only with this assumption in place it makes sense to maintain that there might be a conflict between our intuitions about the microphysical structure of the dog and its duplicate, and the claim that they have different persistence conditions,²⁷ and ultimately conclude that such a conflict should count as a principled reason against co-location.

Dean Zimmerman provides an interesting version of what I think is a variation of this strategy. It is not immediately evident that he appeals to microphysical determination to rule out co-location, but I believe that the only way of making sense of his claim is by presupposing the determination claim. To show this, we need to keep in mind the distinction between intrinsic qualitative properties and intrinsic non-qualitative properties, where the former are duplication preserving across possible worlds while the latter are not. Zimmerman's view deserves close attention and for this reason I prefer to dedicate a whole section to his argument.

²⁷ Merricks would also maintain that the claim that the constituent quantity of matter of an object could survive the squashing of said object is even more striking than the case of dogs that are microphysical duplicates, for the quantity of matter and the object share not only the same microstructure but, unlike the dog and its duplicate, also the same relational properties (39fn). See also Heller (1990), Zimmerman (1995, 87-88), Burke (1992) and Sosa (1987). They all call attention to the fact that co-located objects share the same relational properties.

Zimmerman, ungrounded properties and microphysical determination

Zimmerman moves from the observation that objects in the presumed cases of colocation “are exactly alike in every empirically discriminable intrinsic respect” (87), to the claim (implicit in this case) that two material objects that share the same microphysical structure should have the same non-categorical properties: “Should not two physical objects constructed in precisely the same way out of qualitatively identical parts have the same capacities for survival under similar conditions?” (Ibid.). Does Zimmerman believe this because of a tacit endorsement of microphysical determination? In order to understand his position we need to look at his response to the pro-colocation claim that objects that share the same basic parts can differ in sortal properties.

Zimmerman maintains that denying that objects that share the same parts have the same sortal properties is absurd:

Of course one may say that the big difference between the two is found in the *sort* each belongs to—one is a mere mass, the other a living animal. But can sortal properties be *basic*, not possessed in virtue of any other features of a thing? If we admit that sortal differences are ungrounded in this way, we would seem to be committed to the possibility of a world in which a four-dimensional path through space and time is successively filled by a series of masses of cellular tissue S that—in every other respect—is exactly like the series of masses S making up my body in the actual world, but that differs only in that S constitutes a persisting human body and S does not. Surely this is absurd. (Ibid.)

First some terminology. For Zimmerman a “basic property” is a kind of property that any given object instantiates in virtue of none of the other features of that object. Accordingly, an “ungrounded” difference between two objects would be a difference that results from the instantiation by each of these objects of a different set of basic properties. So, to say that a difference between objects is “ungrounded,” is to say that the objects in question differ in their basic properties. Perhaps an alternative way of putting this point is to say that the difference in

question is a brute fact. Thus, if in this account we say that the sortal differences between co-located objects are ungrounded, and such differences are ungrounded in the sense that they depend on sortal properties that are basic, then we mean to say that co-located objects differ in sortal properties of a basic kind or in brute sortal properties. Finally, I presume that Zimmerman uses the term “feature of a thing” in the same way as I have been using the term ‘property,’ namely to refer, at the very least, to a *predicable* of an object (See Fn. 4).

Now, the key premise in the argument seems to be the somewhat implicit disjunction, *either sortal properties are grounded on some of the other features of the object, or they are basic*. Presumably, if we favor the first disjunct, and maintain that sortal properties are grounded, we would be committed to a view that Zimmerman would find compelling: Roughly, if we are committed the view that there is a possible world in which a four-dimensional path through space and time is successively filled by a series of masses of cellular tissue S that is exactly like the series of masses S* that make up Zimmerman’s body, and S* provides necessary and sufficient conditions for instantiating the sortal property ‘human body,’ then we must be committed to the view that S constitutes a persisting human body in the same way that S* does.²⁸ In other words, we would have to maintain that S provides necessary and sufficient conditions for the instantiation of the sortal property ‘human body.’ No surprises here. However, if we instead endorse the second disjunct, and maintain that sortal properties are basic, then we end up with the conclusion that S does not necessarily constitute a human body because although it might be true that S* provides sufficient conditions for the instantiation of the sortal property ‘human body,’ we would have assumed that ‘human body’ is a basic property, and this would mean that none of the properties of S, which by assumption are qualitatively the same as those of

²⁸ In fact, if S is exactly like S*, the former would constitute a perfect duplicate of Zimmerman’s body.

S*, is sufficient for the instantiation of the sortal property ‘human body.’ In other words, the instantiation of sortal properties *qua* instantiation of basic properties does not depend on any of the properties of the object in question. This is what Zimmerman believes to be “absurd,” but why exactly?

Perhaps Zimmerman believes that it is highly counterintuitive or even contradictory to think that an object can instantiate sortal properties that are basic. For instance, imagine that the sortal property ‘being a president’ is a basic property. Barack Obama instantiates such a property: He is the president of the United States. If, indeed, this is a basic property, then no property of Barack Obama grounds the property ‘being a president.’ This is highly counterintuitive, for it would mean that it is a brute fact that Barack Obama is a president, but how could this be? If we assume this, we would need to say that even in nineteen eighty nine, twenty years before being inaugurated as the forty fourth president of the United States, Obama was already a president. Putting the issue in these terms may even lead some to counter that the claim entails a contradiction, since, then, we would need to believe that Obama was and was not a president in nineteen eighty nine.

This unsavory result would explain Zimmerman’s call for absurdity, but since the result depends on the disjunction, *either sortal properties are grounded on some of the other features of the object, or they are basic*, advocates of co-location could question whether Zimmerman is justified in using this disjunction as a characterization of the available options open to advocates of co-location. In other words, they could ask, why should we presuppose that these are the only two options open to those who defend co-location? The first disjunct says that *sortal properties are grounded on some of the other features of the object*. If we deny this claim we must claim that sortal properties are basic and this leads us to absurdity. However, I think that advocates of

co-location can deny this claim without necessarily having to endorse the view that sortal properties are basic.

Notice in this respect the role that the notion of a ‘feature of a thing’ plays in Zimmerman’s argument. I pointed out that Zimmerman seems to use the term ‘feature of a thing’ at least in the minimal sense of a *predicable* of an object (a sense which I have been using in connection to the term ‘property’). Assuming this reading, for Zimmerman’s argument to work, he cannot mean *any* other feature of the object simply because not all predicables can provide the conditions that he requires for the disjunction to work against co-location. For instance, some of the ‘other’ features of the object include the aforementioned intrinsic non-qualitative properties, or properties that are non-duplication preserving across possible worlds. Suppose that these are part of the features that we consider when assessing the claim that *sortal properties are grounded on some of the other features of the object*. Consider again the case of perfect duplicates S and S*. Even though S and S* are supposed to be perfect duplicates, they can differ in intrinsic non-qualitative properties such as ‘being identical to S,’ or ‘being identical to S*.’ If this is the case, then advocates of co-location could point out that at least some sortal properties depend on the intrinsic non-qualitative properties of the object. And if this is possible, then advocates of co-location can argue that Zimmerman’s disjunction presents no problems whatsoever to their account. Sortal properties are not necessarily basic, they can be grounded on some of the intrinsic non-qualitative properties of the object.

This move would help to block the view that the only alternative left is for sortal properties to be basic. For instance, we said that Barack Obama instantiates the property ‘being a president.’ This does not need to be a basic property if there is an intrinsic non-qualitative property or set of properties grounding ‘being a president.’ What could this property be? The

pro-collocation advocate could say that Barack Obama instantiates the property ‘being a president’ partly because of certain features of *his personality*. In other words, partly because Obama instantiates certain intrinsic properties associated with his personality, he instantiates the property ‘being a president.’ The property ‘being a president’ would be an intrinsic non-qualitative property, and this means that it would be instantiated in virtue of Obama himself, but it is not an intrinsic qualitative property in that it is not an instance of a duplication preserving property: Obama is a president partly because of our conventions and institutions, and we can imagine a possible world in which these are different in a way that, in spite of Obama himself, he would not be a president.

Similarly, if we imagine a world in which a four-dimensional path through space and time is filled by a series of masses of cellular tissue S that is exactly like the series of masses S* making up Zimmerman’s body in our world, but that differs only in that S* constitutes a persisting human body and S does not, advocates of co-location do not need to conclude that the possibility is absurd: They can say that S* is a human body and S, in spite of the striking similarities, is not because the sortal property ‘being a human body’ is an intrinsic non-qualitative property of S,* and for this reason it is duplication non-preserving. No doubt, it is partly in virtue of the specific arrangement of cellular tissue S* that S* is a human body, but it is also true that S* would not be a human body without certain facts about our categorization systems concerning life on the planet, and certain facts about the evolutionary history of the species. I suppose that when Zimmerman talks about a ‘human body,’ he means the body of an anatomically modern human (after all he is referring to his own body). Thus, he is referring to the body of an instance of *Homo sapiens*, or an instance of a particular species of hominids. Now, *pace* Zimmerman, we can agree that S* is a human being and that S and S* have many of

the same properties, but if S is not a hominid then S is not a human being. We can imagine that S exists in a possible world in which there is no human evolutionary history at all simply because there have never been any primates around. Suppose instead that due to some interesting feature of the laws of nature in that world, random particles of matter clash and combine with each other in unusual ways during very intense electromagnetic storms. S is one of those random combinations of particles. In such a world, S is not an instance of a particular species of hominids at all, so S cannot constitute the body of a human being. In general, it is not metaphysically necessary for an object with the properties of S* to instantiate the property 'being a human being,' because 'being a human being' is grounded on intrinsic non-qualitative properties.

The long and short is that if we take the disjunction *either sortal properties are grounded on some of the other features of the object, or they are basic*, then there is no problem for advocates of co-location: Sortal properties do not need to be basic properties since they can be grounded on features of an object that are duplication non-preserving across possible worlds.

The problem with Zimmerman's argument is that he presupposes that the intrinsic qualitative properties of objects such as S* are sufficient for instantiating sortal properties. It is reasonable to suppose this since, earlier in his discussion, he points out that co-location involves objects that "are exactly alike in every empirically discriminable intrinsic respect" (87) and wonders, "should not two physical objects constructed in precisely the same way out of qualitatively identical parts have the same capacities for survival under similar conditions?" (87). Zimmerman, must be using the expressions 'empirically discriminable intrinsic respects' and 'qualitative parts' to refer to properties that are duplication preserving across possible world—

i.e., to refer to intrinsic qualitative properties, and he presupposes that this must be sufficient for determining sortal properties.

This would explain why he believes that the fact that S is mass of tissue (or series of masses of tissue) that is exactly alike the mass of tissue (or series of masses of tissue) S* would be sufficient to force the move to the claim that sortal properties must be basic: If S* and S are exactly alike in every empirically discriminable intrinsic respect, or in every intrinsic qualitative property, and these are sufficient for instantiating sortal properties, then the objects in question must share all of the properties that would be relevant for grounding sortal properties. If we deny that they share the same sortal properties, we must be committed to the conclusion that sortal properties are basic, and this according to Zimmerman is absurd. Now, why would Zimmerman think that intrinsic qualitative properties are sufficient for grounding sortal properties? I believe that the answer is that he implicitly presupposes the claim of microphysical determination.

Simply put, if he wants to use the disjunction *either sortal properties are grounded on some of the other features of the object, or they are basic*, he must presuppose that the features in question are intrinsic qualitative properties, but for this to be the relevant notion, Zimmerman must presuppose that we can sort out intrinsic qualitative and intrinsic non-qualitative properties on the grounds of their relevance for grounding sortal properties. Therefore, it would seem that Zimmerman would need to maintain that intrinsic qualitative properties are the relevant properties that we need to consider in order to determine whether sortal properties are grounded or basic. This makes sense since Zimmerman is interested on the notion of sortal properties that are metaphysically necessary in view of certain basic properties that constitute the object, and these are intrinsic properties of the qualitative kind. But this is to say that Zimmerman must presuppose that intrinsic qualitative properties are the determinants of sortal properties, and this

is simply to presuppose the truth of microphysical determination. Thus, Zimmerman presupposes microphysical determination.

Once again, we find that there is an appeal to microphysical determination as a constraint that we ought to acknowledge in our conceptualization of objects that are indistinguishable with respect to their basic microphysical properties. If two objects are alike in every intrinsic respect, they must have the same sortal properties, because these must supervene on such intrinsic respects. Think otherwise and we will end up with an absurd conclusion.

Co-location friendly supervenience (CFS)

In view of this position, how can the pro-co-location camp argue that there are significant non-categorical differences between co-located objects? So far I have assumed that microphysical determination is a version of strong supervenience, or the claim that a given set of properties *A* strongly supervenes on a set of properties *B* just in case cross-world indiscernibility in *B* entails cross-world indiscernibility in *A*. Kim argued that only this version of supervenience can ensure world-to-world stability for the correlations between a certain set of base properties and a certain set of supervenient properties, and I take it that it is because of this that determination is supposed to be an attractive principled reason against the possibility of co-location. Thus, with microphysical determination in force, it is not possible for the statue and the quantity of bronze to instantiate different sortal properties and persistence conditions if they truly happen to share the same microstructure.

Fortunately, advocates of co-location do not need to accept microphysical determination. In fact, in view of the structure of the confrontation between microphysical determination and co-location, I even wonder whether friends of co-location need to worry about it at all.

Co-location denies microphysical determination. So what? Friends of co-location can maintain that the argument for the possibility of co-location is precisely a counterexample to microphysical determination insofar as it is a denial of the view that the physical properties of the object exhaustively determine the individuation and persistence conditions of material objects. It is not clear that microphysical determination can settle whether the individuation and persistence of material objects is fully determined by the physical and ultimately the microphysical. What is clear, is that if the physicalist view implied by the anti-co-location position is true, then supervenience, if true, may help explain why we should expect the intrinsic qualitative properties of the object, including those of the non-categorical variety to depend on the microphysical properties of the object. So, if we favor the pro-co-location position, and believe that individuation and persistence does not necessarily depend on physical properties, why should we be constrained by a view that attempts to explain how certain apparently problematic properties can be made to fit into a physicalist framework?

Let us suppose that foes of co-location are justified in thinking that the pro-co-location camp has not actually established that objects such as the statue and the quantity of bronze differ at all. Microphysical determination precludes this possibility. So the question of how to establish the non-categorical differences between co-located objects, would still be an issue for friends of co-location. A common strategy for maintaining the relevant non-categorical differences, consists of endorsing a different version of the supervenience claim. The advocate of co-location can argue that it is possible to distinguish different ‘strengths,’ of the supervenience claim (Bennett, 2004; de Rosset, 2011; Rea, 1997; Zimmerman, 1995). Once this is done, the pro-co-location front can argue that some accounts of supervenience are able to accommodate the possibility of co-location and by so doing they allow for a way for attributing different non-

categorical properties to co-located objects. For instance, Zimmerman points out that it is possible to maintain the following view concerning the supervenience of sortal properties:

one may insist that sortal properties do supervene upon the intrinsic physical properties of things, but that an object possessing intrinsic properties sufficient to ensure that something falls under the supervening sort may not itself be of that sort; its having these grounding properties merely guarantees that there is something coincident that is of this sort. (88)

Zimmerman himself rejects any version of supervenience that allows for co-location, but his remarks have inspired what some (including Zimmerman) call a *co-location-friendly supervenience*, or CFS for short (Bennett, 2004, Rea, 1997; Zimmerman 1995). I propose a Rea-inspired definition of CFS as the claim that:

B-properties CF-supervene on A-properties if for any worlds w_1 and w_2 and any objects x and y , if the parts of x compose an object in w_1 that has exactly the same A-properties as an object that the parts of y compose in w_2 , then the parts of y compose an object that has in w_2 exactly the same B-properties as an object that the parts of x compose in w_1 .

Alternatively, we can say that this version of supervenience does not work as a determination claim, for it does not entail that objects that instantiate the same microphysical structure must instantiate the same intrinsic qualitative properties across all possible worlds. The claim only entails that if x and y share the same microphysical structure, and if properties P and Q supervene on that structure, it would then be possible for the microphysical structure at issue to compose an object x which in turn is able to instantiate P and to compose something that may or may not be identical to x (say, object y) which in turn is able to instantiate Q . Thus, CFS makes room for the possibility that the object that instantiates P is numerically different than the object that instantiates Q , and this means that co-location is back in the picture, for co-located objects are supposed to share one common microstructure, but instantiate different properties: According to the co-location friendly version of supervenience, if x and y are co-located, x and y

must share the same microphysical structure, but x can instantiate P but not Q and y can instantiate Q but not P .

Consider sortal properties again. As per microphysical determination, sortal properties are presumed to fully depend on microstructure but some instances of sortal properties do not seem to meet this requirement, and this leads to the violation of microphysical determination and ultimately to co-location. CFS entails that the microphysical structure at issue can compose two numerically different objects s and b in such a way that s instantiates properties associated with the sortal 'statue,' but not with the sortal 'quantity of bronze,' and b instantiates properties associated with the sortal 'quantity of bronze' but not with the sortal 'statue.' Therefore, it seems that CFS can accommodate the claim that co-located objects instantiate different sortal properties in spite of complete microphysical overlap, and this means in turn that to the question, is b also a statue just like s in virtue of having the same microphysical structure as s , the advocate of co-location can answer, *no*, b is not a statue.²⁹ This is the case because advocates of co-location can appeal to CFS, which allows for objects that share a common microphysical base to instantiate different sortal properties. Hence b is not a statue but a quantity of bronze. Furthermore, the advocate of co-location does not need to worry about whether b is a statue with different persistence conditions as those of s , or whether b , having the same persistence conditions as s , cannot survive being transformed into a bronze chest (as a quantity of bronze would). *Pace* Merricks, although it is true that co-located objects are supposed to share microstructure and

²⁹ However, see the last section of this CHAPTER and my discussion of CFS in the next. It is not clear that CFS can proceed without some form of determination relationship. At the very least, some philosophers, may demand clarification as to how CFS can explain the relationship between a common microstructure and the objects that are supposed to be co-located. If the former does not determine the latter, then what is their relationship?

differ in persistence conditions, this by itself is not a reason to object to co-location. CFS entails that even if the microstructure of the statue is qualitatively identical to that of the quantity of bronze, their shared supervenient basis does not necessarily rule out their having different persistence conditions. Object *b* is not a statue with different persistence conditions from those of *s* and from those of any object that falls under the sortal ‘statue;’ *b* is simply a quantity of bronze, and *b* does survive being transformed into a bronze chest because CFS allows for the claim that *b* actually has the persistence conditions of a quantity of bronze (and can survive the types of changes that quantities of bronze can survive).

This is also the reason why Zimmerman’s position does not lead to an option that advocates of co-location need to endorse. The claim that co-located objects are exactly alike in every empirically discriminable respect is not sufficient to establish the conclusion that material objects that share the same microphysical structure should have the same persistence conditions. This is so, because the advocate of co-location can make use of CFS as an alternative construal of supervenience that captures both, intuitions about the correlation between the microphysical structure of the object and the properties in question, and intuitions about the differences between objects that share the same microphysical structure.

Consider Zimmerman’s version of the argument from supervenience. Zimmerman advances the disjunction, *either sortal properties are grounded on some of the other features of the object, or they are basic*, as the backbone to his anti-colocation reasoning. Zimmerman believes that the first disjunct is acceptable and the second one leads to absurdity. With the latter claim, we end up with the conclusion that in a case where we have two masses of tissue that are qualitatively the same, *S** and *S*, *S* does not necessarily constitute a human body because although a microstructure such as *S** instantiates the sortal property ‘being a human body,’

‘being a human body’ is a basic property, and this would mean that none of the properties of S, is sufficient for the instantiation of ‘being a human body.’ Therefore we have two objects that are identical in all of their intrinsic qualitative properties and yet do not instantiate the same sortal properties. I said that this conclusion depends on a tacit appeal to the claim of microphysical determination insofar as Zimmerman must presuppose that the relevant grounding features to which he refers in the disjunction must be intrinsic qualitative properties (i.e., properties that are duplication preserving across possible world), and that these are sufficient for instantiating sortal properties.

I have shown that friends of co-location do not need to follow Zimmerman down this path if they argue that sortal properties can be grounded on properties of the object that are intrinsic but non-qualitative in the sense of being duplication non-preserving across possible worlds. But even if my argument from intrinsic non-qualitative properties is not a good response against Zimmerman, the pro-colocation camp can argue that microphysical duplicates do not necessarily instantiate the same sortal properties because the relationship between microstructure and sortal properties can be CFS. We can see that absurdity follows only if we assume metaphysical determination:

Sortal properties are determined by microphysical structure if and only if for any worlds (w.sub.1) and (w.sub.2), and for any objects x and y, if x has in (w.sub.1) exactly the same microphysical structure that y has in (w.sub.2) then y has in (w.sub.2) exactly the same sortal properties that x has in (w.sub.1).

But advocates of co-location do not need to accept this; they can appeal to CFS:

Sortal properties supervene on microphysical structure if and only if for any worlds (w.sub.1) and (w.sub.2) and objects x and y, if the parts of x compose an object in (w.sub.1) that has exactly the same microphysical structure as a numerically different object that the parts of y compose in (w.sub.2), then the parts of y compose an object that has in (w.sub.2) exactly the same sortal properties as a numerically different object that the parts of x compose in [w.sub.2].

If we substitute CFS in the argument, we find that the reasoning involving the assumption of supervenience does not lead to absurdity because CFS does not entail strict metaphysical determination of sortal properties. Indeed, CFS entails instead that in a given case of co-location between a certain microphysical structure and two numerically different objects *x* and *y*, a particular instance of sortal properties may supervene on the given microphysical structure in the sense that such a microphysical structure may determine the instantiation of the sortal property in question on object *x*, while simultaneously a different sortal property may supervene on the same microphysical structure in the weaker sense that the microphysical structure may simply correlate with the instantiation of a different sortal property on the numerically different object *y*. And since the instantiation of the latter sortal property of *y* correlates with, but is not determined by, the relevant microstructure, then it is possible for *x* and *y* to differ with respect to their sortal properties in spite of sharing the same microstructure. Therefore, advocates of co-location can say that since there is no demand for microphysical determination, there is no absurd conclusion in spite of co-location.

Intermezzo: Two objections against CFS

Is CFS a good alternative to microphysical determination? Eric Olson (2001) does not think so. Olson argues that a denial of familiar forms of weak or strong supervenience on the grounds of CFS is tantamount to changing the topic: “You cannot rebut an argument by pointing out that it is invalid on one reading of a certain term if it is perfectly valid on another plausible reading. Changing the definition of 'supervenience' merely changes the subject” (344). Olson is particularly concerned with a denial of weak or strong supervenience with respect to mental properties:

No one with any sympathy for psychophysical supervenience would accept that things with the same physical properties and the same surroundings (including the same laws of nature) might still differ radically in their intrinsic mental properties; yet that is precisely what coincidents-friendly psychophysical supervenience allows. (Ibid.)

(Perhaps, but how about those that reject psychophysical supervenience?) In any case, the question is whether an appeal to CFS as an alternative to microphysical determination is a superficial attempt at fencing off the anti-co-location implications of determination by not actually engaging the claim of microphysical determination. In response to Olson, I believe that putting the confrontation between microphysical determination and CFS in these terms is misleading, for it fails to acknowledge the dialectic of the confrontation. The confrontation between these views concerns the viability of the claim that the individuation and persistence conditions of material objects are exhaustively determined by physical properties. Co-location is deeply counterintuitive because it contradicts basic intuitions about the nature of material objects. But although the physicalist view might be widely held, it is not self-evident. That is the point of co-location. Now, should we believe that physicalism is true because we believe that the thesis of microphysical determination is true? If this is the issue, why should we believe that microphysical determination is true?

If we are to believe Kim's account of the promises of microphysical determination (i.e., strong supervenience) with respect to general assumptions about the metaphysical structure and hierarchy of reality (see my discussion of the 'layered picture of the world' above), the reason to believe in microphysical supervenience is not the presumed fact that the individuation and persistence conditions of material objects are determined by physical properties, for the capacity of physical properties to determine individuation and persistence is what microphysical determination, at least in part, tries to explain. Instead, the reason must be that microphysical

determination is plausible and epistemically promising in light of certain pragmatic considerations concerning the utility of the thesis for a metaphysics of material objects: In view of a layered picture of the world, microphysical determination is useful for explaining why the properties of one basic level of reality determine the properties of a another less basic level of reality. If this is the main reason for considering microphysical determination, I think that we should clarify the role that CFS plays in this context in relation to co-location and in relation to the physicalist intuitions about individuation and persistence. The point of bringing CFS into the conversation is to show how the claim of co-location can be made to be coherent. If the possibility of co-location is coherent, then the appeal of microphysical supervenience decreases, because co-location undermines the metaphysics that provides the pragmatic context in which microphysical determination makes sense. If the metaphysics is not plausible, then microphysical determination is not a significant factor for assessing the nature of the relationship between microphysical properties and non-categorical properties.

To this effect, we can say that CFS provides a principled reason for attributing different properties to co-located objects, and this in turn, provides further support for the skeptical stance against a physicalist view of individuation and persistence. All this is to say that friends of co-location are not simply changing the topic when they invoke CFS; to endorse CFS is not to change the topic, but to provide support for the view that the reasons for believing in microphysical determination are not by themselves sufficient. As Rea observes, inferences concerning the relationship between microstructure and non-categorical properties “are valid only given certain definitions of supervenience; and there is no reason to think that the co-locationist need accept those definitions when there are definitions such as [CFS] readily available” (369).

I return to issues concerning the relationship between physicalism and microphysical determination in chapter 7. There I make clear why microphysical determination begs the question against co-location.

Be this as it may, Olson has a second objection against CFS:

The mass of a material object is determined by the masses of its (non-overlapping) parts: things cannot differ in mass unless their parts do (if they have parts, anyway). Coincidents-friendly supervenience fails to capture this familiar idea. It is consistent with the coincidents-friendly supervenience of a thing's mass on the masses of its parts that things composed of the very same parts, or exactly similar ones, may differ radically in mass. For instance, the very elementary particles that compose me may at the same time compose an object with half my mass. The coincidents-friendly supervenience of a thing's mass on the masses of its parts implies only that any particles just like mine in number and mass must compose something with my mass. But they may at the same time compose other objects with any mass you like, as long as any such particles would compose things with those masses. That is absurd: an object's mass at least weakly, if not strongly, supervenes on the masses of its parts. Of course it is far less clear whether intrinsic mental properties supervene in any sense on physical properties; but the attraction of that view appears to lie in a conviction analogous to what we all believe about mass. Coincidents-friendly supervenience is simply a red herring. (344)

Olson's example concerns the mass of a material object; that is, it concerns an instance of a physical intrinsic qualitative property. We have dealt with the implications of supervenience arguments based on physical intrinsic-qualitative properties before. I said then that cases involving intrinsic qualitative properties of the physical kind are not the right type of cases for testing the coherence of co-location. I think that the same can be said about their utility for testing the coherence of CFS. The issue for this strategy is that advocates of co-location can maintain that CFS does not apply to physical intrinsic qualitative properties and that, instead, microphysical determination holds for all such properties. As I mentioned before, the problem is not to explain why co-located objects do not differ with respect to their physical qualitative properties, the problem is to understand why their non-categorical properties fail to behave in the same way as

their physical properties, and whether they should behave in such a way. Thus, CFS is useful because it allows us to understand why objects that share the same physical intrinsic qualitative properties can differ with respect to non-categorical properties. To presuppose that microphysical determination can explain them is to presuppose without argumentation a claim that is under question; the claim that non-categorical properties are physical properties themselves or depend only on physical properties. Olson cannot say that CFS is “a red herring” because of what it implies for physical intrinsic qualitative properties, for CFS was not supposed to account for the supervenience relationship between physical properties.

In view of my response, an issue that friends of co-location need to address concerns the reasons to accept the use of CFS alongside microphysical determination. Part of the answer is connected to issues concerning an explanation as to why CFS would hold at all. I discuss these issues at length in the next chapter.

Sortal Properties and Explanation as a Problem (1)

Back to the main thread. I think that we can treat Michael Burke’s (1992) anti-co-location argument in a similar way as we have treated Zimmerman’s. I maintain that his argument also depends on a tacit acceptance of microphysical determination, and that he fails to consider the possibility that there is an alternative version of supervenience that can accommodate co-locationist intuitions. Furthermore, as Mark Moyer (2006) points out, Burke’s notion of ‘cross-time identity’ is ambiguous. The notion could refer to numerical identity *simpliciter*, or to a type of relationship between two numerically different objects at different times, *genidentity*. I argue that friends of co-location can handle any of these options.

Burke's challenge of circularity

The demand for an explanation of the differences and similarities between the presumed co-located objects is a common accompaniment to the argument from microphysical supervenience. The step involving the demand for explanation is independent from the *reductio*, but the question is intended to add rhetorical force to the anti-co-location position and direct attention to the assumption that the best explanation for the empirically discriminable properties of a certain object is that there is only one object composed of a set of microphysical parts occupying a particular location in space. The basic parts of the object explain the character of the more complex ones and it is ultimately this microstructure that explains the character and behavior of the upper metaphysical levels of the object. If we deny this belief, we would either have a very hard time trying to explain non-categorical differences in a coherent manner, or we would simply be at a lost for explanatory resources.

Burke maintains that trying to explain why qualitatively identical objects can differ in sort leads to more problems than solutions. Call this *Burke's argument from explanatory circularity*: Since an object can be identified under a sortal only if it already satisfies that sortal, we need to explain why one of the objects in question satisfies one sortal, say '*d*,' while the other one satisfies a different sortal, say '*g*.' Suppose that we try to explain the difference in sortal properties by appeal to the claim that *d* and *g* have different historical properties. Burke argues that this response is unsatisfactory given that the presumed co-located objects are coextensive at time *t*₁, and do not seem to differ in their historical properties at that time. Thus, to say that they differ in historical properties must be to say that objects *d* and *g* differ in a certain type of property at some point before *t*₁ or after *t*₁. However, if they do differ at some point in time

different than t_1 , what could account for their difference in their cross-time identity? Whatever the answer turns out to be, it cannot be ‘sortal properties.’

If one but not the other is identical with a certain past or future object, the only apparent explanation for this is that one but not the other is like that object in sort. In short, historical differences between Statue and Piece could be explained only by reference to the very difference they are themselves supposed to explain: the alleged difference in sort. (15)

We may try to explain the alleged difference in sort by means of the claim that co-located objects have different persistence conditions, but if the difference in the persistence conditions of objects presumed to be co-located is used to explain their difference in sort, there will be no apparent way to explain the difference in their persistence conditions. Once again we would be trying to explain a difference in one type of property s by reference to a difference in another type of property p that s is supposed to explain.

Burke’s argument presupposes microphysical determination. In order to see this, it is useful to structure Burke’s reasoning into the following steps:

- i. (Co-location claim 1) Objects d and g are numerically different but co-located at time t_1 , in virtue of instantiating different sortal properties (one is a statue and the other a quantity of bronze) (14).
- ii. (Explanatory claim of object identification under a sortal): We can correctly identify any given object x under a certain sortal S only if x satisfies S (Ibid.)
- iii. (Co-location claim 2) we can correctly identify co-located objects d and g under different sortals because, as a matter of fact, they instantiate different historical properties (15).
- iv. (Intermediate conclusion 1) Thus, according to the pro-colocation position, the instantiation of different historical properties explains why d and g satisfy different sortals. (i, ii)
- v. If d and g instantiate different historical properties at some time, then we have two objects that are coextensive at a time t_1 and not coextensive at a time t_2 (or t_0). (Ibid.)
- vi. (Intermediate conclusion 2) Therefore, one of the co-located objects at t_1 is cross-time identical with an object at t_2 (or t_0) but the other co-located object at t_1 is not. (v)
- vii. Since co-located objects d and g are identical with respect to their intrinsic qualitative properties at t_1 , these cannot explain why one of them is cross-time identical with an object at t_2 but the other is not. (Ibid.)

- viii. (Burke's claim of explanatory dependence on sortals) Since *d* and *g* do not differ in any other relevant respect, a difference in sort between *d* and *g* must ground their respective difference in historical properties. (Ibid.).
- ix. (Conclusion) Burke's claim of circular explanation: It seems then that historical properties must ground differences in sortal properties between co-located objects, and sortal properties must ground differences in historical properties between co-located objects. This means that if we attempt to explain an object's sortal properties in virtue of the object's historical properties, then the only alternative explanation left to explain such historical properties is the sortal properties that we were originally trying to explain, and this is an invalid circular explanation. (iv, viii)

The problem with Burke's argument is related to (v). The claim that objects *d* and *g* are coextensive at *t*₁, but not at a different time, implies that Burke conceives of *d* and *g* as objects that instantiate *all* of the same properties at the time in which they are co-located. Burke uses the term 'coextensive' to refer to the reflexive relation between *d* and *g* at *t*₁. He defines co-location in terms associated with the opposite of reflexivity:

Let's say that objects *x* and *y* coincide[i.e. co-locate] at time *t* just in case (1) *x* is not *y*, and (2) the place wholly occupied at *t* by the whole of *x* is numerically the same as the place wholly occupied at *t* by the whole of *y*. As here defined, [co-location] is an irreflexive relationship. We will use 'coextension' and its cognates for the corresponding reflexive relationship. (13)

If Burke believes that this is the case for *d* and *g*, and of co-located objects in general, he must presuppose microphysical determination. Indeed, for Burke, *d* and *g* are supposed to be coextensive at *t*₁, but this would mean that even their historical properties are the same at that time. This would explain why he thinks that the problem for the pro-colocation position begins when we try to understand the relationship between, on one hand, objects that are co-located at a certain time, and on the other, an object at a different time. The problem seems to be this:

According to (vii), since the intrinsic qualitative properties of *d* and *g* are the same at *t*₁, they by themselves cannot account for a difference between the historical properties of *d* and *g* at either *t*₁, or any other time. Something else must be making a difference, and the pro-colocation camp

must explain what does. But if this is the argument, Burke must believe that *d* and *g* cannot fail to have the same historical properties at t_1 because they do not differ in any intrinsic qualitative respect, and this seems to be a tacit commitment to microphysical determination.

Now, defenders of co-location would not say that *d* and *g* necessarily instantiate the same historical properties at t_1 simply because they would disagree with any view that entails sameness of historical properties on the grounds of sameness in microphysical structure. To illustrate their disagreement they could say that it is possible for a statue *s* and the quantity of bronze *b* that constitutes it to differ with respect to historical properties at a specific time: Imagine that Brie, the artist, decides to celebrate the tenth anniversary of a gift that she received consisting of very rare piece of bronze *b*, by making a statue *s* out of it. The same day of the anniversary of *b*, which is a specific quantity of matter, she completes *s*. Exactly ten minutes after completing *s*, she has in her studio a statue that is only ten minutes old, and a quantity of bronze that is at least ten years old sharing the same microstructure at a given time t_1 . The question is, why should not we believe that at t_1 *s* is only ten minutes old while *b* is at least ten years old? We have seen that, if we adopt CFS, it would be coherent to maintain that microphysical structure can determine and fail to determine a given property as long as we maintain that the claim of supervenience does not necessarily entail microphysical determination. Accordingly, co-located objects *d* and *g* can instantiate different historical properties at t_1 : In view of CFS, it is possible for co-located objects to instantiate different historical properties simultaneously.

Additionally, Burke's step (vi) is ambiguous. A clarification is important insofar as (vi) helps to move the argument to (vii), which expresses the intuition that we need to explain what makes a certain object at a time identical to another object at a different time. The latter helps to

elicit the explanatory demand directed at advocates of co-location as to why only one of the co-located objects at t_1 , but not the other, is identical with an object at t_2 ? Eventually this leads to (viii), or the claim that a difference in sort must be grounding the difference between co-located objects. So, being clear about what step (vi) implies is important in order to understand the exact content of Burke's challenge against co-location.

In this respect, notice that (vi) is the claim that only one of the two alleged co-located objects at t_1 can be identical to *another* object at a different time t_2 . If this is the right way of reading (vi), we would need to interpret (vii) as the view that intrinsic qualitative properties are not sufficient for explaining why only one of the two co-located objects at t_1 is identical to another object at a different time. Mark Moyer (2006) has noted that Burke's language of 'cross-time identity' can be misleading. An object d at certain time is not identical to an object m at a different time, but to itself; d is identical to d , not to m :

By 'cross-time identity' Burke might mean simply identity, perhaps restricting our attention to cases where we pick out the relata by means of properties they have at different times. If identity is the relation intended by 'cross-time identity', then expressions describing the relata of this relation, such as 'the statue that will sit on the mantle next week', must be talking about the object – in this case the statue. Thus, Burke might be talking about identity and about Angel, asking for an explanation of why Angel (i.e., the statue sitting here now) is identical to Angel (i.e., the statue that will sit on the mantle next week) whereas Clayton (i.e., the lump of clay sitting here now) is not. But if we're talking about why the identity relation holds between these relata, there is really nothing to explain. For we cannot explain the identity of Angel with itself other than to repeat that it is the same, i.e., identical, thing being considered as both relata [...]. Thus, if we're talking about the referent of 'the statue sitting here now' and the referent of 'the statue that will sit on the mantle next week' – rather than about the properties in virtue of which we pick out these referents – we're not really starting with any difference between the two that would invite an explanation of their identity.
(413)

While it is true that friends of co-location would say that co-located objects are numerically different objects that share the same intrinsic qualitative properties, they would not say that co-located object *d* can be identical to a different object at a different time in virtue of instantiating different properties from those that object *g* instantiates. Co-located objects, just as any object, are not supposed to be ‘identical’ to any other object at any time; they are only supposed to be identical to themselves. Be this as it may, Burke may have something different in mind. Moyer argues that Burke’s notion of ‘cross-time identity’ refers not to a relation between an object and itself but to a relation between things that exist at different times. This is reasonable in light of related discussions dealing with persistence conditions of material objects (e.g., what makes a statue before ionization the same object as the statue after ionization?), and in light of the use of sortals in explaining differences in historical properties (e.g. different objects satisfy different sortals and we make use of such sortals in order to assign differences in the histories of the respective objects). In what follows, I borrow some of Moyer’s terminology in order to define Burke’s notion of cross-time identity. Thus, I introduce two new notions, the notion of *genidentity* and the notion of *sets of property instantiations*. With these in place, we can say that cross-time identity would be a relation of genidentity between two sets of property instantiations:

Let’s say that when an object instantiates a set of properties intrinsic to a time it ‘exhibits’ the set of equivalence classes of property instantiations formed from that set. These equivalence classes allow us to abstract away from differences between coincident objects at a time. Thus, the question of whether the statue *x* at *t* and the statue *y* at *t* are cross-temporally identical can be rephrased as the question of whether the set of equivalence classes of property instantiations which statue *x* exhibits that are intrinsic to *t* and the set of property instantiations which statue *y* exhibits that are intrinsic to *t* are sets of equivalence classes of property instantiations exhibited by a single thing. Or, in other words, this can be understood as talk of two sets of property instantiations bearing a genidentity relation *R* to each other. (414)

Now, when we articulate (vi) in these terms, and we pair it with CFS, advocates of co-location can respond to Burke's challenge. Since co-located objects *d* and *g* are identical with respect to their intrinsic qualitative properties, such properties cannot explain why the set of property instantiations that only one of them exhibits is genidentical with a set of property instantiations that an object at *t*₂ exhibits. Presumably, this represents a challenge to advocates of co-location because they would need to explain why only one of the sets of property instantiations at *t*₁ is genidentical to one at *t*₂. But notice that even opponents of co-location need to provide an explanation of the genidentity relationship between any set of property instantiations that any object exhibits at any time, and any other set of property instantiations that any other object may exhibit at a different time. If identity were at issue, then foes of co-location can simply say that *d* is identical to itself and this explains why *d* has the same properties as itself, but genidentity is not numerical identity. Both, foes and advocates of co-location need to invoke supervenience in order to explain whether a set of property instantiations is genidentical to another one at a different time, and in view of this parity, advocates of co-location that endorse CFS can coherently maintain that such sets of property instantiations *can* fail to be genidentical to each other because CFS does not necessarily entail the claim of determination: According to CFS, it is not necessary for objects that share the same intrinsic qualitative properties to instantiate the same historical properties. In the language of genidentity, the claim only entails that if an object has a certain microphysical structure at one time, and if the set of property instantiations that an object exhibits at a time supervenes on that structure, it would then be possible for the microphysical structure at issue to compose something at that time which in turn is able to have a different set of property instantiations at a different time.

This is important for analyzing step (vii): Friends of co-location believe that *d* and *g* are identical with respect to their intrinsic qualitative properties, and they grant that intrinsic qualitative properties, by themselves, cannot explain genidentity at times *t*₁ and *t*₂. However, they also maintain that even if it is true that intrinsic qualitative properties do not explain genidentity, this would generate the explanatory challenge only if we take microphysical determination to be the best available alternative to explain genidentity. Burke does not consider any of this because his step (vi) conflates identity and genidentity, failing to realize that we need an explicit appeal to supervenience in an explanation of genidentity. If he had not conflated identity and genidentity, he would realize that an argument against co-location on the grounds of genidentity requires a denial of CFS or at the very least an argument against its coherence.

This result means in turn that step (viii) does not follow: it is not the case that difference in sort between *d* and *g* must explain the difference in their respective historical properties. The differences in historical properties between *d* and *g* are readily explained by the shared microstructure of co-located objects *and* the metaphysical assumption of CFS. Furthermore, Burke's conclusion is false: There is no circular explanation once we correct for the assumption of supervenience and its variants. Although it might be true that advocates of co-location must appeal to historical properties in order to explain differences in sortal properties between co-located objects, it is not true that they need to appeal to sortal properties in order to explain differences in historical properties between co-located objects. All they need to do is adopt CFS and maintain that if we agree that the relation of 'genidentity' is not numerical identity, then anybody needs to appeal to some version of supervenience or other in order to fully account for genidentity.

Burke's argument may seem plausible at first partly because of his conflation of the notions of numerical identity and genidentity: the conflation conspires against a proper recognition of the argumentative need for supervenience, but once we reintroduce supervenience, the possibility of a pro-co-location response is plausible again. This is a weakness in Burke's argument, and unfortunately for his attempt at blocking co-location, this might not be his only conflation. Moyer observes that part of the argument's appeal is based on a conflation of epistemic and metaphysical intuitions concerning sortal terms and property determination.

Does the referent's sort explain whether 'this' is identical with 'that'? In some sense, yes. Epistemically, we are unable to determine whether 'this' and 'that' are demonstratives referring to identical things unless we know the sort of the referents. But this is simply because we are unable to fix upon the referents without first coming to know their sorts. Metaphysically, however, whether 'this' and 'that' are identical is determined solely by the two referents, without any need to appeal to their sorts. If 'this' refers to one plank and 'that' refers to another, then this and that are not identical; the reason they are not identical is not that they are planks but instead that they are different things. If 'this' and 'that' refer to the ship, then ipso facto this and that are identical; again, this is not because of the sort involved but only because that which was referred to the first time just is that which was referred to the second time. (415)

My take on Burke's misstep is a bit more conservative than Moyer's. I do agree that it is hard to escape the need for sortals in order to have an epistemic 'entry' into the identification of an object. I also agree that we need to be cautious with the pairing of epistemic and metaphysical claims: Metaphysical conclusions do not necessarily follow from epistemic premises. However, unlike Moyer, I remain agnostic about whether only the referents of the demonstratives 'this' and 'that' are ultimately responsible for determining identity. I suppose that a lot rides on what Moyer means by the expression *determined solely by the two referents*, and if this means *determined by virtue of the object only*, then it seems that, if we accept this claim, we would be implicitly committed to the claim that the intrinsic qualitative properties of the object determine

the identity of the object. Moyer's intuition is perfectly reasonable: Whether or not we refer to one and the same object by means of demonstrative expressions such as 'this' and 'that' does not depend on sortals such as 'the ship,' 'the plank' or 'the coffee mug.' It depends on the actual objects that we are trying to track by the expressions that exemplify such sorts and by the expressions that exemplify such demonstratives. This intuition is explicit when Moyer says that:

If 'this' refers to one plank and 'that' refers to another, then this and that are not identical; the reason they are not identical is not that they are planks but instead that they are different things. If 'this' and 'that' refer to the ship, then ipso facto this and that are identical; again, this is not because of the sort involved but only because that which was referred to the first time just is that which was referred to the second time. (Ibid.).

The question is, what makes these planks numerically different? In any case, while we may agree, *contra* Burke, that it is an open question whether sorts determine identity, we may remain agnostics concerning what does.

More problems with CFS?

If CFS is correct, then microphysical determination is not a reason to reject co-location. Furthermore, advocates of co-location can continue advancing the case for a rejection of the view that the individuation and persistence conditions of material objects are exhaustively determined by the physical properties of the object. So far, the pro-co-location camp, has shown that co-location does not need to be a significant problem for a metaphysics of material objects. However, since the pro-co-location case depends partly on the viability of CFS, the anti-co-location camp may fairly ask, is CFS a plausible view?

Consider the idea of determination. There seems to be a sense in which with CFS sortal properties *are* instantiated in virtue of microphysical properties. CFS requires that whenever there is a certain microstructure R, there will be both, an object x and an object y. CFS says that

if such a microstructure is associated with two co-located objects x and y , then whenever we have R we must have x and y . Thus, although CFS states that microphysical properties do not necessarily determine sortal properties, there is a sense in which CFS *does* dictate that sortal properties are instantiated in virtue of microphysical properties, for, according to this view, microphysical properties determine that there is an object x and y , and ultimately these objects instantiate their respective sortal properties.³⁰ But why is it that a certain microstructure can be linked to the pair of objects x and y ? It would seem, then, that if we agree to CFS, we would have an explanatory mystery in our hands, for the claim does not seem to have anything to say about the relationship between a set of basic microphysical properties and the objects that depend on such a microphysical properties—objects which by assumption are able to instantiate different non-categorical properties. On one hand, foes of co-location would reject CFS on the grounds of a lack of explanation for the mysterious relationship between co-located objects and their common microstructure, and on the other, friends of co-location would need to provide the explanation that would satisfy their critics. I discuss the details of this anti-co-location reply in the next chapter.

³⁰ I owe this observation to Mark Moyer (in private conversation).

CHAPTER 6

CO-LOCATION, INDISCERNIBILITY AND THE GROUNDING PROBLEM

My target in this chapter is Dean Zimmerman's explanatory challenge against co-location. I argue against Zimmerman that the problem of explaining non-categorical differences is not only a problem for the pro-co-location position, but also for the anti-co-location position. Hence a decision of which of the two alternatives we should favor over the other should not be made on those grounds. My account of this argument is based on what some philosophers have called *the grounding problem*, or the problem of explaining what is the metaphysical grounding for the non-categorical differences between objects that are presumed to be co-located. After I have explained the content and implications of the objection, I proceed to show that, if grounding is a real problem, this is a problem for defenders of no-coincidence (by means of determination) and co-location alike.

Explanation as a problem (2): The explanatory weakness of CFS

Zimmerman argues that without a strong version of supervenience we would find ourselves at a loss to explain non-categorical properties. We would need to explain why the objects in question differ at all:

If the difference between being a living body and being a mere mass of cellular tissue is not grounded in more fundamental intrinsic physical differences, then we still have physical indiscernibles that nonetheless differ in their ability to survive certain physical changes: one can persist in scattered form, while the other cannot; one can survive the destruction of some cells, while the other cannot. The friends of coincident objects will no doubt say that the difference here is one of sort, and that it is simply a "conceptual truth" that objects of the one sort can do things objects of the other sort cannot. But the fact remains that the mass and living body are supposed to differ in the sorts of physical changes they can undergo without differing in their physical construction; explaining these differences by appeal to

ungrounded sortal differences is merely to insist that the two do in fact differ in these ways. Surely such a surprising state of affairs demands a better explanation than that. (90)

To the question, why do non-categorical properties supervene on microphysical properties? Microphysical determination has a straightforward answer: Microphysical properties determine non-categorical properties and for this reason the latter supervene on the former. But, as I explained in the last CHAPTER, the question for CFS concerns its capacity for explaining dependencies between sets of properties. It would seem that, if we are committed to CFS, we must say that a correlation between sets of properties is not a form of dependency, but holds in virtue of one. This is so because CFS requires that whenever there is a certain microstructure R, there will be both, an object x and an object y. CFS says that if such a microstructure is associated with two co-located objects x and y, then whenever we have R we must have x and y. The question is, why should this be the case? This could be problematic for CFS, for although the correlation that CFS entails might not be a form of dependency, it seems to hold in virtue of one, and CFS does not say anything about the dependency that underlies the presumed correlation.³¹ Accordingly, the charge goes, it is epistemically unsatisfactory to claim that microstructure only sometimes, and not always, is sufficient for determining non-categorical properties without an explanation of why this must be the case.

Zimmerman's argument is based on this implication of CFS. His explanatory challenge is this: CFS implies that two material objects can be qualitatively indiscernible in virtue of sharing the same microstructure and yet still differ in sortal properties because sortal properties are not determined by microphysical properties. Therefore, according to CFS, microphysical properties do not explain why the objects in question differ in their sortal properties. Furthermore, since the

³¹ I am indebted to Mark Moyer for clarifying this point.

objects in question differ in sortal properties they differ in persistence conditions; they do not necessarily survive the same types of changes. *A fortiori*, since microphysical properties do not explain differences in sortal properties, they do not explain differences in persistence conditions: CFS says that objects that are qualitatively indiscernible may not survive the same types of changes. Therefore, at this point we have the first request for explanation that advocates of co-location and CFS must consider:

Request for explanation 1: If microphysical properties do not explain differences between the persistence conditions of the objects in question, what explains it?

Zimmerman thinks (correctly) that friends of co-location can respond that, in cases of co-location, differences in persistence conditions are explained by differences in sortal properties. It is conceptually true that different sorts of objects can survive different sorts of changes. (e.g., supposedly, the statue and the quantity of bronze have different survival capacities in virtue of the fact that one of them instantiates the sortal property ‘statue,’ while the other instantiates the sortal property ‘quantity of bronze’). So far so good for the pro-co-location position, however it is at this point where Zimmerman drops the hammer of the explanatory challenge:

Request for explanation 2: Differences in persistence conditions are explained by differences in sortal properties, but what explains differences in sortal properties, if the objects in question are microphysically indistinguishable? Microstructure cannot provide an explanatory basis here, but what does?

Even conceding the coherence of CFS, this type of demand for explanation may still present a serious challenge to advocates of co-location, for, according to Zimmerman, the claim that microphysical structure does not determine sortal properties, and fails to provide an explanatory basis for an account of the numerical difference between co-located objects, leads

into an incomplete answer to the question of why co-located objects differ in sort and persistence conditions in spite of their qualitative similarities.

Burke, Zimmerman, and the indiscernibility problem

It is important to appreciate the difference between Zimmerman's explanatory challenge and Burke's. For Burke, if we say that co-located objects differ in historical properties and this explains sortal differences, then we are committed to an unsatisfactory response. The presumed co-located objects share all of their properties at the time of co-location t_1 . Thus, to say that they differ in historical properties must be to say that any two co-located objects d and g differ in a certain type of property at some time before t_1 or after t_1 . If the presumed co-located objects differ at some point in time different than t_1 , and they share all of the same properties, then it would seem that only sortal differences are available in order to account for historical differences. However, this is a problem because then we would be trying to explain differences in historical properties by reference to the differences in sort that historical properties were supposed to explain. Similarly, if we use differences in persistence conditions to explain differences in sort, there would be no apparent way to explain differences in persistence conditions, for differences in persistence conditions were supposed to be explained by differences in sort.

Against this, I argued that advocates of co-location are able to counter Burke's challenge by pointing out that he presupposes microphysical determination, in spite of the availability of CFS. Burke's argument presupposes microphysical determination insofar as he maintains that co-located objects instantiate *all* of the same properties at the time in which they are co-located. Advocates of co-location would insist that there is no necessary microphysical determination of historical properties at the time of co-location, and they can reject Burke's argument simply by

rejecting the assumption that co-located objects instantiate the same historical properties at the time of co-location. They would say that we do not need to accept the latter assumption, and that instead, we can rely on CFS in order to explain differences in historical properties, and avoid Burke's challenge of explanatory circularity. If my account is correct, Burke's challenge is not directed at CFS and we can still use this variation of the supervenience claim in order to support the claim that microphysical properties do not necessarily determine historical properties in specific, and non-categorical properties in general.

In contrast, advocates of co-location cannot employ the same move against Zimmerman's argument because this represents a direct attack against CFS. We might say that, Zimmerman's argument represents a *second order* explanatory challenge against the possibility of co-location insofar as it questions the explanatory sufficiency of the *first order* explanatory resources provided by CFS. I believe that Zimmerman's explanatory challenge is what Olson (2001) has called *the indiscernibility problem*, or the problem of explaining how objects that are qualitatively indiscernible can differ at all:

By definition, materially coinciding objects are made up entirely of exactly similar particles, related in precisely the same way, in identical surroundings. (They are, after all, the very same particles.) That would seem to make the objects so similar that not even God could tell them apart. How then could they have the qualitative differences that constitutionalists say they have? By virtue of what, for instance, could they belong to different kinds? What could give them different identity-conditions? How could only one of them be alive? What could explain why one of them is rational, conscious, morally responsible, and so on, while the other has no mental properties at all, or at best very different ones? What prevents Animal, who has the same nervous system and the same surroundings as Person, from thinking or experiencing as Person does? Should not the difference between animals and non-animals, and between people and non-people, be empirically detectable? [the pro-co-colocation view] appears to rule out any satisfactory answers to these questions. But surely they must have answers. (339)

Olson believes that the problem is so deep, that foes of co-location could even accept a metaphysics that allows for co-located objects and friends of co-location would still have to face

the indiscernibility problem, insofar as the indiscernibility problem concerns qualitative identity and not numerical identity:

For all the indiscernibility problem shows, the same atoms could compose any number of different objects at once. Those objects would simply have to belong to the same kind and have the same identity-conditions and other qualitative properties. The idea that the same atoms might at once compose two or five or seventeen identical cats (say) faces problems enough, but the indiscernibility problem is not one of them. Because the problem has to do with qualitative rather than numerical identity [...] (340)

Indeed, what could distinguish qualitatively identical objects from one another? I mentioned in chapter 5 that we can maintain *contra* Olson that CFS is supposed to be a claim about the supervenience relationship between microphysics and non-categorical properties, and that it does not apply to physical intrinsic qualitative properties. Friends of co-location can continue using the stronger claim of microphysical determination to characterize the relationship between intrinsic qualitative physical properties and microphysics, for the problem is not to explain why co-located objects do not differ with respect to their physical qualitative properties, but to explain why such objects differ with respect to their non-categorical properties. However, Olson could still have a point concerning the principled reasons for accepting this division of labor between supervenience claims. In order to settle this issue, friends of co-location need to address the type of explanatory problem advanced by Zimmerman (i.e., Olson's indiscernibility problem). Why, if co-located objects are qualitatively indiscernible, CFS would hold at all? Or in Zimmerman's language, if the objects in question are microphysically indistinguishable, what explains differences in sortal properties?

Explanation as a common problem

Now, Zimmerman and Olson may have an important anti-co-location challenge in their hands, but they may also have gotten more than what microphysical determination is able to chew. Even if Zimmerman's explanatory demand is justified, the problem of explanation seems to cut both ways. Specifically, it seems that advocates of co-location could easily demand an explanation of the presumed non-categorical dependence on microstructure. Why do certain microphysical properties determine certain non-categorical properties, and not others? By assumption, non-categorical properties *qua* intrinsic qualitative properties necessarily depend on the microstructure of the object, but why? What is it about microphysical properties that guaranty the grounding of non-categorical properties? Friends of co-location can maintain that microphysical determination is not a satisfactory explanatory account of the relation between non-categorical and microphysical properties.

This, in fact, seems to be an old and recurrent problem with any version of the supervenience claim. In the philosophy of mind, Kim (1998), amongst a number of discussants, has argued that supervenience (including microphysical determination as a strong form of supervenience) is at best an incomplete explanation of the relationship between mind and body. Generally speaking, supervenience does not address the question, what *accounts* for the alleged supervenience of mental properties on brain properties? (12-13). Or in the specific language of determination, even if we assume that microphysical properties determine non-categorical properties, we can ask the further question as to what virtue of microphysical properties ensures that microstructure determines the non-categorical properties of the object. In this respect, Kim point out that it is quite telling that different positions with respect to the mind/body problem endorse the thesis of supervenience. This suggests that:

[...] supervenience itself is not an *explanatory theory*; it merely states a pattern of property covariation between the mental and the physical and points to the existence of a dependency relation between the two. Yet, supervenience is silent on the nature of the dependence relation that might explain why the mental supervenes on the physical. (14)

Kim goes on to say that:

Supervenience is not a *type* of dependence relation—it is not a relation that can be placed alongside causal dependence, reductive dependence, mereological dependence, dependence grounded in definability or entailment, and the like. Rather, any of these dependence relations can generate the required covariance of properties and thereby qualify as a supervenience relation. Supervenience therefore is not a metaphysically ‘deep’ relation; it is only a ‘phenomenological’ relation about patterns of property covariation, patterns that possibly are manifestations of some deeper dependence relationships. (Ibid.)

Thus, we may characterize the situation with microphysical determination, understood as strong supervenience, in the following way: On one hand, it is coherent to maintain that the set of non-categorical properties *A* strongly supervenes on the set of microphysical properties *B* in case cross-world indiscernibility in *B* entails cross-world indiscernibility in *A*, and this would be sufficient for blocking the possibility of objects that are indiscernible with respect to microphysical properties *B* but discernible with respect to non-categorical properties *A*. However, on the other hand, the shallowness of supervenience questions the or normative weight of the thesis of microphysical determination in a theory of material objects that attempts to exclude co-location: Even if the pro-co-location camp grants that microphysical supervenience, if true, represents a legitimate objection to co-location, they can still demand an account of why microphysical supervenience obtains at all between the microstructure of the object and non-categorical properties. In the same way as foes of co-location can demand an explanation of what could possibly ground the non-categorical differences between objects that are qualitatively identical, friends of co-location can demand an explanation of what grounds the microphysical supervenience of the non-categorical over the microphysical.

The explanatory success of microphysical determination

Or cannot they? To this, anti-colocationists could respond that the previous account is not quite fair to their own position, for unlike the pro-colocation camp, anti-colocationists can offer an explanation of why non-categorical properties supervene on the microphysical; namely, because microphysical properties determine non-categorical properties. End of story. Moreover, anti-co-locationists can maintain that although friends of co-location are in position to ask a further question concerning the nature of the determination relation, the question of why and how is possible for one set of properties to determine the other, they themselves do not have an answer to this, and worse, they do not have an answer to the first type of question (i.e., why non-categorical properties at least sometimes supervene on the microphysical, and why they sometimes fail to so supervene?). Hence, we should still prefer microphysical determination over CFS, for it is hard to see what kind of determination relation could underlie the latter and thereby provide the desired explanation.

Putting aside for a moment the explanatory problem that CFS faces, let us be clear as to how effective this defense of microphysical determination really is. We can say that, If Kim's analysis is correct, the downside of the defense is that it works only to the extent that we accept the background view of physicalism with respect to individuation and persistence, for it is this assumption that would ensure that determination of the microphysical over the non-categorical goes through. Indeed, the anti-colocation camp does not only want to say that non-categorical properties co-vary in relation to microphysical properties, but that the latter determine the former. However, with microphysical determination in force, we can say that non-categorical properties supervene on microphysical properties only to the extent that microphysical properties determine non-categorical properties, but for this to be true, the claim that the individuation and

persistence conditions of material objects is determined only by physical properties must be true. And, in spite of the appeal of the physicalist view, this is not a point of agreement; specially, when the issue of co-location itself possess a challenge to the physicalist view. Co-location questions the utility of the claim of microphysical determination *because* it questions the view that the individuation and persistence conditions of material objects at a given time do not depend on physical properties alone.

In view of this, the pro co-location camp can question microphysical determination on the grounds of ignorance with respect to the subject that we are trying to explain partly because positions that rely on the thesis of supervenience, regardless of how they characterize the modal strength of the supervenience relationship, face what we may call an epistemic gap problem, in that while the aim of microphysical supervenience is to carve nature at the joints, the evidential basis for the claim of microphysical determination is only phenomenological (Kim, 1998). Consequently, advocates of co-location can press the point that, for all we know with respect to the covariance between a set of properties *A* and a set of properties *B*, *A* may supervene on *B* without *A* obtaining in virtue of *B*. To paraphrase Kim, since supervenience is no more than a phenomenological relationship that tracks patterns of co-variation between sets of properties, we may not know if we have the adequate epistemic grounds to judge whether *B* in fact explains *A*. Supervenience is silent on the nature of the dependence relation that might explain why non-categorical properties supervene on microstructure. Louise de Rosset (2011) makes this very same point when he says that, contrary to expectations, supervenience “does not impose any further interesting explanatory requirement on the relation between the subvening and supervening facts” (176). Consider de Rosset’s analysis of properties of size and shape of a certain table:

[T]here is the fact that [the table] is more than 1 centimeter high, it is not spherical, etc. Call facts of this kind the table-facts. Now just pick a contingent fact P from outside this realm. For instance, let P be the fact that there is at least one person in the same room as the table. Consider the kind of fact obtained by conjoining P with all of the table-facts in turn. You get such facts as that P and the table is more than one centimeter high, P and the table is not spherical, etc. Call facts of this kind the conjunctive facts. The table-facts supervene on the conjunctive facts, in the sense that situations cannot differ with respect to the table-facts without also differing with respect to the conjunctive facts. The converse does not hold. Since P is contingent, situations can differ with respect to the conjunctive facts without differing with respect to the table-facts. Consider, for instance, the situation now and the situation yesterday at noon, when no one was in the same room as the table. Assuming that the table's size and shape has remained the same, the table-facts are the same in both situations, while the conjunctive facts differ. It follows that the table-facts supervene on the conjunctive facts, and not vice versa. The table-facts do not, however, obtain in virtue of the conjunctive facts. If there is any explanatory relation here, it's partial, and it's going the other way. (Ibid.)

This is not, of course, to say that the pro-co-location position is exempt from the question, but the point works to level the balance between pro-co-location and anti-co-location positions. Since the question at issue concerns the viability of a physicalist view of individuation and persistence, the argument is that the burden of explanation does not fall only on the shoulders of the pro-co-location position insofar as this tries to establish that co-location is possible, and so individuation and persistence cannot be fully determined by the physical, but also on those of the anti-co-location position insofar as this tries to establish that individuation and persistence are physically determined. Therefore, foes of co-location cannot appeal to that burden in order to argue against co-location.

The epistemic gap problem as the grounding problem

Considering the previous analysis, I think that what I have called the epistemic gap problem for microphysical supervenience is an instance of the *grounding problem*, or the

problem of providing an explanation for why a certain material object with certain basic microphysical properties instantiates a given cluster of non-categorical properties (Bennett, 2004; de Rosset, 2011).

I am aware that my proposal may at first sound odd in view of the fact that the grounding problem is typically presented as a challenge to the pro-co-location position (in fact, I think that ‘grounding problem’ might be a different name for Olson’s ‘indiscernibility problem’) and not against anti-co-location strategies that rely on microphysical supervenience. My rationale for using ‘grounding’ as a problem against foes of co-location is that although it is true that grounding is a challenge to co-location insofar as it generates an explanatory demand about the grounds of the alleged non-categorical differences between qualitatively identical co-located objects (Bennett, 339), it is also a challenge to the anti-co-location position insofar as any complete account of objects must explain why non-categorical properties supervene on the microstructure of the object. As Bennett says with respect to modal properties, “anyone who takes de re modality seriously should have something to say about what it is, if anything, in virtue of which things have the [non-categorical] properties they do” (340). This means that not even endorsing the view of microphysical determination as strong supervenience may help us meet the challenge of grounding: Since the grounding problem is an explanatory problem, and since supervenience does not track deep explanatory relations, endorsing strong supervenience does not solve the underlying difficulty of explaining what grounds non-categorical properties. Contrary to expectations, the truth of microphysical supervenience *qua* strong supervenience can only at best provide a necessary condition for avoiding the grounding problem (de Rosset, 178). Therefore, it is a mistake to argue, as Burke does, that we should reject any view that allows for co-location on the grounds that alternative accounts that meet the no-coincidence principle are

more metaphysically economic: "The difference in sort between a tree and a mouse is attributable to the difference in their qualities" (14n4). To restate my point, if both, pro-co-location and anti-co-location positions need to face the grounding problem, why should we prefer the anti-co-location position based on the assumption that supervenience can explain the similarities between co-located objects?

If we do not know why supervenience holds, we do not need to believe that the type of supervenience that obtains between microstructure and non-categorical properties is really a type of metaphysical determination. Indeed, the question for the anti-co-location camp is why should we believe that a microphysical supervenience relation holds that guarantees non-categorical indiscernibility between microphysically indiscernible objects? After all, the statue and the quantity of bronze happen to have identical qualitative parts and do not seem to have the same capacity for survival under similar conditions, yet this is what Zimmerman believes should not happen. Furthermore, we can maintain that co-location is a counterargument to the belief that microphysics is a sufficient base for non-categorical properties. The microphysical properties of the statue do not provide sufficient conditions for the instantiation of the statue's persistence conditions and sortal properties simply because the quantity of bronze instantiates the same microphysical properties but does not instantiate the same persistence conditions and sortal properties as those that the statue instantiates. It seems, then, that nothing purely microphysical determines what persistence conditions and sortal properties either of them has. Nothing purely microphysical is sufficient. So, stating that co-located objects should have the same capacity for survival because of their identical qualitative parts begs the question against co-location.

In summary, if it is true that a variety of views can endorse supervenience, and if it is true that, whether or not we endorse microphysical determination, we still need to explain why

certain objects instantiate certain non-categorical properties and not others in virtue of instantiating certain, presumably basic, microphysical properties, then it would seem that supervenience does not provide a sufficient epistemic resource for identifying the correct relationship between non-categorical properties and the microphysical basis of the object. If this is the case, then supervenience is not sufficient for deciding whether co-location is possible or not, for co-location can reenter our discussion if we do not know whether microphysical properties *always* determine non-categorical ones. In other words, advocates of co-location do not need to be impressed by the argument from supervenience: The claim that there is a supervenience relationship between sets of properties underdetermines any further claim about the nature of the deep metaphysical relationship between sets of properties.

CHAPTER 7

MICROPHYSICAL DETERMINATION AND NO-COINCIDENCE

In this chapter I expand on the result of the previous one concerning microphysical determination and its relationship to physicalism. Microphysical determination appears to be an articulation of a commitment to a physicalist metaphysics of material objects and not an independent reason in favor of physicalism. If this is true, and microphysical determination is not an independent reason in favor of a physicalistic account of macroscopic material objects, then it cannot justify the microphysical dependence of non-categorical properties. And since we need physicalism in order to establish the no-coincidence principle, microphysical supervenience is not a reason to warrant no-coincidence. We can see this when we revisit the no-coincidence principle.

I said in chapter 2 that the intuitive plausibility of no-coincidence depends partly on the assumption that, necessarily, the individuation and persistence conditions of material objects ensures the impossibility of co-location, but for no-coincidence to be understood as a particular consequence of this view, it must be interpreted as containing a claim of *exclusive* part possession: Only one object can be composed by a certain set of parts, at some level of decomposition, at any given time. Accordingly, I argued that the principle must look as follows:

The mereological exclusive version of the no-coincidence principle (MENC_P): If, (i) the individuation and persistence conditions of material objects depend ultimately on the general kind ‘material object,’ and (ii) such conditions are ultimately determined by material properties, then, if A is a material object and B is a material object, and A is not identical to B, then A and B cannot, simultaneously, be composed of exactly the same parts, at some level of decomposition.

In turn, this version of no-coincidence would be true, if and only if (i) and (ii) are true, or we can say, if and only if it is true that the individuation and persistence conditions of material objects always depend on the general kind ‘material object,’ in the sense that such conditions are completely determined by physical properties: if we do not assume (i) then we would need to accept that individuation and persistence may depend on the different subclasses to which material objects belong (e.g. bronze statue vs. quantity of bronze; wood chair vs. quantity of wood, and so on), in which case it would be fine for the statue to have different individuation and persistence conditions than those of the quantity of bronze. This ultimately would lead to co-location. And if we do not assume (ii) we would need to concede that, at the very least, individuation and persistence may depend on properties that are not consistent with the view that material properties and properties that depend on physical properties, exhaust the nature of objects (e.g. the statue may have properties that do not depend on its physical properties, such as, perhaps, properties of authorship and style), and this also would lead to co-location. Together, (i) and (ii), articulate a physicalist claim with respect to macroscopic material objects: According to this, for an object to be a material object is for that object to be completely constituted by physical properties. Thus, a justification of the no-coincidence principle requires a justification of our belief in the truth of physicalism about macroscopic material objects, because only then we can go from the claim that the objects that are presumed to be co-located actually instantiate the same empirically discriminable properties to the claim that they are one and same object.

I also considered in chapter 2 an issue concerning the justification of (i) and (ii). They are supposed to justify no-coincidence, but they themselves are not justified: Physicalism about macroscopic material objects is not justified, so it is far from clear that colocated objects are really only one object. I argued in chapters 4 and 5 that this is where determination was supposed

to help: If microphysical supervenience is true, then microphysical properties would be sufficient for determining the kind of properties that some believe lead to co-location. Now, the introduction of the grounding problem for microphysical determination does not necessarily question the truth of the thesis as a claim about the metaphysics of material objects. Rather, it only provides a type of skeptical argument that undermines our confidence in microphysical determination. In short, if my analysis of the implications of the grounding problem for microphysical supervenience is correct, a definitive rejection of co-location on the grounds of microphysical indiscernibility, would need to wait until we have additional reasons to believe in a physicalist metaphysics of material objects.

The problem for those positions is not only that we need further reasons *beside* microphysical determination in order to warrant physicalism, establish no-coincidence, and reject co-location. Rather, the problem is that microphysical determination is not the type of reason that would justify no-coincidence simply because it is not the type of reason that would justify (i) and (ii). In fact, using the thesis of microphysical determination to justify those assumptions is equivalent to putting the cart before the horse: Determination cannot be a principled reason for (i) and (ii) because whether microphysical properties determine non-categorical properties or not would depend on the truth of (i) and (ii), that is, on the truth of physicalism. Therefore, rejecting co-location on the grounds of supervenience still begs the question against co-location.

This argument against the use of microphysical determination for justifying no-coincidence must be true in light of Kim's analysis of the uses of supervenience in the philosophy of mind: Any version of supervenience is content-neutral with respect to positions concerning the mind/body problem, and in our present case, content neutral with respect to positions concerning non-categorical and microphysical properties. Many different positions can

use supervenience because the details of what properties are base-properties and what properties are supervenient properties are provided not by the thesis of supervenience, but by the general metaphysical framework that stands behind a particular version of supervenience or other. This means that if we believe that microphysical supervenience is true, we already believe that physicalism is true. However, without (i) and (ii), it is difficult to see why microphysical determination would be an interesting candidate to explain at least some features of the relationship between basic microphysics and other presumably non-basic properties.

Interestingly, since co-location questions no-coincidence *because* it questions (i) and (ii), that is since co-location can be understood to show that the individuation and persistence conditions of material objects do not depend on physical properties only, and since the thesis of microphysical supervenience depends on assumptions (i) and (ii), the claim of co-location, in a sense, concerns a more basic metaphysical issue than microphysical determination: The claim of co-location concerns the truth or falsity of the physicalist framework with respect to material objects, while the claim of microphysical supervenience concerns the view that, on the assumption that physicalism is true—an assumption that co-location calls into question—the relationship between microphysical properties and non-categorical properties must be constrained by the general physicalist claim. Once again, Kim provides a useful articulation of this point:

Mind-body supervenience captures a commitment common to all positions on the nature of mentality that are basically physicalistic. For it represents the idea that mentality is at bottom physically based, and that there is no free-floating mentality unanchored in the physical nature of objects and events in which it is manifested.
(14)

Similarly, we can say that microphysical determination represents the idea that non-categorical properties are ultimately physically based, and that they are necessarily anchored to

the physical properties of the objects that manifest them. Now, given the possibility of co-location, to advance microphysical determination as a response to co-location, and insist that non-categorical properties must supervene on microphysics is tantamount to insisting that physicalism is still true in spite of counterexamples.

There is, furthermore, a relation between the incapacity of microphysical supervenience to justify (i) and (ii) and the fact that the anti-co-location position faces the grounding problem. The grounding problem, the problem of explaining why a material object with certain microphysical properties instantiates a certain set of non-categorical properties, is a symptom of an incomplete metaphysics of material objects. A complete metaphysical picture of material objects would rule out skeptical arguments, and the grounding problem belongs in that category of arguments. So, by itself, the presence of the grounding problem suggests that although the physicalist intuitions that fuel attacks on co-location may seem to offer plausible explanatory resources, such resources do not rest on solid metaphysical ground. Ultimately this means that microphysical supervenience is not in a better position than co-location-friendly accounts with respect to explaining non-categorical properties. Thus, it would be unfair to say, as Rea (1997) does,³² that:

Clearly our most ordinary explanations for qualitative differences will be unavailable to the co-locationist. For example, one would ordinarily explain the fact that Socrates and his horse differ in their sortal properties by appeal to the fact that Socrates's parts are arranged in one way whereas the parts of Socrates's horse are arranged in a completely different way. But obviously the co-locationist can't invoke this sort of explanation to account for the qualitative discernibility of Socrates and [the quantity of matter that constitutes Socrates]. (370)

³² Rea himself thinks that friends of co-location have a way of explaining sortal differences

The truth of the matter is that, in spite of appearances, such resources are not available to foes of co-location either, for the metaphysical background that would make these types of resources available to the anti-co-location position has not yet been established.

The fact that the limitations of microphysical supervenience, by themselves, generate the explanatory burden of the grounding problem, is a reason to think that Zimmerman is partly mistaken when he characterizes the fundamental problem of co-location as contradicting the belief that physical objects constructed in the same way out of qualitatively identical parts should have the same capacities for survival under similar conditions (87). This articulation equates the problem of co-location to the problem of denying microphysical determination. But understanding co-location as a metaphysical problem involving determination does not make sense if we have not presupposed that the individuation and persistence of objects is determined by physical properties *only*. Co-location, then, is not simply the problem of denying microphysical determination; co-location is the most basic problem of accepting what the nature of the individuation and persistence conditions of material objects may demand of a general metaphysics of material objects, in view of the (intriguing) nature of a variety of non-categorical properties. A way of understanding this demand is as a denial of physicalism as the view that for an object to fall under the general kind 'material object' is for the individuation and persistence conditions of such an object to be completely determined by physical properties. If physicalism is limited to this claim, then co-location shows that physicalism is wrong. At the very least, co-location shows that if we are going to embrace a physicalist metaphysics of material objects, the reasons considered here are not sufficient.

CHAPTER 8
CONCLUSION

I began this work with the idea that it is not immediately obvious why co-location is supposed to be a problem for an account of material objects. When we try to get an understanding of this issue, we find that a common characterization of the problem consists of a conflict between co-location and the no-coincidence principle. In turn, a plausible articulation of this principle *the mereological version of the no-coincidence principle (MNCP)*, says that if A is a material object and B is a material object, and A is not identical to B, then A and B cannot, simultaneously, be composed of exactly the same parts, at some level of decomposition. I argued that stating the problem in these terms is not very informative. I argued further that this conception of the problem seems plausible because of the apparent self-evident nature of no-coincidence. But the principle seems self-evident because it is interpreted as involving an unacknowledged appeal to a claim of *exclusive* part possession. I maintained that this latter claim depends on two assumptions: First, the individuation and persistence conditions of any material object depend ultimately on the general kind ‘material object.’ Second, the individuation and persistence conditions of any material object are ultimately determined by the physical properties of the object. I claimed on the grounds of this analysis that a more informative way of understanding the problem of co-location is to conceive of it as a conflict between the possibility of co-location and the view that material properties determine the conditions of individuation and persistence of material. However, if no-coincidence depends on the claim that physical properties exhaustively determine the metaphysics of material objects, then we need a warrant for this claim.

With this in mind, I went on in chapter 3 to consider a type of anti-co-location strategy that attempts to motivate the belief that material objects are identical to the quantities of matter that constitute them. I called instances of this strategy, the argument from the normative primacy of identity. I argued that the argument does not provide plausible reasons to believe in the identity of constituting and constituted object. This is the case because indirect arguments exemplify a pattern of *inference to the best explanation*. While the argument from the normative primacy of identity may offer non-demonstrative support for the claim that material objects are identical to the quantities of matter that constitute them, it does not say anything about the kind of metaphysics that would rule out colocation and support a correspondence between identity and the constitutive structure of material objects. It simply presuppose that it is plausible to assume identity, making the no-coincidence principle true. Thus, the argument fails as a reason to preclude colocation insofar as it does not say why, in the face of a coherent metaphysics of colocation, we should prefer a metaphysics that precludes co-location to one that embraces it.

Subsequently, in chapter 4, I introduced the thesis of microphysical determination as the view that many or even all of the *intrinsic qualitative properties* of the object depend on the microphysical structure of the object. Microphysical determination is a relationship that anchors the properties of the object to a metaphysical hierarchy in which the nature and characteristics of the presumably fundamental microphysical properties determine everything else (or at least many important aspects of everything else). Microphysical determination promises independent support for the no-coincidence principle insofar as it seems to bolster the belief that the relationship between the constituted and constituting object must be one of identity. This claim, if true, would allow us to preserve the no-coincidence principle and avoid co-location.

Furthermore, I said that some philosophers believe that the problem of co-location is the problem of contradicting the thesis of microphysical supervenience.

In spite of the promise of microphysical supervenience, I maintained in chapter 5 that arguments based on supervenience do not offer decisive reasons against co-location. I argued that friends of co-location can coherently endorse a weaker version of microphysical supervenience, co-location friendly supervenience or CFS, that is compatible with co-location. I then proceeded in chapter 6 to defend CFS from arguments that demand an explanation of the non-categorical differences and similarities between objects presumed to be co-located. These arguments are supposed to provide support for the assumption that the best explanation for the empirically discriminable properties of a certain object at a certain time is that there is only one object composed of a set of microphysical parts occupying a particular location in space at that time. If we deny this belief, we would either have a very hard time trying to explain non-categorical differences in a coherent manner, or we would simply be at a lost for explanatory resources. First, I argued against Burke's argument from explanatory circularity. I claimed that Burke's view depends partly on the tacit appeal to strong supervenience, according to which, the microphysical structure of any possible object *d* always determines the historical properties of *d*. Friends of co-location do not need to accept this presupposition, and this means that they do not need to accept Burke's reasoning against co-location.

Second, I argued against Zimmerman's version of the argument from explanation. Zimmerman believes that explaining differences in persistence conditions by an appeal to ungrounded sortal properties is to insist that co-located objects differ in sort and persistence conditions. I maintained that Zimmerman's argument cuts both ways: Even if we grant that microphysical determination represents a legitimate objection to co-location, we can still demand

an account of why microphysical supervenience obtains at all between the microstructure of the object and non-categorical properties. If we are not certain whether microphysical determination holds, we do not need to believe that the type of supervenience that obtains between microstructure and non-categorical properties is really a type of metaphysical determination.

Finally, in chapter 7, I claimed that the anti-co-location position faces a very serious problem: Microphysical determination is a thesis that reflects a commitment to a physicalist metaphysics of material objects, and not a thesis that provides independent reason in favor of physicalism. Consequently, if microphysical determination is not an independent reason in favor of a physicalist account of material objects, then it cannot justify the microphysical dependence of non-categorical properties. Furthermore, since we need physicalism in order to establish the no-coincidence principle, microphysical determination is not a reason to warrant no-coincidence.

In closing, I argued that what co-location might be more than a problem involving the denial of microphysical determination. Rather, purported cases of co-location introduce the problem of accommodating the nature of non-categorical properties into a general metaphysics of material objects. If purported cases of co-location are in fact cases of co-location, as they seem to be, co-location simply shows that a view of physicalism based on the kind of arguments and assumptions that I have evaluated in the preceding paragraphs is wrong. At the very least, co-location shows that on the grounds that I have considered above, we should be skeptical of a completely physicalist metaphysics of material objects.

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