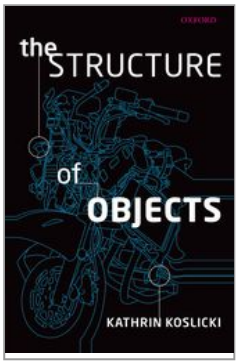

The Structure of Objects
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A Different Kind of Whole

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Abstract and Keywords

This chapter returns to the question, postponed in Chapter 2: why, from a three-dimensionalist perspective, the properties of ordinary material objects are not already adequately accounted for by Thomson's modified and weakened version of standard mereology. To this end, the work of Kit Fine is examined, who, in a series of papers, has provided powerful reasons for abandoning the standard conception of composition. In its stead, Fine proposes an alternative, neo-Aristotelian model, which is in some respects close to the positive framework advocated later in this book. The chapter begins by examining Fine's reasons for parting ways with the standard conception; these reasons are found to be utterly persuasive and fatal to the standard conception. The later sections of the chapter provide a detailed discussion of Fine's own positive proposal and indicate in what respects it might be found to be unsatisfactory.

Keywords: Kit Fine, neo-Aristotelian mereology, rigid embodiments, variable embodiments, aggregative objection, monster objection

§IV.1 Introductory Remarks

So far, we have been concerned primarily with the main concepts and principles of standard mereology or CEM as well as the cogency of a certain style of argument which reasons from Leibniz's Law to the numerical distinctness of wholes and their parts. Chapter II examined both three-dimensionalist and four-dimensionalist applications of standard mereology to the case of ordinary material objects. Our main representatives there were Thomson, for the three-dimensionalist camp, and Lewis, for the four-dimensionalist camp. Two components of Lewis' approach were found to be directly relevant to the present

discussion: his argument in favor of Unrestricted Composition, which has recently been creatively adopted and elaborated in Sider (2001), in what Sider calls the “argument from vagueness”; and Lewis' so-called “Composition-as-Identity Thesis” in Lewis (1991). Both components are independent of Lewis' endorsement of four-dimensionalism and could therefore, if successful, also persuade the three-dimensionalist to embrace a CEM-style analysis of ordinary material objects. However, as I hope my arguments in Chapter II have established, the three-dimensionalist need not feel moved by either of these components of Lewis' view, since both are ultimately founded on question-begging reasoning. It remains to be seen, however, why, from a three-dimensionalist perspective, the properties of ordinary material objects are not already adequately accounted for by Thomson's modified and weakened version of standard mereology. To this end, I turn next to the work of Kit Fine, who, in a series of papers, has provided powerful reasons for abandoning the standard conception of composition; in its stead, Fine proposes an alternative, neo-Aristotelian, model, which is in some respects close to my own (see also Johnston 2002 for a related framework). I begin this chapter by examining Fine's reasons for parting ways with the standard conception; I consider these reasons to be utterly persuasive and fatal to the standard conception. In the later sections of this chapter, I turn to a detailed discussion of Fine's own positive proposal and indicate where I take myself to be departing from it.

(p.72) §IV.2 Parting Ways with the Standard Conception

In a series of papers, starting in the early 1980s, Kit Fine has developed a novel, neo-Aristotelian conception of ontology and mereology, which differs in certain crucial respects from the more mainstream, CEM-inspired analyses of ordinary material objects (see especially Fine 1982, 1983, 1992, 1994a, 1994c, 1999, 2003). Fine believes that an adequate analysis of ordinary material objects calls for new, *sui generis*, relations of composition; it cannot be couched in terms of the old, CEM-style conception, in his view, because the conditions of existence, spatio-temporal location, and part–whole structure of ordinary material objects simply do not match those of standard mereological sums. In fact, once Fine brings to our attention just how blatantly ordinary material objects diverge from standard mereological sums with respect to their conditions of existence, location and part–whole structure, one wonders how the standard conception could ever have had such a powerful hold on the minds of so many philosophers. Whatever the psychological, historical and sociological reasons for this curious preference for austerity, it is high time that we follow Fine's lead and look towards alternative conceptions of composition which are not blind to certain obvious features exhibited by ordinary material objects; such alternative conceptions will turn out to have much closer affinity to those developed more than two thousand years ago by Plato and Aristotle than they do to those which enjoyed popularity in the 20th century.

Fine's main motivation for the introduction of new primitives is that he believes extant conceptions of parthood to suffer from the following two shortcomings: (i) they are committed, first, to an *aggregative* or *disjunctive* conception of parthood, which assigns the wrong conditions of existence and spatio-temporal location to ordinary material objects; and (ii) even when patched up in certain obvious ways, they misrepresent the part–whole structure of ordinary material objects, as brought out by what Fine calls the *monster objection*. (The second, but not the first, objection applies to Fine's earlier conception of parthood, as developed in Fine 1994a, as well.)

§IV.2.1 Fine's "Aggregative Objection"

Fine's first objection is stated in the following passage:

> . . . [O]n [the standard, "aggregative"] understanding, a sum of material things is regarded as being spread through time in much the same way as a material thing is ordinarily regarded as spread out in space. Thus the sum $a+b+c+$. . . will exist *whenever* any of its components, a, b, c, . . . , exists (just as it is located, at any time, *wherever* any of its components are located). It follows that under the proposed analysis of the ham **(p.73)** sandwich, it will exist as soon as the piece of ham or either slice of bread exists. Yet surely this is not so. Surely the ham sandwich will not exist until the ham is actually placed between the two slices of bread. After all, one *makes* a ham sandwich; and to make something is to bring into existence something that formerly did not exist.
>
> (Fine 1999, p. 62)

Fine has in mind the following problem. Suppose, for example, the ham sandwich is analyzed as a standard mereological sum, $s=s_1+s_2+h$, consisting of two slices of bread, s_1 and s_2, and a slice of ham, h. Given the standard conception of parthood and mereological composition, it seems that we will thereby have assigned to the ham sandwich simply the wrong conditions of existence and spatio-temporal location, at least if we take our ordinary beliefs and utterances about such objects as ham sandwiches as a guide. For a mereological sum, according to the standard conception, exists wherever and whenever *at least one* of its parts does. Thus, if the slice of ham, h, comes into existence at time, t, before the two slices of bread, s_1 and s_2, have come into existence, and h is located at t in the spatio-temporal region, p, then the mereological sum, $s=s_1+s_2+h$, also exists at t, in the region, p, occupied by h, and has as parts all and only the parts of h: for the mereological sum, s_1+s_2+h, according to the standard conception, is that object, s, which has as parts all and only the parts of s_1, s_2 and h; since only h exists at t, the parts of s at t simply are the parts of h at t. But we would not ordinarily say that the ham sandwich has already come into existence at t, when the two slices of bread have not yet come into existence. Of course, we would ordinarily also not say that the ham sandwich has come into existence, even when all of s_1, s_2 and h already exist, unless s_1, s_2 and h were *arranged* in a characteristically sandwich-like manner, with h being between s_1 and s_2. Thus, as far as ordinary material objects are concerned, it is not enough simply to tack onto the standard

conception of parthood the requirement that the parts of a sum must all exist at the same time in spatial proximity to one another; the parts must also be arranged in certain specific ways, depending on the kind of object at hand.

§IV.2.2 Fine's “Monster Objection”

Fine's second objection, the “monster objection”, is precisely a way of bringing out why simply tacking on an additional requirement of spatio-temporal cohabitation is not sufficient to turn the standard conception of parthood into one that becomes useful for an analysis of ordinary material objects. The problem Fine points to in this objection is the following. Consider an *extended* sense of parthood, according to which, for any two objects, o_1 and o_2, o_1 is (in the extended sense) part of o_2 if the *restriction*, $o_{1-restr}$, of o_1 to the times at which o_2 exists is (in the unextended sense) a part of o_2, i.e., $o_1 <_{ext} o_2$, if $o_{1-restr} < o_2$. The extended notion of parthood provides a way, so to speak, of cutting out, by brute force, the spatio-temporally non-cohabiting parts of an object from **(p.74)** the mereological sum it helps to compose. We may thus wonder what the merits of such a notion are for the analysis of ordinary material objects, since a proponent of what I have been calling “the standard conception” may well take this extended notion of parthood to be sufficiently close to the original one to feel that his approach can triumph after all. Fine's “monster objection” shows why this won't work:

> In any case, the proposed sense of part will not deliver the correct results. Consider the sum of the ham and Cleopatra or, more dramatically, the sum of the ham and all objects that existed only before or after the ham sandwich existed. Then the restriction of this sum to the time the sandwich exists is the same as the restriction of just the ham and hence must also be a part of the sandwich. But it is ludicrous to suppose that this monstrous object—of which Cleopatra and all merely past and future galaxies are parts—is itself a part of the ham sandwich.
>
> (Fine 1999, p. 63)

Consider the restriction of the mereological sum, $s = s_1 + s_2 + h$, to those times at which the ham sandwich exists; the result of this restriction is another mereological sum, s_{restr}, which exists at all and only those times and places at which the ham sandwich exists and which has at those times all and only the parts of s. Now consider the restriction, h_{restr}, of the ham to those times at which the ham sandwich exists. According to the new notion of parthood, the ham, h, is a part in the extended sense of the restricted sum, s_{restr}, (even though it exceeds s_{restr}'s spatio-temporal boundaries) because the restriction, h_{restr}, of h to the times at which s_{restr} exists is a part in the unextended sense of s_{restr}: i.e., $h <_{ext} s_{restr}$, since $h_{restr} < s_{restr}$. This, of course, is a welcome consequence, since we would like to be able to say that the ham is part of the ham sandwich, even though the ham already existed before the ham sandwich did; we just don't want

it to follow from this claim that the ham sandwich therefore *also* already exists as soon as the ham comes into existence.

So far so good. But now, as brought out by the “monster objection”, it turns out that, according to the same modified notion of parthood, various “monster objects” also count as parts in the extended sense of the restricted sum, s_{restr}, e.g., the object that has as parts the ham along with *all* objects *whatsoever* that ever have existed or will exist at times at which the ham sandwich doesn't exist (since these will be “cut out” in the restriction). And why, so Fine rightly asks, should we consider a relation which has these consequences to be a relation of parthood at all? It is certainly not one that holds much promise for an analysis of ordinary material objects.

The “aggregative” objection and the “monster objection” evidently provide strong motivation for abandoning the standard conception of parthood and composition. The lesson we learn from these two objections is that an analysis of ordinary material objects requires a notion of parthood which is sensitive not only to the *spatio-temporal proximity* of objects but also to their *manner of arrangement*. **(p.75)** Even after the standard conception has been suitably weakened and modified by Thomson to meet the temporal and modal arguments for distinctness from Leibniz's Law, the conditions of existence, identity, spatio-temporal location and part–whole structure that are assigned to ordinary material objects by the Modalized Cross-Temporal Calculus of Individuals still retain too much of the original analogy between sums and sets to make room for both of these crucial elements. Fine's first objection brings out that ordinary material objects simply do not exhibit the “aggregative” conditions of existence and spatio-temporal location of mereological sums according to the standard conception, since ordinary material objects exist and are located at those times and places at which *all* of their parts *together* are located. Thus, as Fine (1994a) already urged us, an adequate analysis of ordinary material objects evidently requires *conjunctive* conditions of existence and spatio-temporal location. But the “monster objection” shows that the standard conception of mereology cannot be saved merely by means of tacking onto the standard notion of parthood and composition a “conjunctive” requirement of spatio-temporal cohabitation, because the result is still missing a crucial feature: it fails to represent the *manner of arrangement* which the parts of ordinary material objects must exhibit in order for the object in question to exist.

I take these two considerations to be fatal for the standard conception of mereology as it applies to ordinary material objects. And while I of course have no interest in quibbling over terminology, I assume that any conception of parthood and composition that is rich enough to represent explicitly the *manner of arrangement* of an object's parts is too far removed from the original incarnations of CEM to be regarded as an extension of the standard conception. Such an alternative model may of course take over certain minimal requirements

on parthood and composition from the standard conception; but it will impose further, richer conditions which must be satisfied in order for one object to compose or be part of another. These richer conditions no longer make it possible to hold on to the original analogy between wholes and sets: for the existence and identity of a set of course in no way depends on the *spatio-temporal proximity* of its members; nor does it impose any special requirements on the *manner of arrangement* which its members must exhibit.

§IV.3 Fine's Theory of Embodiments

I now want to discuss Fine's own alternative conception of composition in some detail and indicate what I take to be its strengths and weaknesses. I focus in particular on his discussion in “Things and Their Parts” (1999), since this is Fine's most recent and comprehensive exposition of his views concerning the topics that are relevant to the present discussion.

Fine's aim in this and earlier papers (especially Fine 1982) is to “sketch a theory of the general nature of material things”; the more specific entry into **(p.76)** this theory taken in Fine (1999) is through consideration of the question, “How are objects capable of having the parts that they do?”, or, “What in an object's nature accounts for its division into parts?”. The theory is broadly divided into the following two components: (i) the first part, the theory of *rigid embodiments*, is intended to apply to objects which have their parts *timelessly*; (ii) the second part, the theory of *variable embodiments*, is intended to apply to objects whose parts can vary over time. As examples of the former, we are given such objects as ham sandwiches, bouquets of flowers, molecules, suits, nuts and qua-objects (e.g., “personages” such as airline passengers, mayors, and the like; for the theory of “qua-objects”, see Fine 1982). As examples of the latter, Fine cites such objects as the water in a particular river (where this phrase is to be understood not as denoting a particular quantity of water, but as denoting a variable quantity of water, one about which it could be meaningfully said, for example, that it is rising) as well as artifacts such as cars.

§IV.3.1 Rigid Embodiments

The theory of rigid embodiments analyzes such composite objects as the ham sandwich as having the constituent structure, “< a, b, c,. . ./R >”, where a, b, c, . . . are objects, R is a property or relation, and “/” denotes a *sui generis* relation of rigid embodiment, a particular way in which wholes may be formed out of parts.[1] Even though the relation, “/”, of rigid embodiment is taken as primitive, we may nevertheless derive an implicit understanding of it from the following six postulates, which specify conditions for the existence, location, identity and part–whole structure of rigid embodiments:[2]

> (R1) Existence-Postulate:
> The rigid embodiment, < a, b, c,. . ./R >, exists at a time t iff R holds of a, b, c, . . . at t.

(R2) Location-Postulate:
If the rigid embodiment, e = < a, b, c,. . ./R >, exists at a time t, then e is located at the point p at t iff at least one of a, b, c, . . . is located at p at t.[3]
(p.77)
(R3) Identity-Postulate:
The rigid embodiments, < a, b, c,. . ./R > and < a′, b′, c′, . . . /R′ >, are the same iff a = a′, b = b′, c = c′, . . . , and R = R′.
(R4) 1st (Timeless) Part–Whole Postulate:
The objects, a, b, c, . . . , are (timeless) parts of < a, b, c,. . ./R >.
(R5) 2nd (Timeless) Part–Whole Postulate:
The relation R is a (timeless) part of < a, b, c,. . ./R >.
(R6) 3rd (Timeless) Part–Whole Postulate:
Any timeless part of < a, b, c,. . ./R > is a timeless part of one of a, b, c, . . . or of R.

Postulate (R1) requires that in order for a rigid embodiment, e, to exist at a certain time, all of e's object components must exist at that time and be arranged in the manner specified by e's intensional component, R. (Following Fine's usage, I refer to the property or relation component of a rigid embodiment as its “intensional component”; I shall have more to say about the nature of this component below.) Postulate (R2) ties the location of the rigid embodiment to the location of its object components, since presumably the intensional component doesn't have spatio-temporal location, at least not in the same straightforward sense as the object components. The identity-postulate (R3) places very strict conditions on the identity of rigid embodiments and results in what Fine himself admits is an “embarrassing diversity” of rigid embodiments. To illustrate, the region of space-time which we would ordinarily say is occupied by a ham sandwich will be inhabited by multiple rigid embodiments composed of the same object components, depending on how the intensional component is specified: the rigid embodiment composed of the two slices of bread, the slice of ham, and the relation of being between, for example, is distinct from the rigid embodiment composed of the two slices of bread, the slice of ham, and the relation of being surrounded, since the relation of being between is distinct from the relation of being surrounded.

Given this “embarrassing diversity” of rigid embodiments, Fine offers an alternative formulation of (R3) (and, correspondingly, (R4)) which delineates the identity conditions and mereology of rigid embodiments on the basis of the identity conditions of the *states* into which their components enter:

(R3′) Alternative Existence-Postulate:
The rigid embodiments, < a, b, c, . . . /R > and < a′, b′, c′, . . . /R′ >, are the same iff the state of a, b, c, . . . , standing in the relation R is the same as the state of a′, b′, c′, . . . standing in the relation R′.

(R4′) Alternative 1st (Timeless) Part–Whole Postulate:
The rigid embodiment, < a, b, c,. . ./R >, is a (timeless) part of the rigid embodiment, <a′, b′, c′, . . . /R′ >, if the state of a, b, c, . . . standing **(p.78)** in the relation R is a part of the state a′, b′, c′, . . . standing in the relation R′.

Of course, these alternative formulations are only helpful if we can somehow get a handle on the identity conditions of states independently of those of the objects, properties and relations that participate in them.

Postulate (R5) brings out what is perhaps the most Aristotelian aspect of Fine's theory, namely that the intensional component of a rigid embodiment is a genuine part of it, in the same sense of “parthood” in which its objectual components are parts of the rigid embodiment. Postulate (R6) states that all of the parts of a rigid embodiment derive from their objectual and intensional components. And while the theory of rigid embodiments itself doesn't contain an explicit postulate to the effect that *every* timeless part of a timeless part of a given whole is itself a timeless part of the whole, the transitivity of timeless parthood (and parthood in general) is simply presupposed by Fine as an independently given formal requirement on the part-relation as a strict partial ordering. In fact, Fine's alternative system in general simply presupposes standard mereology and imposes on it further conditions.[4]

§IV.3.2 Variable Embodiments

The theory of variable embodiments analyzes such objects as the water in a particular river or a particular car as having the following more complex constituent structure. A variable embodiment, f = /F/, is an object consisting of a principle, F, of variable embodiment as well as a series of “manifestations”, f_t, determined by F at the times, t, at which /F/ exists. The principle, F, of a variable embodiment, /F/, is described by Fine as a “function” from times to objects (ibid., p. 69); however, we are to understand the term “function” in this context in a neutral, non-committal way, and not (necessarily) according to its strict, mathematical usage. The manifestation, f_t, of /F/ determined by F at t may itself be a rigid embodiment or a variable embodiment.

Metaphorically speaking, variable embodiments may be thought of along the lines of containers and their contents: the principle, F, of variable embodiment plays the role of the container (which is to be understood not as yet another physical object alongside the content; and not as merely a passive holding-device, but rather as an active participant in determining its content); the manifestations, f_t, are likened to the content (which may vary over time); and the variable embodiment, /F/, itself may be compared to the container together with its content.[5]

(p.79) Although the operation, / . . . /, of variable embodiment is again taken as a primitive, *sui generis* way of forming wholes out of parts, we gain an implicit

understanding of this notion by means of the following postulates governing the existence, location, identity, part–whole structure, and character of variable embodiments:

(V1) Existence-Postulate:
The variable embodiment, f = /F/, exists at a time t iff it has a manifestation at t.
(V2) Location-Postulate:
If the variable embodiment, f = /F/, exists at t, then its location is that of its manifestation, f_t (assuming that f_t has a location).
(V3) Identity-Postulate:
The variable embodiments, /F/ and /G/, are the same iff their principles, F and G, are the same.
(V4) 1st (Temporary) Part–Whole Postulate:
Any manifestation of a variable embodiment at a given time is a temporary part of the variable embodiment at that time (in symbols: $f_t \leqslant_t f$).
(V5a) 2nd (Temporary) Part–Whole Postulate:
If a is a timeless part of b that exists at t and if b is a part of c at t, then a is a part of c at t.
(V5b) 3rd (Temporary) Part–Whole Postulate:
If a is a part of b at t and if b is a timeless part of an object c that exists at t, then a is a part of c at t.
(V6) 4th (Temporary) Part–Whole Postulate:
If a is a temporary part of b at t, then there is a mereological chain at t connecting a to b.
(V7) Character Postulate:
The pro tem properties of a variable embodiment, f, at a given time t are the same as those of its manifestation f_t.

The last two postulates involve the technical terms, “mereological chain” and “pro tem property”, which are defined as follows: **(p.80)**

(D6a) Definition of “Fundamental Link”:
A link between two objects is a fundamental link at t if it holds between the manifestation, f_t, of a variable embodiment and the variable embodiment itself.
(D6b) Definition of “Auxiliary Link”:
A link between two objects is an auxiliary link at t if it holds between two objects, a and b, where a and b both exist at t and a is a timeless part of b.
(D6c) Definition of “Mereological Chain”:
A sequence, $(a_1, a_2), (a_2, a_3), \ldots, (a_{n-1}, a_n)$, of connected links is a mereological chain at t if (i) each link in the sequence is either a fundamental link or auxiliary link at t, and (ii) at least one link in the sequence is fundamental.

(D7) Definition of “Pro Tem Property”:
A property of an object is a pro tem property if its holding at a time depends only upon how the object is at that time.

Postulates (V1) and (V2) tie the existence and location of a variable embodiment, /F/, at a time t to the existence and location of its manifestation, f_t, at t. Postulate (V3) ties the identity of a variable embodiment, /F/, to the identity of its principle, F, of variable embodiment: two variable embodiments, /F/ and /G/, are the same just in case their principles, F and G, are the same, i.e., just in case they determine for each time for which they are defined the same manifestation.

Postulates (V4), (V5a), (V5b) and (V6) tell us about the part–whole structure of variable embodiments: they serve to relate the two notions of parthood, timeless part and temporary part, which correspond to the (at least) two sorts of wholes, rigid embodiments and variable embodiments; moreover, they also serve to reconstruct a restricted form of transitivity across the two notions of parthood. (V4) states that variable embodiments have their manifestations as temporary parts;[6] this link, between variable embodiments and their manifestations, as **(p. 81)** brought out by Postulate (V6), is also the fundamental mereological link which grounds all other relations of temporary part. Postulates (V5a) and (V5b) state that timeless parts of temporary parts are themselves temporary parts, and that temporary parts of timeless parts are themselves temporary parts; thus, chaining temporary with timeless parts itself results in temporary parts.

Finally, Postulate (V7) connects the character of a variable embodiment to that of its manifestations: a variable embodiment inherits those properties from its manifestations which depend only on “how the object is at that time” (whatever exactly that means).[7] Thus, Postulate (V7) is the successor of the principle that was called “Inheritance” in Fine (1982) (see Koslicki 2004a and 2005a for critical discussion of Fine's “Inheritance” principle). In general, the theory of Fine (1999) extends the theory of Fine (1982) by allowing for variation of parts over time; the qua-objects of Fine (1982) are all, in the language of Fine (1999), rigid embodiments.

Since the theory of variable embodiments, with its hierarchical part-structure, is difficult to comprehend, let's consider how it applies, first, to the (variable) water in the river and, then, to the particular car. The (variable) water in the river, according to Fine, is to be analyzed as a variable embodiment, /F/, whose principle, F, selects at each time, t, at which the river exists a particular quantity of water, the manifestation, f_t, of /F/ at t. We are not explicitly told whether the particular quantities of water selected by F at the different times at which the river exists are themselves rigid embodiments or whether they are objects that lack an intensional component altogether (if there are such objects). I assume that Fine takes the particular quantities of water not to be capable of changing

their parts over time, and thus not to be variable embodiments; but whether they are themselves rigid embodiments or objects of another kind is left open.

The car, on the other hand, is analyzed as a variable embodiment, /F′/, whose manifestations, f'_t, are rigid embodiments of the form, < a, b, c,. . ./R >. We are to think of the objectual components, a, b, c, . . . , of these rigid embodiments as the “major” parts that are characteristically associated with cars, e.g., the engine, the chassis, the wheels, etc.; the relation, R, reflects the fact that these “major” parts must be arranged in a characteristically “automotive” fashion. The **(p.82)** objects which are part of each of these rigid embodiments, on the other hand, i.e., the engine, chassis, wheels, etc., are themselves variable embodiments, i.e., objects whose parts may vary over time. The resulting car is thus a hierarchical arrangement of variable and rigid embodiments.

§IV.4 Discussion

As we saw earlier in this chapter, Fine's two main objections against standard mereology, the “aggregative” objection and the “monster objection”, certainly provide strong motivation for abandoning a traditional, CEM-style analysis of ordinary material objects. However, once this realization is granted as a starting point, there are of course various directions in which one can go to seek such an alternative conception of parthood and composition. The question now at hand is therefore whether the particular alternative conception developed by Fine yields the most attractive analysis of ordinary material objects.

§IV.4.1 The Proliferation of *Sui Generis* Relations

From a methodological point of view, Fine's analysis raises the worry that it leads to a proliferation of primitive, *sui generis* relations of parthood and composition. Fine's general strategy is to presuppose standard mereology and to impose on it further, more stringent conditions, in the form of postulates specifically tailored to the demands of a particular domain of objects.[8] As we saw in the preceding sections, the domain of ordinary material objects alone, in Fine's view, already calls for two distinct, primitive, *sui generis* relations of parthood and composition: the relations of composition by which rigid embodiments and **(p.83)** variable embodiments are formed out of their respective components; as well as the relations of timeless part and temporary part that go along with these. Rigid embodiments have only timeless parts; variable embodiments have both timeless and temporary parts. Since the two sorts of embodiments can enter into hierarchical arrangements with one another, various postulates are required in order to connect the two notions of parthood, to reconstruct a restricted form of transitivity. Whatever connections there are between the two notions of composition and parthood thus do not follow from the general formal properties of the basic mereological vocabulary, independently of the domain of objects to which this vocabulary is currently applied; rather, they are explicitly imposed on these relations via postulates specifically tailored to the realm of ordinary material objects. Thus, even within

this single domain of objects, Fine's strategy already leads on a (comparatively) small scale to a proliferation of distinct, primitive relations, which are not obviously needed in order to capture the conditions of existence, identity, location, character and part–whole structure of ordinary material objects. Since mereological vocabulary also applies outside of the realm of ordinary material objects, however, Fine's strategy would appear to lead to further distinct, primitive, *sui generis* relations of composition and parthood for each such domain of objects, accompanied by a system of postulates specifically tailored to the particular kinds of objects at issue. Such an approach takes on an overly stipulative and fractured air.

§IV.4.2 The Superabundance of Objects

Fine's strategy of solving long-standing metaphysical problems by introducing new primitive notions thus raises *methodological* concerns; but there are also serious *ontological* reasons for wanting to resist Fine's theory. (For an insightful discussion, among other things, of the problematic ontology of the earlier theory of qua-objects in Fine 1982, see Ray 2000b.) As Fine himself admits, the ontology to which his theory of embodiments is committed far outstrips that of traditional mereology, which many of us, with its endorsement of arbitrary sums, already find troubling. We saw earlier that each occupied region of space-time is inhabited by numerous rigid embodiments which share their objectual components and only differ in how their intensional component is specified. (Exactly *how* numerous the rigid embodiments occupying a given region of space-time are depends on how finely properties, relations or states are individuated.) But now, with the addition of variable embodiments, each such region of space-time is even more densely populated, with both rigid and variable embodiments, whose current manifestations again share many of their parts with each other and with their rigid cohabitants. And although the theory does not spell out the *modal* character of these coincident objects, it seems that many of them will turn out to be *necessarily* coincident, and yet numerically distinct (Fine 1999, p. 73).

(p.84) To illustrate, consider again the region of space-time occupied by a car. (To recall, a car is analyzed as a variable embodiment, /F′/, whose manifestation, f'_t, at a time t is itself a rigid embodiment, of the form, < a, b, c,. . ./R >; the objectual components, a, b, c, . . . , of f'_t, are variable embodiments, viz., the "major" parts of a car, its chassis, engine, etc., arranged in a characteristically "automotive" fashion indicated by R.) The same region of space-time that is occupied by the car, /F′/, is also occupied, for example, by the variable embodiment, /G/, the (variable) quantity of metal, plastic, rubber, etc. of which the car consists throughout its lifetime. The manifestations of /F′/and /G/ share some, but not all, of their objectual components; /F′/, for example, has a chassis as a temporary part, while /G/ merely has as a temporary part the quantity of matter that constitutes the chassis.

But the car, /F′/, and the variable quantity of matter, /G/, that constitutes the car throughout its career, are only the tip of the iceberg, so to speak. To get a sense of just how densely the single region of space-time in question is populated, consider the existence principle endorsed by Fine: “In general, we will suppose, *given any suitable function or principle F* (taking times into things), that *there is a corresponding object* standing in the same relationship to F as the variable water of the river stands to its principle” (Fine 1999, p. 69; my italics). What makes a principle *suitable*? No boundaries are set, other than a type-restriction on the entities to which the principles apply: the principles must take times as arguments and determine objects as values. Perhaps Fine is pessimistic that any principled line can be drawn between those principles (which relate times to objects) that select ordinary material objects and those that don't, and so decides to accept the whole lot. Without any further restriction on which principles are “suitable”, however, the single region of space-time will be occupied by a dizzying array of objects, many of which determine objects with persistence-conditions that strike us, from an ordinary point of view, as quite bizarre. For example, there is also in the particular region of space-time under discussion an object, /H/, whose principle, H, divides up cars like sandwiches: it selects at time t a manifestation, h_t, which is a rigid embodiment, < d, e, f/S >, whose objectual components, d, e and f are (the quantity of matter constituting) the left half of the car, a thin middle “slice” and (the quantity of matter constituting) the right half of the car, respectively, and whose intensional component, S, requires that the thin middle “slice”, e, be between the left half, d, and the right half, f. Since this principle, H, takes times to objects, it constitutes, for all we know, a “suitable” way of selecting an object which occupies the region of space-time inhabited by the car, /F′/, and the variable quantity of matter, /G/; and who knows how H behaves at other times: it might, for all we know, select at the next time a flower bouquet on a different continent. It thus seems that Fine's theory of embodiments, with its exceedingly tolerant existence principle, generates plenty of “monsters” of its own.

We can also appreciate now how Fine answers the original questions he sets himself, “How are objects capable of having the parts that they do?” or “What **(p.85)** in an object's nature accounts for its division into parts?”. Fine's answer is that an object has the parts that it does because its intensional component yields this particular way of partitioning the occupied region of space-time in question. However, talk of “nature”, in this context, is misleading at best, since the theory predicts that, given our apparently never-ending supply of principles, for any imaginable way of partitioning an occupied region of space-time, there is an object whose intensional component yields this particular division into parts.

To make his “vast superstructure” of objects somewhat more palatable, Fine suggests that we might take the intensional component of an object (i.e., the properties, relations and functions) to be of a *conceptual* nature, and that the commitment to these objects need not be regarded as *ultimate*. However, from

the point of view of those who believe that ordinary material objects deserve a privileged ontological status, this suggestion will be no less disconcerting; for, in that case, trees, houses and people will of course suffer the same fate as “car-sandwich-flower-bouquets”.[9]

§IV.4.3 The Mysterious Nature of Variable Embodiments

The goal of Fine's theory is to provide an analysis of the “general nature of material things”, which answers the question of why material things are divided into parts in the particular ways that they are. But the theory of variable embodiments leaves unanswered several central questions concerning the nature of variable embodiments, their principles and their manifestations (see also notes 5 and 6 for comments to this effect).

(p.86) Let's think first about the principles of variable embodiment themselves. We know that they are principles or functions (in a neutral sense) from times to objects. But what are these principles and how is it that each object has such a principle associated with it? Some of Fine's remarks towards the end of the paper suggest that the answer to this question might ultimately refer back to us, if the intensional components of embodiments are to be thought of as being of a conceptual nature and commitment to them is not “ultimate” (but see the remarks on Fine's “method of postulation” in note 9). I take it, however, that these remarks are not intended to touch on the ontological status of the principles themselves, only perhaps on the mechanism by which specific principles are selected in particular contexts.

The principles which play the role of associating each variable embodiment with its current manifestation cannot be thought of along the lines of Aristotelian forms, at least as long as these are conceived of as *universals*. For variable embodiments are identical just in case their principles of variable embodiment are identical. Thus, no two distinct variable embodiments can have the same principle; but this is precisely not what Aristotelian forms, as universals, are like: all members of the same species, according to this conception, have the same form. (See Fine 1994c for discussion of some puzzles which arise in connection with the Aristotelian conception of matter and form.)

Thus, the principles of variable embodiment may be likened more plausibly to Aristotelian forms, thought of as *individuals*, perhaps something along the lines of *individual essences*. The essences in question must be so specific that they select exactly one current manifestation (barring issues of vagueness) for each time at which the variable embodiment exists. If we think of individual essences as collections of properties, one wonders what collection of properties, short of haecceities, could be sufficiently specific to do this job; certainly, such non-trivial essential properties as those concerning origin will not be nearly fine-grained enough.

Moreover, think again in this context of the “monster objects” to which Fine's theory gives rise. To illustrate, consider a function, f, which selects an object with roughly the persistence conditions of what we ordinarily refer to as a car. Suppose further the car in question comes into existence in the year 1957 and goes out of existence in the year 2000; then, f is not defined before 1957 and after 2000. However, given the never-ending supply of principles from times to objects, there are of course other principles, g_1,. . .,g_n, which agree with f in their 1957-to-2000 portion but which are defined before the year 1957 or after the year 2000; these principles, g_1,. . .,g_n, combine their 1957-to-2000 car-portion with all sorts of other objects (umbrellas, sunflowers, rain drops, what have you) in every way imaginable. If the principles of variable embodiment are thought of as individual essences, then each of these principles, g_1,. . .,g_n, counts as the individual essence of some object; in fact, in general, since no restrictions have been placed on which principles (from times to objects) are **(p.87)** “suitable” for selecting objects, *every* such principle which takes times to objects, as far as we know, is the individual essence of some object. I take it that this outcome would make most essentialists uncomfortable.

My second comment concerns the nature of the connection between a variable embodiment, its principle and its manifestations. We know that the relation between a variable embodiment and its manifestations is that of temporary parthood; we know furthermore that the relation between a principle of variable embodiment and a manifestation at a time is something resembling function application. But what is the relation between a variable embodiment and its principle? The variable embodiment presumably is not *identical* to its principle, since this principle is something like a function, i.e., an abstract object, and variable embodiments are (often) material objects. A natural candidate for the relation that holds between a variable embodiment and its principle is of course that of *timeless parthood*. But, in that case, we face the analogue of the worry raised already in note 6 for manifestations and temporary parthood: if a variable embodiment has its principle as a *proper* timeless part, then what are its other, non-overlapping proper timeless parts? According to Simons' Weak Supplementation Principle, an object cannot have just a single proper part; every object that has a proper part must have at least another proper part disjoint from the first. If, on the other hand, the principle is a timeless part of the variable embodiment, but not a proper part, then (assuming WSP holds) it is identical to the variable embodiment and we are back to the worry that material objects have been identified with abstract principles. Finally, if the relation between a variable embodiment and its principle is neither that of identity nor that of timeless parthood, then the nature of this relation has been left mysterious by the theory. In that case, however, Fine's goal of providing a “theory of the general nature of material things” has not been met in a crucial way, as long as we are left in the dark on this question. The worry is, of course,

that the theory might at this point be forced to appeal to yet another primitive, *sui generis* relation of composition.

As a matter of fact, although this is not explicitly stated in Fine (1999), Fine's position is that each variable embodiment has both its principle as a *proper timeless part* and its current manifestation as a *proper temporary part*. Fine opts to resolve the dilemma just raised by rejecting the Weak Supplementation Principle; this rejection, in his view, is in any case independently motivated. Consider, for example, a domain of time intervals which are not to be thought of as composed of instants. Now, a particular closed interval, T, may be a proper part of an open interval of time, T′, without there being at least one further interval that is both a proper part of T′ and disjoint from T. In Fine's view, even when WSP is satisfied, the question of what the whole is over and above the parts remains: this mystery is not resolved by pointing to additional parts; rather, it is addressed only by means of elucidating the particular relation of composition at work in the context at hand. The work of elucidating a particular composition relation is accomplished by providing a system of postulates, of the kind Fine develops for **(p.88)** rigid and variable embodiments. This latter point can be illustrated by means of the following set-theoretic example. Assume for the moment that the members of a set are, at least in some sense, part of the set (even though this assumption is of course not beyond challenge and contradicts, for example, assumptions made in Lewis 1991). Now consider the relation between Socrates and his singleton set. In this case, WSP is not satisfied: the singleton set containing nothing but Socrates is distinct from its only proper part, Socrates; but it has no other proper parts, disjoint from Socrates. If we now consider instead a set containing as members two sets, Socrates' singleton set and any other set, the presence of the additional proper part, in Fine's view, in no way makes it easier to understand the original mystery, namely how a whole—in this case, a set—is related to its proper parts, even though WSP is satisfied in the latter case. Examples of this kind illustrate why Fine believes that his rejection of WSP as a necessary constituent of any genuine parthood relation is independently justified.

§IV.4.4 The Formal Properties of Parthood

Among the attractive features of Fine's theory of embodiment are (i) its wide applicability across the domain of both material and abstract objects; as well as (ii) its “sparse” and hierarchical conception of parthood. To illustrate, Fine's notion of rigid embodiment is tailored to apply not only to material objects such as ham sandwiches, but also to acts such as Oswald's killing of Kennedy, and to abstract objects such as the “law of the land”. For example, Oswald's killing of Kennedy is analyzed as Oswald's act of shooting the gun (its objectual component) under the description of causing Kennedy's death (its intensional component); the “law of the land”, on the other hand, is analyzed as a variable embodiment whose manifestations are different bodies of law.

The “sparseness” and hierarchical nature of parthood, on Fine's model, can be brought out by considering the resemblance parthood bears to the relation of *set membership*, rather than to the *subset* relation, to which it is traditionally likened (Fine 1999, p. 72). Thus, embodiments are viewed by Fine as “sparsely” and hierarchically structured objects which may be composed of further “sparsely” and hierarchically structured objects. At each level in the hierarchy, an object's division into parts is prescribed by the particular intensional component that is operative at that level, with the result that not every arbitrary way of dividing up an embodiment results in a division into *parts*.

Given this hierarchical and “sparse” conception of parthood, Fine's model allows for an attractive distinction between parts in a *vertical* sense and parts in a *horizontal* sense. Consider, for example, a tree and the wood (and other biological substances) of which it is composed. The tree has as its immediate, horizontal (temporary) parts its trunk, branches, leaves, etc.; the (variable quantity of) wood, on the other hand, has as its immediate, horizontal (temporary) parts the cellulose molecules of which it is composed at each time at which it exists, but not the **(p.89)** more highly structured parts of which the tree consists. In the non-immediate, vertical sense, however, the parts of the wood are also parts of the tree. This situation is to be compared, for example, to the set-theoretic analogue of {a, b, c, d} and {{a, b}, {c, d}}: even though the two sets, in some sense, are built up out of the same basic constituents, the latter is more highly structured than the former and the two do not coincide in their part structure (assuming, again, that the members of a set are, in some sense, parts of it).[10]

While I take the “sparse” and hierarchical nature of Fine's notion of parthood as well as its wide applicability across diverse ontological domains to be attractive features of his theory, there is I think a legitimate worry as to whether this theory preserves to a sufficient extent the formal properties that have at least a strong claim to being considered constitutive of any genuine relation of parthood. We have seen already that, despite the fact that Fine accepts unrestricted transitivity for each parthood relation individually, due to the proliferation of distinct parthood relation, transitivity *across* the different notions of parthood cannot in general be presupposed but must be reconstructed, where it holds at all, by means of separate postulates. Moreover, we have also observed that Fine's theory leads to the rejection of the Weak Supplementation Principle, which has at least a plausible claim at being a mark of any genuine relation of parthood and which forms the distinctive formal core of Simons' most minimal mereology. Thus, in addition to the methodological and ontological worries I have raised in the preceding sections, Fine's theory might legitimately make us wonder why its so-called relations of parthood and composition should in fact be considered to be genuinely mereological at all, given their formal profile.

§IV.5 Concluding Remarks

Given the methodological and ontological consequences of Fine's theory of embodiments, the question thus arises as to whether such commitments are in fact needed to accomplish the tasks Fine sets himself: to give an analysis of the "general nature of material things", which answers the question of why material things are divided into parts in the particular ways that they are. Unless one is already accustomed to the outlook of standard mereology, it is not obvious that the theory of rigid embodiments is really required for an analysis of *material* objects (as opposed to, say, abstract objects which have their parts essentially), since the objects of our scientifically informed common-sense ontology (even, **(p.90)** arguably, such things as ham sandwiches, flower bouquets, suits, and nuts) generally seem to be capable of surviving the gain and loss of parts. Whether there are material objects (such as, possibly, very small subatomic particles) which are counterexamples to this claim is, I take it, an empirical question; and even if there turn out to be such objects, it is not clear that their analysis requires the introduction of an additional timeless notion of parthood into the domain of material objects, since such objects otherwise exist in time and may be capable of persisting through changes with respect to some of their remaining characteristics; thus, using the same, time-relative notion of parthood that applies to such objects as trees, which can change their parts over time, we may simply say of these mereologically inflexible objects that they must have the same parts at all times at which they exist.

Thus, from the point of view of those not yet in the grip of the mereological rigidity of traditional sums, it would seem that the material world in general is composed, in the terminology of Fine's theory, of variable embodiments, which are in turn hierarchically composed of further variable embodiments. But in order to reflect an object's ability to survive change of parts over time, all that is required is that the part relation be relativized to time, just as property instantiation in general (according to the three-dimensionalist picture) is relativized to time. Thus, the only consideration so far which seems to favor Fine's theory of variable embodiments over standard alternatives is its widely applicable "sparse" and hierarchical conception of parthood, which allows for a response to the "monster objection" by taking into account not only the spatio-temporal proximity of an object's parts but also their *arrangement*. But we have encountered reasons to be doubtful of the success of this alternative conception of parthood. For we have seen that Fine's theory gives rise, first, to a proliferation of primitive *sui generis* relations of parthood and composition, whose characteristics must be imposed on them stipulatively by means of distinct systems of postulates, tailored to different domains of objects. Secondly, we noted that, given its "superabundance" of objects, Fine's theory is committed to its very own population of "monsters". Thirdly, once rigid embodiments are abandoned, the neo-Aristotelian flavor of Fine's theory is preserved only at the cost of abandoning the Weak Supplementation Principle. This, along with the

other formal properties of Fine's system, makes us wonder why one should consider the primitive, *sui generis* operations introduced by Fine's theory to be genuinely mereological at all. In sum, there are thus good reasons to look for an alternative analysis of material objects which preserves the neo-Aristotelian flavor of Fine's embodiments, but avoids their methodological and ontological excesses.[11]

Notes:

(1) I add the brackets merely as a device of notational convenience, not to be confused with the notation used for ordered pairs.

(2) About the character of rigid embodiments, i.e., the properties they have and how these properties are related to those of their constituents, nothing of a general nature can be said, according to Fine. In contrast, the earlier theory of "qua-objects" proposed in Fine (1982) contained a principle to this effect called the "Inheritance Principle", according to which a qua-object inherits a certain class of properties (the so-called "normal" properties) from its objectual component (see Koslicki 2004a and 2005a for criticisms of Fine's "Inheritance Principle").

(3) By (R2), the location *in space* of a rigid embodiment still retains the "aggregative" character of standard mereological sums, since the objectual components of a rigid embodiment may of course occupy non-overlapping regions of space. However, its location *in time* is required to be *conjunctive* by force of (R1): I take it that the property or relation component, R, can only hold of the objectual components, a, b, c, . . . , at t, if all of a, b, c, . . . , *exist* at t.

(4) Professor Fine has assured me (personal communication, October 9, 2003) that this was his intention. All of my comments in what follows that go beyond what Fine explicitly says in his written work are based on his verbal remarks on this occasion; I hope that I have represented his views with accuracy.

(5) Unlike the theory of rigid embodiments, the theory of variable embodiments does not explicitly state that the intensional component of an object, its principle of variable embodiment, is a genuine *part* of the object; Fine accepts, however, that this is the case (p.c.). The intensional component of a variable embodiment cannot be a part of the variable embodiment in the same sense of "parthood" as that which applies to its manifestations, since these are *temporary* parts of the variable embodiment. It is therefore a *timeless* part of the variable embodiment; to state this explicitly, the theory would need to be supplemented with a postulate corresponding to postulate (R5) from the theory of rigid embodiments. Unless a postulate to this effect is added to the theory, the nature of the relation which holds between a variable embodiment and its principle remains mysterious, since it would otherwise make no pronouncements as to how each such object has its very own principle "attached" to it.

(6) Is the manifestation, f_t, selected by F at t a *proper* temporary part of the variable embodiment, /F/? If so, we may wonder, what (if any) are its *other*, non-overlapping, proper temporary parts? (I am appealing here to Simons' Weak Supplementation Principle, which in Simons' view is constitutive of the notion of parthood; this principle states that nothing can have just a single proper part (excluding the overlapping ones); for any proper part of a whole, there must be at least one other, non-overlapping proper part that makes up the remainder of the whole.) The variable embodiment, /F/, cannot be *identical* to its manifestation, f_t, at t, since this would turn numerical identity into a temporalized relation. What exactly, then, is the object to which the variable embodiment, /F/, is identical at each time at which it exists? In the case of rigid embodiments, the theory explicitly answers this question: a rigid embodiment is an object which is composed, by means of the primitive *sui generis* relation, “/”, out of other objects, along with an intensional component; the objectual components are arranged in the manner required by the intensional component; the intensional component is itself a genuine part of the resulting composite object; the object in question has its parts timelessly. But the nature of variable embodiments is not settled to the same extent by Fine's theory as that of rigid embodiments. (See also note 5 for a similar complaint; we will return to these issues below.)

(7) Presumably, a principle of this sort does not apply to rigid embodiments, because what a rigid embodiment is like at each time at which it exists depends not only on what each of its objectual components is like individually at that time, but also on how the objectual and the intensional components interact when combined; and about this (so Fine seems to think) nothing general can be said beyond the fact that the objectual components must instantiate R (Postulate (R1)). For example, even though having a temperature of 100°F presumably counts as a “pro tem property” of an object, one cannot infer from the fact that an objectual component, a, has this property that the rigid embodiment, <a, b, c, . . ./R> it helps to compose also has this property; for its other objectual components, b, c, . . . , may have different temperatures, so that it would be wrong to say the rigid embodiment as a whole has the temperature 100°F.

(8) Fine doesn't actually say in writing which principles of standard mereology he presupposes. Since, as will become clear shortly, he rejects the Weak Supplementation Principle, the version of standard mereology accepted by Fine must be exceedingly weak: for, as we saw in Chapter I, WSP is entailed by the full-strength version of CEM; but both WSP and the Proper Parts Principle (PPP) are also already entailed by the Strong Supplementation Principle (SSP), which results in a system much weaker than full-strength CEM, since it doesn't make provisions for the conditional or unconditional existence of arbitrary products and sums. Presumably, Fine accepts Unrestricted Composition for *his own* relations of composition; i.e., those governing the formation of rigid and variable embodiments. But since these relations of composition have placed upon them a

system of postulates, composition in the sense of embodiment of course only takes places when these postulates are satisfied. Uniqueness of Composition would seem to be inert in the case of Fine's *sui generis* relations; for while we have a superabundance of coinciding objects which occupy the same region of space-time, quite possibly in *every* possible world, I presume that even these necessary coincidents would not share the same part-structure. Arbitrary sums, according to the standard conception, on the other hand, can be taken to be *postulated* entities (according to the "method of postulation" mentioned in note 9); and while Fine would presumably not be opposed to the existence of arbitrary sums in the standard sense, as such, when conceived of in this way as postulated entities, I assume that he would insist that none of these mereological sums in the standard sense serve to represent ordinary material objects.

(9) Current work by Fine on postulation may help address the worries raised in the last two sections concerning the proliferation of primitive *sui generis* relations as well as the superabundance of objects. According to Fine's "method of postulation", what there is (in the unrestricted sense) is relative to postulation. Postulation is a means of extending one's ontology, but it is not a method by which objects are merely "created"; it is an interpretative act, by which existing quantifiers are interpreted as ranging over new objects. Only some relations can be used for the postulation of objects; relations which are legitimate for this purpose satisfy certain constraints. Some of these constraints are general, others are specific to particular domains. For example, within the confines of set theory, set formation is an acceptable method of postulating objects; but this operation must satisfy the following formal constraints: (i) extensionality: one cannot postulate a set that is distinct from and has the same members as an already existing set; (ii) new set-theoretic objects may only be postulated on the basis of already existing objects, but not vice versa; and (iii) any object which has a member must be taken to be a set. While Fine's "method of postulation" may indeed make the proliferation of objects and relations less burdensome, it also appears to lead to a certain form of ontological relativism. (Fine's remarks concerning the "conceptual" nature of intensional components and the non-ultimate commitment to the resulting compounds already foreshadow a certain skeptical attitude to ontology; moreover, further evidence for this development can be gleaned from Fine 2001.) For those of us who are not attracted to relativism in ontology, Fine's "method of postulation" therefore provides little comfort. Instead of letting a zillion entities bloom and then dealing with this fantastic multiplicity by invoking a relativistic stance, the absolutist is best served by opting for a different strategy from the outset, which prevents the proliferation of objects and relations from even getting off the ground.

(10) The analogy with set theory is, in Fine's view, only that, an analogy. Sets are not rigid embodiments; rather, they are governed by their own *sui generis* relation of composition, associated with its own relation of parthood. Fine does not believe that the membership relation can be defined in terms of parthood;

rather, if anything, the direction of analysis is reversed: parthood for set-theoretic objects can be defined as the ancestral of the membership relation.

(11) The contents of this chapter have appeared in print as part of Koslicki (2007) and are followed by brief responses to some of my criticisms by Professor Fine.