

Multiple Constitution*

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comments and suggestions are still very welcome!

1 Introduction

The Problem of the Many (henceforth **PM**) presents a serious threat to the coherence of our ordinary conceptual scheme. The problem is that a contradiction follows from seemingly innocuous premisses, all motivated from within that scheme. In this paper I outline a novel solution to **PM** according to which objects can be simultaneously constituted by many collections of particles. I show that this is incompatible with the view that objects are fusions of particles and, on that basis, suggest a diagnosis of **PM** as symptomatic of an overemphasis on mereology in contemporary ontology. To support my solution to **PM**, I develop a non-mereological, broadly Aristotelian conception of objects that implies it. On this view, objects are fundamentally subjects of change: facts about the changes an object can survive are explanatorily prior to facts about its constituents. From this perspective, **PM** arises and objects are multiply constituted because the changes that objects survive are too coarse-grained to distinguish between many different collections of particles at a time. Because this view about objects implies my solution to **PM**, the result of combining them is a theoretically unified whole, not merely an unoccupied point in logical space.

§2 begins with some terminology. §3 outlines **PM**, an adequacy condition on candidate solutions, and my proposed solution. §4 outlines my Aristotelian conception of objects and uses it to argue for my solution to **PM**. §5 develops the view further in response to some objections and discusses the connection with mereology.

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2 Constitution

Ordinary objects, the most familiar inhabitants of the macroscopic world, are made out of other things.¹ Statues are made out of clay, houses are made out of bricks, and humans are made out of organs, which are made out of tissue, which is made out of cells, which are made out of particles. My primary concern will be the sense in which one object is made out of many particles. Let us regiment this by saying that objects are *constituted* by (many) particles. And if x is one of the particles that constitute y , say that x *partially constitutes* y .

Two questions arise. Firstly, are there any most fundamental particles, or might there be an infinite series of levels of increasingly fundamental particles, with the inhabitants of each level made out of those in the next? One can avoid taking a stand on this issue by selecting some level to serve as fundamental relative to the present discussion, and restricting one's quantifiers over particles to inhabitants of this level. Secondly, might material reality's ultimate constituents not be individual particles but, say, regions of spacetime or the denotations of mass-nouns? One can avoid taking a stand on this issue too. Even if particles are not ontologically basic, discourse about them is surely legitimate: not all meaningful discourse, or even all metaphysical disputes, need be conducted in absolutely fundamental terms.² So one can employ constitutional vocabulary whilst remaining neutral about whether one's discussion is couched at an ontologically basic level. Alternatively, subsequent talk about particles can be understood as a placeholder for talk about reality's ultimate material constituents, whatever they turn out to be; my discussion should be reformulable in terms of such basic entities without significant loss.

I am using 'constitution' to express a binary relation between many particles and a single object. I therefore require the now standard apparatus of plural quantification and reference brought to prominence by George Boolos.³ On this view, a plural term denotes not one plural individual, but one or more of those individuals over which our singular nominal quantifiers range, and likewise *mutatis mutandis* for plural variables. When α is a singular term/variable, $\ulcorner \alpha\alpha \urcorner$ and $\ulcorner \text{the } \alpha\text{s} \urcorner$ will serve as plural terms/variables. I will also make liberal use of talk about collections; despite being syntactically singular, this should be understood as semantically plural talk about the elements of those collections.

Typically, some particles constitute an object without any one of them constituting that object. So the constitution relation is *collective* in its plural argument position. In this respect, constituting an object is akin to writing a book or being

¹ Although this leaves the extension of 'ordinary object' imprecise, the idea is clear enough for present purposes. Throughout, 'object' is reserved for ordinary objects; 'entity', 'individual' etc. are used more inclusively, for any potential value of a nominal variable.

² On one view, fundamentality is a property of entities. On this view, fundamental ontology concerns only some of what exists. On another view, fundamentality is a property of representations. On this view, fundamental ontology ignores topics not formulable using fundamental vocabulary. Why should ontologists limit their interests in either of these ways?

³ (Boolos, 1984). A useful overview is (Linnebo, 2010).

arranged in a circle: in this collective sense, Russell did not write *Principia* and Whitehead did not write *Principia*, even though Russell and Whitehead together wrote *Principia*; likewise, some chairs can be arranged in a circle without any one of those chairs being arranged in a circle.

Objects are typically constituted by different particles at different times. So constitution should be relativised to a time. Temporal relativisation will, however, often be omitted for simplicity.

The constitution relation between particles and objects is less general than our ordinary notion of “being made out of” in at least three respects:

1. A statue can be made out of (some) clay, or a cat out of (some) feline tissue. So a fully general constitution relation should be able to connect the denotation of a mass-noun to an object. Adequate treatment of this case requires more detailed investigation of the semantics and metaphysics of mass-nouns than is appropriate here. So I ignore it henceforth.
2. A jumper can be made out of a single woolen thread, or a statue out of a piece of clay. So a fully general constitution relation should be able to connect an object to another object. This kind of case raises too many complexities and controversies to be considered here. Even the formal of properties of object-object constitution — e.g. transitivity and asymmetry — are controversial.⁴ So I ignore it henceforth.
3. A house can be made out of many bricks, or an organism out of many cells. So a fully general constitution relation should be able to connect many objects to another object. Given the following plausible principle, I can harmlessly ignore this case in the sequel:
 - Some objects xx constitute an object y iff y is constituted by the collection of particles z such that: z partially constitutes something amongst xx .

My primary concern is not a fully general notion of “being made out of”, but just the sense in which objects are made out of many particles. Some restriction in scope is needed to reduce complexity, simplify exposition, and allow for detailed discussion within a single paper. The restrictions introduced here will hopefully not generate distortions later.

The logical and terminological preliminaries are now complete. Let us continue to **PM**.

⁴ Even if, say, the thread-jumper relation appears asymmetric (transitive), it may be a restriction (resp. the ancestral) of an underlying symmetric (resp. non-transitive) relation.

3 The Problem of the Many

Contemporary discussion of **PM** was initiated by Peter Unger.⁵ I focus throughout on one representative instance of **PM** concerning Tibbles the cat. The problem is that the following are jointly inconsistent:

Solitude Tibbles is the one and only cat on his mat.

Abundance Many collections of particles on Tibbles' mat are equally good, and good enough, candidates to constitute cats.

Equality If many collections of particles are equally good, and good enough, candidates to constitute cats, then each of those collections constitutes a cat.

Unique Constitution (UC) No cat is constituted by more than one collection of particles.⁶

Abundance, **Equality** and **UC** jointly imply that many cats are on Tibbles' mat, contrary to **Solitude**.^{7, 8} Something has to give. But what?

Solitude seems innocuous: surely there often is just one cat on a given mat. **Abundance** holds because Tibbles' boundary, like that of any other typical cat, is indeterminate. Suppose one collection of particles is a better candidate to constitute a cat than any other. Then that collection and no other does constitute a cat: the best candidate wins. So Tibbles' boundary is that of this privileged collection, and therefore not indeterminate. Since Tibbles' boundary is indeterminate, the supposition is false and **Abundance** is true. **Equality** holds because one way for the *x*s to be better candidates to constitute a cat than the *y*s is for the *x*s but not the *y*s to constitute a cat. Finally, **UC** is a natural assumption about constitution: how could different collections of particles simultaneously constitute the same cat? Because these motivations turn on no peculiarity of Tibbles or of cats, the problem generalises to all ordinary material objects, including ourselves. And because these motivations flow from our ordinary conception of cats, **PM** presents a serious threat to our ordinary conceptions of macroscopic reality and our own place within it. Something has gone badly wrong.⁹

⁵ (Unger, 1980)

⁶ As stated, **UC** is false. Suppose some *F*-particles constitute Tibbles, and that each *F*-particle comprises two *G*-particles. Then Tibbles is also constituted by the *G*-particles which comprise the relevant *F*-particles, *contra UC*. So the quantifier over particles in **UC** should be restricted to either (i) absolutely fundamental particles (if such there be), or (ii) the elements of some relatively fundamental decomposition of reality into non-overlapping particles. These qualifications are left tacit in the sequel. See also §2.

⁷ Note that since "a" candidate collection is not one plural individual but many particles, **PM** cannot be resolved by, e.g., restricting fusion. **PM** does not presuppose a plenitudinous ontology.

⁸ Does **PM** require the additional assumption that a cat is located where its constituent particles are located? No. Drop the qualifier 'on his mat' from **Solitude** and suppose Tibbles is the only cat ever to exist. This affects neither the coming motivations for **Solitude**–**UC**, nor their mutual inconsistency.

⁹ Unger originally accepted the incoherence of our ordinary conceptual scheme (Unger, 1980). His most recent discussion of **PM** concludes that we are not material objects, but simple immaterial souls

Although several responses to **PM** already exist, none is entirely satisfactory.¹⁰ Rather than evaluate these proposals in detail, I want to explore an unjustly neglected alternative. More options are needed, and my goal is to outline one such so that it can stand for evaluation alongside the competition. In doing so, I hope to reveal that the range of available positions is wider than is often assumed, and to thereby help alleviate (or at least expose) a metaphysical myopia afflicting much contemporary thinking about objects and constitution. To take one example, symptomatic of this myopia, variants of my solution are absent from Brian Weatherston's (otherwise excellent) *Stanford Encyclopedia* survey article on **PM**.¹¹ This affliction is identified and discussed in §5.5.

The lesson I want to draw from **PM** is that we should reject **UC** and endorse:

Multiple Constitution (MC) A cat can be constituted by more than one collection of particles at a time. In particular, when many such collections have equally good, and good enough, claim to constitute a cat c , then each of those collections does constitute c .¹²

On this view, many different collections of particles can simultaneously constitute a single object.¹³ Suppose that a particular hair h is Tibbles' only borderline part. Let the T^+ s be the particles that constitute Tibbles taken as including h ; let the T^- s be those that constitute Tibbles taken as excluding h . In this context, **MC** amounts to:

- Both the T^+ s and the T^- s constitute Tibbles.

I will examine this response to **PM** in the remainder, leaving the simplifying supposition about h in force throughout.

It is worth emphasising an adequacy condition on solutions to **PM**: an adequate solution should comprise a theoretically unified whole. We should aspire to more than a mere technical fix or ad-hoc collection of theses unified only by their role in blocking **PM**. Every solution will reject one of **Solitude–UC**. But an adequate

for which **PM** cannot arise (Unger, 2006a, ch.7). See also (Unger, 1979a), (Unger, 1979b), (Unger, 1979c), (Unger, 2004).

¹⁰ Perhaps the most popular solution to **PM** is (Lewis, 1993). Criticisms of Lewis have concerned: *de re* thought (McGee and McLaughlin, 2000); self-reference (Hawthorne, 2006a); freewill and our capacity to make genuine choices (Hudson, 2001) (Unger, 2006a, ch.7); quantified claims about indeterminacy (Sattig, 2010, §7.2). For alternative proposals, see (Quine, 1981b), (van Inwagen, 1990, ch.17), (Johnston, 1992), (Lowe, 1995), (Markosian, 1998), (Hudson, 2001), and (Sattig, 2010).

¹¹ (Weatherston, 2009)

¹² See note 6 on **UC**.

¹³ Distinguish **MC** from: a cat is constituted only by the plural union uu of candidate collections. This view says that exactly one collection of particles constitutes Tibbles, whereas **MC** says that many do. But if only uu constitute Tibbles, then the other collections are not equally good candidates, contrary to **Abundance**. **MC** does not even imply that uu do constitute Tibbles. This is a good thing; for there is no *a priori* guarantee that every union of (largely overlapping) candidate collections is a candidate collection. (Although the union of the T^+ s and the T^- s— i.e. the T^+ s themselves — is a candidate collection, there is no *a priori* guarantee that the same holds in every case.) The underlying logical point is that $R(xx, z) \wedge R(yy, z)$ does not imply $R(xx \cup yy, z)$.

solution will explain why we should reject one principle rather than another. That explanation should emerge naturally from a background conception of objects and constitution. Compare the set-theoretic paradoxes: a consistent modification of naïve set-theory provides an adequate solution to the paradoxes only if motivated by a background conception of set, as ZF is motivated by stage-theory.¹⁴ §4 outlines an appropriate conception of object and argues from it to **MC**. My proposal therefore satisfies this adequacy condition and provides a theoretically unified solution to **PM**.

Neglect of this adequacy condition has led some astray. W.V.O. Quine and Ned Markosian reject **Abundance**.¹⁵ Quine connects realism with Bivalence, and Bivalence with determinacy, including determinacy in constitution. He concludes that realists must reject **Abundance**. But since one can consistently retain Bivalence and constitutional determinacy by rejecting **Solitude**, **Equality** or **UC**, Quine's proposal is disunified. Markosian denies that there is a finite non-trivial account of the conditions under which a collection has a fusion. This allows him to claim that just one collection of particles on Tibbles' mat have a fusion, and thereby a better claim to constitute a cat than any other such collection. But since his view about fusion is consistent with the negations of **Solitude**, **Equality** and **UC**, Markosian's proposal is disunified. Indeed, I know of no extant solution to **PM** that satisfies this adequacy condition.¹⁶ This counts strongly in favour of my proposal.

The closest extant solution to **MC** is due to E.J. Lowe and Mark Johnston.¹⁷ I will focus on Lowe. Although Lowe explicitly rejects **MC**,¹⁸ his view is difficult to interpret. The best interpretation involves postulating equivocation on 'constitutes', with **UC** determinately true on one reading and **MC** determinately true on the other. Following Lewis, Lowe invokes the apparatus of supervaluation, positing many sharpenings of the natural object-language in which **PM** is couched.¹⁹ Supertruth (superfalsity) is defined as truth (falsity) on each sharpening. Determinate truth (falsity) is identified with supertruth (superfalsity). Indeterminacy thus becomes lack of supertruth-value. Lowe then claims that one individual on the mat is significantly more cat-like than any other: only this individual substance has, e.g., the history, persistence conditions and modal profile of a cat — everything else on the mat is a particle or mere aggregate thereof. 'Tibbles' refers to this individual on each sharpening, though it is indeterminate which particles constitute it. This is accommodated by a sense of 'constitutes' on which its extension varies across sharpenings: on each sharpening, one candidate counts as constituting Tibbles, different candidates on different sharpenings. In this sense: (i) **Solitude** and **UC** are

¹⁴ (Boolos, 1971)

¹⁵ Quine and Markosian may also be interpreted as rejecting **Equality**. Nothing above turns on this interpretative issue. (Quine, 1981b), (Markosian, 1998).

¹⁶ A possible exception is (Lewis, 1993), when set against the backdrop of Lewis' wider linguistic and metaphysical views.

¹⁷ (Lowe, 1995), (Johnston, 1992).

¹⁸ (Lowe, 1995, pp.180-181)

¹⁹ (Lewis, 1993)

determinately true; (ii) either **Abundance** or **Equality** is determinately false; (iii) it is indeterminate which particles constitute Tibbles. In another sense however, ‘constitutes’ goes with intrinsic character and is therefore invariant across sharpenings. Because the intrinsic differences between the candidates are irrelevant to their constituting cats, this delivers a sense in which each candidate counts as constituting Tibbles on each sharpening. So: (i) **UC** is determinately false, and **MC** determinately true; (ii) **Solitude**, **Abundance** and **Equality** are all determinately true; (iii) there is no indeterminacy in Tibbles’ constitution.²⁰ Lowe’s proposal is inadequate in two ways, which we can see by considering his guiding claim about there being a unique most cat-like individual on Tibbles’ mat. Firstly, since this is consistent with the negations of **Abundance**, **Equality** and **UC**, Lowe does not explain why we should reject one rather than another. Secondly, Lowe offers no account of why his guiding principle and **Solitude** hold. The next section develops a view that avoids both these problems, though which clearly belongs in the same tradition as Johnston and Lowe’s proposals.

4 A neo-Aristotelian conception of objects

My goal is a theoretically unified response to **PM**. This section proceeds by describing a conception of objects and constitution that justifies rejecting **UC** in favour of **MC**. The next section considers some objections.

4.1 The basic idea

My proposal is guided by the broadly, or neo-, Aristotelian idea that objects are fundamentally subjects of change. Call the changes that an object can survive its *characteristic changes*. The suggestion is that an object’s ultimate nature is given by its characteristic changes. This section elaborates this thesis.

One could develop this suggestion by invoking a *sui generis* four-place relation of ontological dependence: *x’s having F ontologically depends upon y’s having G*. The idea would then be that an object *o*’s having a contingent intrinsic, temporal or constitutional property *F* depends upon *o*’s having characteristic changes *G*.²¹ Given an appropriate notion of essence, this goes hand-in-hand the idea that an object’s core essence — that component of an object’s essence from which the rest of its essence flows — is its characteristic changes.²²

Essence and dependence provide useful and picturesque heuristics with which to introduce my view. It is, however, doubtful whether our grasp of these notions

²⁰ Why does Lowe need both senses of ‘constitutes’? Because as Lewis points out, stating the problem requires a sense in which the candidates are all equally good candidates to constitute a cat (Lewis, 1993, pp.173-4, 179-80).

²¹ This could be extended to modal, teleological, aesthetic, . . . properties, but that is not required to respond to **PM**.

²² See (Fine, 1994), (Fine, 1995b) for more on essence. (Fine, 1995a) connects essence with dependence.

is robust enough to provide a secure theoretical foundation. I therefore prefer to invoke a related, though hopefully clearer, notion of explanatory priority. The relevant notion of explanation is the kind of non-causal (conceptual?) explanation in which philosophers, and especially metaphysicians, routinely trade. In these terms, my proposal is that an object's contingent intrinsic, temporal and constitutional profile is explained by its characteristic changes, and not conversely. Importantly, these kinds of change need not be the sole explanatory factor; otherwise objects could have no contingent properties at all, given the plausible assumption that characteristic changes are non-contingent. An object's characteristic changes combine with the contingent distribution of matter and property- and relation-instances across spacetime to explain why the object's history (including its constitutional history) is as it is. An object thus has a particular history because of its characteristic changes.²³ I take it that this is a consequence of the claims about essence, dependence and fundamentality with which this section began.

Residual doubts about this notion of explanatory priority may be alleviated by noting that I will require only the following tractable consequences of this proposal. When an object o 's having an intrinsic, constitutional or temporal property F cannot be explained in terms of o 's characteristic changes (together with other contingent features of reality), o lacks F ; when such an explanation can be given, o has F . Likewise *mutatis mutandis* for universally generalised claims about such properties, like **UC**. §4.3 argues that **MC** can be explained in this manner and **UC** cannot, and hence that **MC** is true and **UC** false.

This is not a proposal about all material individuals, but only the paradigmatic sorts of ordinary object for which **PM** is problematic. The view is consistent with, e.g., portions of matter and aggregates of particles being subject to different orders of explanatory priority; in those cases, constitution plausibly explains characteristic change. This might naturally be labelled a difference in ontological category.

How does this help with **PM**? More detail follows, but an overview may be helpful. On my proposal, **PM** arises because Tibbles' characteristic changes are too coarse-grained to distinguish between the T^+ s and the T^- s in respect of their constituting Tibbles — those collections of particles are just too similar. Any candidate explanation in terms of Tibbles' characteristic changes for why the T^+ s constitute Tibbles also applies to the T^- s, yielding an explanation for why the T^- s constitute him. Likewise *mutatis mutandis* for an explanation of why the T^- s constitute Tibbles. At least one such explanation is correct: Tibbles is constituted by (at least) one of those collections of particles. But since Tibbles' characteristic changes cannot distinguish between these explanations, and it is in terms of those changes that Tibbles' constitution must be explained, it follows that both the T^+ s and the T^- s do constitute Tibbles. So **UC** is false and **MC** is true. The next section elaborates the view further. §4.3 applies it to **PM** in more detail.

²³ This is a key theme from the neo-Aristotelian view in (Wiggins, 2001, esp. chs.2–4).

4.2 Kinds and paths

This section develops my proposal by discussing the connection between an object's characteristic changes and kind.

A useful notion is that of an object's path through space and time. Paths and characteristic changes go hand-in-hand: each path p corresponds to a class of (types of) characteristic changes, namely those changes an object o would have to be able to survive in order for p to be o 's path. Natural and non-arbitrary paths correspond to natural and non-arbitrary classes of changes, while gruesome and gerrymandered paths correspond to gruesome and gerrymandered classes of changes.

Paths will be represented by classes of pairs $\langle r, t \rangle$ of regions r and times t . Path p passes through r at t iff $\langle r, t \rangle \in p$. In this primary sense of 'passes through', p can pass through r at t without passing through any proper subregion or superregion of r at t . Passing through is in this respect akin to exact occupation in the theory of location. Note however that an analogue of the following gloss on exact occupation is inappropriate here: x exactly occupies r at t iff x fills and fits within r at t . There are two reasons for this. The first reason is pragmatic: my solution to **PM** requires Tibbles' path to pass through several regions at a time, which conflicts with the gloss. The second reason is conceptual: my neo-Aristotelian proposal requires that constraints on paths be explicable via the characteristic changes of their occupants; no such explanation has yet been provided.

An object's characteristic changes and path are not arbitrary, they depend on what kind or sort of thing it is.²⁴ The characteristic changes of a cat differ from those of, say, a squid or a pencil. The relationship between kind and path can be understood in two ways. On one view, kind-classifications are notational variants on classifications by characteristic changes. On the other view, kind is a rich independent notion that determines an object's characteristic changes; this second view allows for kind-classifications more fine-grained than the first. Nothing that follows turns on which view is correct.

Each kind K privileges a class of paths appropriate to K s; call these the K -paths. The individual K s correspond one-one to K -paths: each K is associated with exactly one K -path, and each K -path is associated with exactly one K . What happens within an object's path at t determines its intrinsic properties and constitution at t . An object's path thus determines its history.

How does a kind K privilege a K -path? By being associated with a cross-time dyadic relation R_K on regions — represented below by a dyadic relation on $\langle r, t \rangle$ pairs — that satisfies:

$$(K=) \quad \forall r, r', t, t' [f_K(r, t) = f_K(r', t') \leftrightarrow R_K(\langle r, t \rangle, \langle r', t' \rangle)]$$

Here f_K is the (partial) function from regions r and times t to the K -path (if any) to which $\langle r, t \rangle$ belongs. Call R_K the *identity condition* for K . The formal properties of identity ensure that identity conditions are equivalence relations. So K -paths are

²⁴ This is a second key theme from (Wiggins, 2001). See note 23.

equivalence classes under R_K of $\langle r, t \rangle$ pairs. Identity conditions are discussed further in §5.2. In the meantime, it suffices to know that R_K codifies the characteristic changes of K s. Three brief comments follow.

First comment: although it is formally permissible, we should not identify K s with K -paths. Ordinary objects are not abstracta, logical constructions out of $\langle r, t \rangle$ pairs, or paths through space and time. Objects are the occupants of paths, the spatiotemporally located and causally efficacious loci of our interaction with concrete reality. Objects are thus unlike classes of $\langle r, t \rangle$ pairs.

Second comment: my proposal is independent of the epistemological and metaphysical picture associated with neo-Fregean approaches to the foundations of mathematics.^{25, 26} Principles like $(K=)$ play a key role in such approaches, where they are called “abstraction principles”. Within my proposal, a more appropriate label is Timothy Williamson’s: $(K=)$ is a two-level identity criterion.²⁷

Third comment: the explanatory primacy of paths undermines the most powerful objection to coincident entities, namely the grounding problem.²⁸ The problem is that coinciding objects are very similar — they are in the same place at the same time and constituted by the same particles — and yet not completely similar. A particularly pressing case arises when coincident objects have different futures. How is this possible, given their present similarity? Note first that the paths of different kinds of object are determined by different relations. There is no mystery about how relations can share some but not all relata. So there is no mystery about how a K -path and a K' -path can intersect and then later come apart. Since kinds and paths are explanatorily prior to history and constitution, it follows that there is no mystery about how objects of different kinds can coincide and then later not do so. This strategy will not extend to coincidence between objects of the same kind, a phenomenon that even prominent defenders of coincidence like David Wiggins reject.²⁹ It does, however, seem likely that intensional differences between the characteristic changes of K s and K' s can explain, e.g., modal differences between contingently permanently coincident K s and K' s. However, the ultimate viability of this strategy turns upon broader issues in the metaphysics of modality that cannot be discussed here.

²⁵ The classic neo-Fregean text is (Wright, 1983).

²⁶ This differentiates my proposal from a superficially similar one in (Simons, 2000), (Simons, 2008). Simons uses principles like $(K=)$ in which the quantifiers range over occurrents, to capture the supposed ontological dependence of continuants on occurrents. My proposal is silent about this putative dependence and Simons does not discuss **PM**.

²⁷ (Williamson, 1990, ch.9)

²⁸ (Bennett, 2004) gives a nice overview of the problem. A different problem is sometimes raised by asking how it is possible for objects to coincide without “crowding each other out”; an example is (Sider, 2001, pp.141, 154–5). I do not know whether my proposal addresses this because I do not understand the objection. One does not get a statue and lump of clay to coincide by pushing them together, but by making one from the other. Why should objects crowd each other out when one is made from the other?

²⁹ (Wiggins, 1968). For putative examples of same-kind coincidence, see (Fine, 2000).

4.3 Constitution, Solitude and Multiple Constitution

This section puts the conception of objects developed in the preceding two sections to work resolving **PM**.

The motivating thought behind my proposal is that objects are most fundamentally subjects of change, different kinds of change for different kinds of object. This manifests as the explanatory primacy of paths over constitution. How exactly does this explanation go? The natural suggestion is:

Path-Con Particles xx constitute object o at time t iff, for some region r , (i) o 's path p_o passes through r at t , and (ii) xx occupy r at t .

Occupation here is exact occupation: xx exactly occupy r iff xx both fill and fit within r . Exact occupation is collective: some particles can exactly occupy r without any particle amongst them exactly occupying r . The region that xx exactly occupy is the union of those regions occupied by things amongst xx (perhaps supplemented with a way of filling in any gaps).

General truths about constitution, like **UC** and **MC**, should be explicable via **Path-Con** together with facts about the characteristic changes of cats. This can be exploited to argue for **MC**.

One instance of (K=) is:

$$(\text{Cat}=) \quad \forall r, r', t, t' [f_C(r, t) = f_C(r', t') \leftrightarrow R_C(\langle r, t \rangle, \langle r', t' \rangle)]$$

Here, f_C is the (partial) function from regions r and times t to the cat-path (if any) that passes through r at t . R_C is the identity condition for cats; it codifies the characteristic changes of cats. Tibbles is the occupant of cat-path p_T , an equivalence class under R_C . So by **Path-Con**: some particles constitute Tibbles at t iff those particles occupy a region through which p_T passes at t . Let r^+ , r^- be the regions occupied by the T^+ s and the T^- s respectively at the present time t_n , when hair h is a borderline part of Tibbles. The goal is to show that both $\langle r^+, t_n \rangle$ and $\langle r^-, t_n \rangle$ belong to p_T .

Suppose that p_T passes through only one region at any time prior to t_n : before t_n , there is never more than one candidate to constitute Tibbles. This unrealistic supposition will be dropped shortly. Let t_e be an earlier time, say several months prior to t_n ; let r_e be the region through which p_T passes at t_e . The question is this: how should p_T be extended from t_e to t_n , in order for the result to be a cat-path?³⁰ The T^+ s and the T^- s are the only candidates to constitute Tibbles at t_n . So there are two candidate ways of extending p_T to t_n . One is to include $\langle r^+, t_n \rangle$ in p_T ; if this yields a cat-path, then the T^+ s constitute Tibbles at t_n . The other is to include $\langle r^-, t_n \rangle$ in p_T ; if this yields a cat-path, then the T^- s constitute Tibbles at t_n . I will now argue that both ways of extending p_T to t_n result in cat-paths, and hence that both the T^+ s and the T^- s constitute Tibbles at t_n . It follows that the relevant

³⁰ If Tibbles persists beyond t_n , then the result of extending p_T only so far as t_n will not be a cat-path, but a restriction of a cat-path. I ignore this complication henceforth.

instantiation of **MC** is true and **UC** is false. The argument turned on no specific features of Tibbles or of cat. So we can generalise to **MC**.

Since the T^+ s and the T^- s are equally good candidates to constitute cats, both ways of extending p_T to t_n are equally good candidates to yield cat-paths: both $\langle r^+, t_n \rangle$ and $\langle r^-, t_n \rangle$ are equally good candidates to bear R_C to $\langle r_e, t_e \rangle$.³¹ But if they are equally good candidates, then both or neither of those pairs bears R_C to $\langle r_e, t_e \rangle$. We know that at least one of them does, because we know that Tibbles' path passes through some region at t_n and r^+, r^- are the only candidates. So $\langle r^+, t_n \rangle$ and $\langle r^-, t_n \rangle$ both bear R_C to $\langle r_e, t_e \rangle$. Because R_C is an equivalence relation, it follows that those pairs all bear R_C to one another; they all belong to one and the same cat-path, namely p_T . So by **Path-Con**: both the T^+ s and the T^- s constitute Tibbles at t_n . So **UC** is false and **MC** is true. Furthermore, since cats correspond one-one with cat-paths and cat-paths are equivalence classes under R_C , it follows that **Solitude** is true. **Abundance** holds because the T^+ s and the T^- s do constitute cats. And (the relevant instantiation of) **Equality** holds because its consequent is true. My neo-Aristotelian conception of objects therefore vindicates my solution to **PM**.

The preceding argument assumed that there is only one candidate to constitute Tibbles at t_e , and hence that his path then passes through only one region. Let us relax this unrealistic assumption. The argument was underwritten by the following thought: the T^+ s and the T^- s are too similar (at t_n) for the relatively coarse-grained characteristic changes of cats to distinguish between them in respect of their constituting (at t_n) a cat that is in r_e at t_e . On my conception of objects, this amounts to: R_C cannot distinguish $\langle r^+, t_n \rangle$ from $\langle r^-, t_n \rangle$ in respect of bearing R_C to $\langle r_e, t_e \rangle$. This motivating thought is indifferent as to whether some other region r'_e , nearly coincident with r_e , is as good a candidate as r_e for having a cat-path pass through it at t_e . In other words: the argument is indifferent as to whether the particles in r'_e at t_e are also candidates to constitute Tibbles at t_e . A parallel argument thus concludes that $\langle r'_e, t_e \rangle$ also bears R_C to both $\langle r^+, t_n \rangle$ and $\langle r^-, t_n \rangle$. Since R_C is an equivalence relation, it then follows that $\langle r'_e, t_e \rangle$ also bears R_C to $\langle r_e, t_e \rangle$, and hence that those pairs belong to one and the same cat-path, namely p_T . So Tibbles is multiply constituted at t_e as well as at t_n . Since cats correspond one-one with cat-paths, there is no threat here to Tibbles' being the only cat on his mat at t_e .

Let n be the smallest number of candidates there ever are to constitute Tibbles. One might object that (Cat=) is consistent with the existence of n cat-paths, and hence also n cats, on Tibbles' mat. Notice that this objection does not threaten **MC**, but only **Solitude**; for whenever more than n candidates are on the mat, some of the n cats will be multiply constituted. The objection also relies on considering only the structural connections that (Cat=) imposes on cat-paths and R_C , neglecting the non-structural content of R_C itself. R_C codifies the characteristic changes of cats. In order for two cats to be on the mat at, say, t_n , R_C must distinguish $\langle r^+, t_n \rangle$ from $\langle r^-, t_n \rangle$ — those pairs must belong to different cat-paths. In that case, the charac-

³¹ This requires the reasonable assumption that no cat comes into existence at t_n : the changes that occur on Tibbles' mat are not the kind that bring cats into being.

teristic changes of cats distinguish between the T^+ s and the T^- s. But that is simply not plausible given how similar those candidates are at t_n . How could the characteristic changes of cats privilege just one of those collections as the constituter at t_n of the cat in r_e at t_e ? **PM** only arises if the determiners of cat-locations cannot make such fine-grained distinctions; otherwise **Abundance** would fail. This undermines the objection. My proposal grants that **Abundance** holds because the determiners of cat-locations are relatively coarse-grained. This coarse-grainedness is then put to work bundling up the many candidates into one cat. The very phenomenon that generates **PM** thereby provides the key to resolving it.

I have now shown that my neo-Aristotelian conception of objects implies my solution to **PM**. My proposal therefore satisfies the adequacy condition described in §3: it is a unified whole. The next section responds to some objections and develops the view further.

5 Objections and further developments

This section develops my proposal further in response to some objections.

5.1 Multiply located cats

On my proposal, Tibbles' path typically passes through many regions at a time, and associating objects with paths captures the most basic way in which objects are in space. Doesn't it follow that Tibbles is multiply located, that he is in many places at a single time? And isn't that impossible?

There are two objections here. The first is linguistic: ordinary English sentences like 'Tibbles is in only one place at a time' should be true, and my proposal makes them false. To make it stick, this objection must be supplemented; my proposal about the metaphysics of objects must be connected with the semantics of ordinary locational discourse. Two such semantic analyses are available, one of which defuses the objection

Let **LOC** be the following property:

- Region r has **LOC** at time t iff Tibbles' path passes through r at t .

Many regions have **LOC** at each time. Let $\text{LOC}_1, \text{LOC}_2, \dots$ be the properties obtainable by restricting the extension of **LOC** to a single region at each time. Regimenting English locational discourse using the two-place predicate 'x occupies r ', the two rival semantic analyses of the one-place predicate 'Tibbles occupies r ' are:

A1 At each time t , 'Tibbles occupies r ' is coextensive with **LOC**.

A2 At each time t , 'Tibbles occupies r ' is coextensive with LOC_n .

'Tibbles occupies no more than one region at a time' is false on **A1** and true on **A2**. The objection therefore succeeds if **A1** is true, and fails if **A2** is true. So, which view is correct?

On the one hand, *LOC* is more natural than any *LOC_i*.³² Insofar as assignments of natural semantic values provide better candidate interpretations than assignments of less natural values, **A1** is favourable to **A2**. On the other hand, **A1** makes many English sentences untrue that **A2** makes true. General principles like ‘Nothing occupies more than one place at a time’ provide one type of example. Another comes from sentences featuring definite descriptions of locations: **A1** but not **A2** makes ‘the place where Tibbles was sitting’ improper, and hence any sentence featuring it untrue. Insofar as assignments that make true more sentences that ordinary speakers by-and-large hold true provide better candidate interpretations than assignments that make true fewer such sentences, **A2** is favourable to **A1**.

These conflicting metasemantic pressures must be reconciled. We cannot settle this without more detail about meaning-determination. It does, however, seem plausible to weight truth-maximisation over naturalness here, and hence to favour **A2** over **A1**; in which case, the linguistic objection fails.

One might object to **A2** that selection of some *LOC_i* over any other *LOC_j* as the semantic value of ‘Tibbles occupies *r*’ would be arbitrary and unmotivated. This can be resisted in (at least) two ways. Firstly, the precise function from use to meaning is unknown, and possibly unknowable because we lack independent means of calibrating a method of testing hypotheses about it.³³ So it would be arbitrary and unmotivated to endorse an instantiation of **A2**. But it does not follow that instantiations of **A2** are arbitrary and unmotivated in any deeper sense incompatible with their truth, as opposed to their assertability. Secondly, we might accept that many different assignments of semantic value to ‘occupies’ fit our meaning-determining linguistic behaviour equally well, one such assignment for each *LOC_i*. The result will plausibly be indeterminacy in location-ascriptions; it will be indeterminate which instantiation of **A2** is true.³⁴ Given **A2**, my proposal therefore explains indeterminacy in ordinary locational discourse.

The second version of this multiple-location objection is metaphysical: the *location* relation should hold between Tibbles and one region at a time, whereas Tibbles’ path passes through many regions at a time. The response to the linguistic objection weakens this metaphysical objection by accommodating the linguistic evidence for it. And although my proposal does require some re-conceptualisation of our intuitive picture of how objects are in space, the many regions through which Tibbles’ path passes at a time differ by less than the contextually salient threshold for relevance to our ordinary practical and linguistic interests; that is why **Abundance** is not an unremarkable commonplace, but the source of a surprising puzzle. So this re-conceptualisation is consistent with our ordinary experience of objects and their locations, the primary data of metaphysics.

³² Natural in the sense of (Lewis, 1983).

³³ (Williamson, 1994, pp.205–9).

³⁴ The semantic upshot of this indeterminacy is a further issue I remain silent about here.

5.2 What is R_C ?

This section considers the following objection: I have not said enough about R_C to imbue my proposal with content. The objection might be strengthened by claiming I cannot say anything detailed, informative, and true about R_C , and hence that I cannot make my proposal substantive.

The objection fails. §4.3 showed that the explanatory primacy of paths and characteristic changes has non-trivial consequences. Furthermore, (Cat=) and **Path-Con** together impose non-trivial structural constraints on the paths and constitution of cats. But this is not purely structural content; for R_C codifies the characteristic changes of cats, that is, it holds between $\langle r, t \rangle$ and $\langle r', t' \rangle$ iff the characteristic changes of cats are as they would have to be in order for a cat in r at t to be in r' at t' . My proposal therefore has non-trivial structural and non-structural content.

The objection might be nuanced in response. The nuanced complaint is not that my proposal lacks content, but that since I have given no specific details about R_C and the characteristic changes of cats, my proposal is overly unspecific and indefinite. This nuanced objection comes in two varieties.

The first variety requires a finite non-trivial explicit definition of R_C . But there is no reason to expect, and I have said nothing to suggest, that the vocabulary of English or any other natural language will be rich enough to provide this. This expressive deficit is no threat to regarding the obtaining of R_C as a substantive and well-understood matter. Furthermore, the cats form a natural kind. On a broadly Putnamian or externalist view about the semantics of natural kinds, this undermines one (and perhaps the only) motivation for requiring an informative explicit definition of R_C ; for on such views, no explicit definition is needed to fix an extension for 'cat'.³⁵ One might respond that the cats do not form a natural kind. This response might itself be motivated by the absence of cats from fundamental physics. But that motivation is suspect: why should all natural kinds, or even all fundamental/basic kinds, appear within (or be definable in the language of) physics? We can (and in my view should) reject this impoverished form of physicalism and allow that the cats form a natural kind. Note also that rejecting this narrow physicalism does not commit me to immaterial substances: cats are concreta.

This response will not extend to objects of non-natural kinds, such as artefact kinds. Still, the objection may be resisted in a different way, by noting that our grasp of R_C is a largely practical matter, manifested in, e.g., our capacity to track cats through a diverse range of circumstances.³⁶ An argument from our grasping R_C to the possibility of our explicitly defining it therefore requires assimilating this practical capacity (knowledge-how) to propositional knowledge-that. This intellectualist view is highly controversial.³⁷ But without it, our grasping R_C is neutral regarding the possibility of our explicitly defining it. Until reason is given to expect

³⁵ (Wiggins, 2001, pp.7–12, 77–86)

³⁶ Here is a third theme of (Wiggins, 2001, pp.2, 3, 7, 18–20 and elsewhere). See notes 23–24.

³⁷ (Stanley and Williamson, 2001) defend this approach to knowledge-how; for discussion, see (Koethe, 2002), (Rumfitt, 2003), (Devitt, 2011).

such a definition, this first version of the nuanced objection is unmotivated.

The second version of the nuanced objection does not require an explicit definition of R_C . Only some general guidance about the characteristic changes of cats is required. This is readily provided. For example, cats survive through walking, pouncing, eating, and purring; they do not survive through squashing, burning, starvation and drowning. There is no threat here to regarding my gloss on R_C as substantive. So this objection also fails.

5.3 A Problem of the Many Paths?

Does **PM** recur at the level of cat-paths? This section argues that it does not.

One type of reason to think that **PM** recurs at the level of paths invokes higher-order vagueness, the putative phenomenon of borderline cases to the borderline cases. I will, however, set higher-order vagueness aside henceforth and assume a well-defined and determinate range of candidates to constitute Tibbles. There are two reasons for this. Firstly, although §3 justified **Abundance** by appealing to indeterminacy in Tibbles' boundaries, it is controversial whether this is the only such justification, and Unger himself denies that it is.³⁸ It is an open question whether **PM** ultimately involves vagueness, or whether vagueness-specific phenomena like higher-order indeterminacy, should be treated separately. Secondly, the existence and coherence of higher-order vagueness are both controversial.³⁹ It is also controversial whether higher-order vagueness can do the work of explaining seamless transition that motivates introducing it, even if it is coherent.⁴⁰ So even if higher-order vagueness is relevant to my discussion, serious work is required before it can bear argumentative weight here. Let us consider a different reason for thinking that a version of **PM** afflicts cat-paths.

Tibbles' path p_T includes both $\langle r^+, t_n \rangle$ and $\langle r^-, t_n \rangle$, where r^+ and r^- are the regions occupied now, at t_n , by the T^+ s and the T^- s respectively. Let p be the path that differs from p_T only by excluding $\langle r^+, t_n \rangle$. The similarity between the T^+ s and the T^- s that generates **PM** might also seem to imply that p is a cat-path, given that p_T is. Since the cats correspond one-one with cat-paths, it would then follow that two cats are on Tibbles' mat, and hence that my proposal does not solve **PM**, but merely relocates it. This section responds to this objection.

Luckily for me, p is not a cat-path. Cat-paths are equivalence classes under R_C . So cat-paths that share some members are coextensive. p and p_T share some members but are not coextensive. Since p_T is a cat-path — as was argued in §4.3 — it follows that p is not a cat-path. So the objection fails.

A variant problem arises. p is a path, and very similar to p_T . Since p_T is a K -path for some kind K of object — i.e. *cat* — doesn't it follow that p is too, though for some other kind K' ? Members of K' will be very similar to cats. Call them

³⁸ (Unger, 2006a, pp.369–70, 394–96, 468–69)

³⁹ An excellent recent discussion is (Wright, 2010)

⁴⁰ (Graff-Fara, 2003)

‘schmats’. Cats and schmats are so alike that motivations for **Solitude** should carry over to:

Schmolitude Tibbles is the one and only cat-or-schmat on his mat.

If schmats exist, then **PM** has only been relocated.

This variant problem is importantly different from the original one. This new problem concerns an abundance of hitherto unrecognised kinds of object, whereas **PM** concerns only an abundance of cats. **PM** arises because the T^+ s and the T^- s are so similar that they are equally good candidates to constitute cats. Do these same similarities also make them equally good candidates to satisfy ‘the x s constitute an object of some kind’ when the two corresponding existential claims must be witnessed by different kinds? Not obviously. Factors relevant to the existence of kinds may differ from those relevant to the existence of cats; indeed, they probably will. Belief in the existence of K s should go hand-in-hand with the utility of K s in systematising, explaining, and predicting the behaviour of external reality. Cats are undeniably important to this project; schmats are not. No systematic, explanatory or predictive utility comes from admitting a kind of object whose characteristic changes distinguish between the T^+ s and the T^- s, but are otherwise just like those of a cat. The similarity between the T^+ s and the T^- s that generates **PM** thus militates against regarding schmats as contributing to this theoretical project. **PM** therefore does not recur at the level of paths.

5.4 Inherited properties

Objects inherit many of their properties from their constituent particles. Intuitively, Tibbles has his particular mass and shape because he is constituted by some particles that (collectively) have that mass and shape. Examples could clearly be multiplied. Focus on mass as a representative example. There is a *prima facie* problem here for my proposal. Since the T^+ s and the T^- s have different (collective) masses, it seems to follow from **MC** that Tibbles has different and incompatible masses, which is impossible. This section responds by outlining a suitable account of property-inheritance. This account also answers the following sceptical question: what is so special about Tibbles’ path, in virtue of which it deserves that title? wouldn’t any permutation of cats across paths be equally acceptable? The answer is that Tibbles’ path is uniquely privileged in determining what is true of him when.

5.4.1 Four kinds of property

My discussion of inheritance begins by distinguishing four types of properties.

The first type of property are like mass-properties and shape-properties: Tibbles has a mass and shape because he is constituted by some particles with that very mass and shape. This is the simplest case, of what we might call *direct inheritance*.

The second type of property are not inherited. Modal and historical properties provide examples. Tibbles does not inherit his characteristic changes or properties

like *being possibly squashed* and *having once been scattered* from his constituent particles. Such “hypothetical” properties that “look outside their instances” are hereby excluded from my discussion, so that it concerns only “categorical” properties.⁴¹

The third type of property correspond to large-scale (typically structural) properties of Tibbles’ constituent particles. Examples include *purring* and *being hungry*. Other candidates involve functional, teleological, aesthetic, representational and semantic properties.⁴² Some (though maybe not all) of these properties are systematically connected in a law-like manner to properties of particles, though they are not possessed by particles themselves. These systematic connections create logical space for an analogue of the initial problem about mass. However, the problem does not actually arise because the connections are with large-scale properties of particles: the comparatively small-scale differences between Tibbles’ candidate constituters cannot correspond to differences in whether he is, say, hungry or purring. Like the second type of property, I exclude such properties from the coming discussion.

The fourth type of property, like the third, is not directly inherited from Tibbles’ constituent particles; they are, however, systematically connected to properties of particles in such a way that analogues of the initial problem about mass can arise. Examples may include colour-properties: although some cats are ginger, one might doubt whether their constituent particles are (collectively) ginger. Suppose Tibbles’ borderline hair *h* is his only non- ginger hair. Then whether Tibbles is ginger turns on whether the T^+ s or the T^- s constitute him. **MC** says that both collections do constitute him. It seems to follow that he is both wholly ginger and partly non- ginger, which is impossible. The simplest strategy is to provide a separate account of this indirect inheritance paralleling the account of direct inheritance below, though I cannot go into detail here.

5.4.2 Four options

Consider these inheritance principles:⁴³

Naïve Tibbles has ϕ iff the particles that constitute him have ϕ .

Supervaluation Tibbles has ϕ iff any particles that constitute him have ϕ .

Subvaluation Tibbles has ϕ iff some particles that constitute him have ϕ .

Relativisation Tibbles has ϕ relative to the *x*s iff the *x*s both constitute him and have ϕ .

⁴¹ It is doubtful whether categorical properties exist. Even paradigmatic cases concern an object’s behaviour across a range of counterfactual circumstances, and should therefore count as hypothetical. What matters for my purposes is only the exclusion of these non-inherited properties, rather than the metaphysical gloss by which it is effected.

⁴² (Fine, 2003)

⁴³ Alternatives are possible, though these are the most obvious and promising candidates.

This section defends **Relativisation**. **MC** is assumed throughout.

Given **MC**, ‘the particles that constitute Tibbles’ is improper and instantiations of **Naïve** therefore untrue. An alternative is needed.

The T^+ s and the T^- s have different masses. So **Supervaluation** implies that Tibbles does not have any particular mass. This makes it unclear in what sense Tibbles is really a material object. One might respond by applying **Supervaluation** to determinable properties alongside their determinates: since the T^+ s and the T^- s are massive, it then follows that Tibbles is massive, despite his lacking any particular mass. Three problems arise. Firstly, it is doubtful whether we should believe in both determinates and determinables; for what theoretical work is there for determinables that their determinates cannot do? Secondly, this damages our ordinary conception of the determinate-determinable connection: what is having a determinable, if not having one of its determinates? Thirdly, this does not address the initial problem: the sense in which Tibbles is a material object remains obscure, given that he has no determinate mass-property. We should reject **Supervaluation**.

Subvaluation implies that Tibbles has the mass of the T^+ s and also the mass of the T^- s, and hence that he has incompatible masses. Since these are distinct determinates of the same determinable, this undermines our ordinary understanding of both the determinate/determinable contrast and property-incompatibility. Since no alternative understanding is available, we should reject **Subvaluation**.

Relativisation modifies the logical form of Tibbles’ possession of inherited properties, by relativising instantiation to collections of particles that constitute Tibbles. Note that instantiation is relativised, not the property instantiated; for that would lead to an unattractive dualism of dyadic object-masses and monadic particle-masses. Let m^+ and m^- be the masses of the T^+ s and the T^- s respectively. **Relativisation** implies that Tibbles has m^+ relative to the T^+ s and m^- relative to the T^- s. Since Tibbles does have m^+ (relative to the T^+ s), this avoids the objection to **Supervaluation**. Since Tibbles does not have m^+ and m^- *simpliciter*, but only relative to the T^+ s and T^- s respectively, this avoids the objection to **Subvaluation**. **Relativisation** is therefore preferable to these rivals.

How should we understand relativised possession? There are two options. According to the first, the right hand side of **Relativisation** analyses its left hand side: for Tibbles to have ϕ relative to the x s just is for the x s to both constitute Tibbles and have ϕ . One might object that, like **Supervaluation**, this robs Tibbles of each determinate mass: Tibbles himself does not have a mass, but is merely related to some particles with that mass. Calling this relation ‘constitution’ does not help; for what is so special about constitution, as opposed to any other relation, that warrants ascribing m^+ to Tibbles on the basis of his being constituted by the T^+ s? This certainly does not settle the issue.⁴⁴ But let us consider an alternative account of relativised possession instead.

⁴⁴ One might regard this not as a problem, but as a robust metaphysical basis for the thought that objects change their masses by changing what they are constituted by.

This alternative denies that ‘ o has ϕ relative to the x s’ is analysed by the right hand side of **Relativisation**; rather, relativised possession belongs to the primitive ideology — expressive resources — of the theory of instantiation. On this view, relativised possession is a *sui generis* mode of fact-formation, one that takes an object, property and some particles to form a complex fact. **Relativisation** expresses a law that governs this mode of fact-formation. This is not the place for a detailed examination of this proposal, though it is not without precedent: similar suggestions about time- and world-indexed instantiation provide attractive accounts of intrinsic variation across time and modal space.⁴⁵

Note finally that **Relativisation** can be motivated from within my proposal, or at least accords with its general spirit. On that proposal, Tibbles’ path exhibits a branching structure because the characteristic changes of cats are coarse-grained. What happens within Tibbles’ path determines what is true of him at each time. Once Tibbles’ path is allowed to branch, it is therefore natural to allow the history of his inherited properties to branch too. **Relativisation** implements this. Combining **Relativisation** with my proposal therefore does not undermine its theoretical unity.

5.5 Mereology

This section considers the following objection to my proposal: **MC** is incompatible with mereological analyses of constitution.

5.5.1 The incompatibility

This section explains why **MC** is incompatible with mereological analyses of constitution and offers a diagnosis of the source of **PM**.

First, some terminology:

- x overlaps y iff something is part of both x and y .
- x is disjoint from y iff x does not overlap y .
- x fuses the y s iff (i) each of the y s is part of x , and (ii) every part of x overlaps at least one of the y s.

The relevant sense of ‘part’ is *proper or improper part*; in this sense, everything is part of itself.

A natural view about the connection between constitution and fusion is:

Necessity of Fusion for Constitution (NFC) For any particles xx and object o : if xx constitute o , then o fuses xx .

⁴⁵ (Lewis, 2002) offers a powerful critique of time-indexed instantiation. But Lewis assumes that relativised possession should be analysed using unrelativised possession (in the guise of membership). Lewis does not consider the analogue of including relativised possession in our basic ideology, and offers no objection to doing so.

NFC is incompatible with **MC**. **NFC** and **MC** imply: (i) Tibbles fuses the T^+ s, and (ii) Tibbles fuses the T^- s. By (ii) and the definition of fusion: every part of Tibbles overlaps at least one of the T^- s. So by (i) and the definition of fusion: each of the T^+ s overlaps at least one of the T^- s. But some of the T^+ s are disjoint from each of the T^- s; for only the former include the particles that constitute Tibbles' borderline hair h . So **MC** and **NFC** cannot both be true. My proposal precludes a mereological analysis of constitution because it implies that fusion is not a necessary condition on constitution.

Let us be clear about the force of this argument. Mereology is the formal study of parthood. One prominent mereological theory is Classical Extensional Mereology (**CEM**).⁴⁶ **CEM** is characterised by (the universal closures of):

Transitivity If x is part of y and y is part of z , then x is part of z .

Uniqueness If x and y both fuse some z s, then $x = y$.

Unrestricted Any things whatsoever have a fusion.

Despite its popularity, **CEM** is highly problematic. Some examples and solutions:

- **CEM** makes no allowance for temporal or modal mereological variation. So relativise parthood to times and worlds.
- **CEM** identifies, e.g., statues with their coincident portions of clay, despite their differing temporal, modal, aesthetic and teleological properties (amongst others). So reject **Uniqueness**.
- **CEM** overpopulates reality with gruesome and gerrymandered individuals, e.g., trout-turkeys. So reject **Unrestricted** and restrict fusion.

Any theory of mereology incorporating these modifications will be quite unlike **CEM**. It is, however, straightforward to modify the definition of fusion by inserting appropriate time- and world-indexes. This modification does not eliminate the inconsistency in maintaining, as **MC** and **NFC** together require, that the T^- s and the T^+ s are both fused by Tibbles (now, in actuality). The incompatibility between **MC** and **NFC** is therefore independent of **CEM**. Given **MC**, it is not **CEM** that precludes a mereological analysis of constitution, but the mereological relations between the candidates to constitute Tibbles together with the formal structure of fusion itself.

Given this incompatibility, my solution to **PM** implies that ordinary objects are typically not fusions of particles. It follows that objects are not fundamentally fusions of particles. This meshes nicely with my neo-Aristotelian proposal. One lesson of **PM** is that these two conceptions of objects — as complexes or fusions of particles on the one hand, and as subjects of change on the other — may extensionally diverge. This conceptual lesson is independent of the truth of my proposal.

⁴⁶ The canonical discussion of **CEM** is (Simons, 1987); for useful clarification, see (Hovda, 2009). Notable defences of **CEM** include (Lewis, 1991), (Sider, 2001, ch.4.9).

This suggests a diagnosis of the source of **PM**: an overemphasis on mereology within contemporary ontology; only by displacing mereology from its current location at the heart of ontology can **PM** be satisfactorily resolved, by endorsing **MC**. David Wiggins agrees:

“[I]t can be perfectly determinate which mountain x is without x 's extent being determinate... It is not as if there were just as many mountains to be found with x 's peak as there were rival determinations of x 's boundary. An idea like that could not even occur to one with the good fortune to be innocent of classical extensional mereology.”⁴⁷

I am certainly not the first to reject mereological concpetions of objects. But my reason for doing so is more general than most. Lowe has argued that objects are not mereological sums.⁴⁸ His argument assumes either **Uniqueness** or that parthood is temporally invariant. So Lowe's argument is less general than mine. Lynne Rudder Baker has also denied that constitution can be analysed mereologically.⁴⁹ But she offers no argument for this, other than rejection of **CEM**. So Baker's argument is also less general than mine. Furthermore, every view that Ryan Wasserman considers in his survey of leading analyses of constitution assumes **NFC**.⁵⁰ So given **MC**, all those views are false.⁵¹

5.5.2 An objection?

NFC and **MC** are incompatible. Is this a problem for my view? Only if there are good reasons to endorse **NFC**. This section examines and rejects three reasons to endorse **NFC**.

First reason: **NFC** expresses a natural or intuitive view about the connection between mereology and constitution. This is not decisive. If metaphysics, like any other science, can yield genuine discoveries, then our natural and pre-reflective intuitions cannot provide the court of final appeal when adjudicating theoretical disputes. Reality is too complex, varied, and surprising a place for our socially and historically conditioned inclinations to carry so much metaphysical weight. Furthermore, paradoxes like Russell's, the liar, the sorites and **PM** show that our ordinary beliefs cannot all be correct.

Second reason: a conception of mereology as a quasi-logical, topic neutral framework in which the relations between reality's various organisational levels may be

⁴⁷ (Wiggins, 2001, p.166)

⁴⁸ (Lowe, 2009, ch.7).

⁴⁹ (Baker, 2000, pp.179–85).

⁵⁰ This is not strictly true. Wasserman's concern is an asymmetric relation of object-object constitution. The views he considers assume that x constitutes y only if x and y have exactly the same parts. **NFC** is a natural extension of such views. (Wasserman, 2004)

⁵¹ Similar arguments threaten the hylomorphic mereologies of (Fine, 1999) and (Koslicki, 2008). Simply adding another “formal” part to an object does not address the incompatibility of **NFC** with **MC**.

articulated.⁵² This motivates **NFC** because (i) it is unclear how to fit constitution into this framework, unless some mereological relation is a necessary condition on it, and (ii) it is also unclear what relation other than fusion this could be. Although this sort of view is rarely explicitly articulated or defended, it appears to be quite widespread, even if only implicit; this may partly explain the absence of **MC** from the literature on **PM**. Whether or not this speculative claim is correct, *suasive arguments* for this approach to mereology are in short supply. This second reason to endorse **NFC** is therefore not compelling.

Third reason: a direct argument for **NFC**. The first step is to show that Tibbles fuses some particles. An instance of the plural comprehension scheme

$$(P\text{-COMP}) \quad \exists x \forall y (y \preceq xx \leftrightarrow \Phi)$$

is:

$$\exists x \forall y (y \preceq xx \leftrightarrow (y \text{ is a particle} \wedge y \text{ is part of Tibbles}))$$

Let tt witness this claim. Does Tibbles fuse tt ? There are two ways he could fail to do so. (i) No particles are parts of Tibbles. (ii) Some of Tibbles' parts do not overlap particles. Note that (i) entails (ii) but not conversely. Response (i) is both extreme and implausible. Both responses raise seemingly unanswerable questions, e.g.: how close to microscopic particles do downwards parthood-chains originating with Tibbles reach? This will be especially problematic if parthood is transitive, as is standardly assumed. So it seems that Tibbles fuses tt . How, then, could Tibbles fail to be constituted by tt ? And how could any other particles constitute him, given that he fuses tt ?⁵³ The argument turns on no peculiarity of Tibbles or of cats. So we can generalise to an even stronger claim than **NFC**: constitution and fusion are necessarily coextensive.

The defender of **MC** must resist this argument. One option is to reject (P-COMP). But some instances are unproblematic:

$$\exists x \forall y (y \preceq xx \leftrightarrow (y \text{ is a coffee cup} \wedge y \text{ is on my desk}))$$

The challenge is to give a principled account of legitimate instances of (P-COMP) that lets coffee cups in whilst keeping particles and parthood out. It is not clear how to do so. Instead, the defender of **MC** should reject the dyadic parthood relation employed in the argument: the fundamental notion of parthood between objects and particles is not two-place, but three.⁵⁴ The account of property-inheritance in §5.4 can be used to justify this response.

Cats inherit (at least some of) their mereological properties from their constituent particles:

⁵² Versions of this broadly Lewisian view are described and defended in (Lewis, 1991), (Sider, 2007).

⁵³ Note 6's qualification to **UC** is important here.

⁵⁴ (Hudson, 2001) also suggests relativising parthood, though to a spatiotemporal region. Unlike Hudson, I do not regard this relativisation as central to resolving **PM**; this byproduct of my account of inherited properties is needed only to resist the current objection.

- A particle p is part of Tibbles (if it is) because p is amongst some particles that constitute Tibbles.
- A fusion f of particles pp is part of Tibbles (if it is) because pp are amongst some particles that constitute Tibbles.

Let F be a property concerning Tibbles' mereological relations to particles or fusions of particles. Tibbles' possession of F should be relativised to a collection of particles that constitute him, just like any of his other inherited properties.⁵⁵ With this modification in place, the argument above can show only:

- For any particles xx that constitute Tibbles, there exist some particles yy such that Tibbles fuses yy relative to xx .

This and the preceding two bullet points jointly imply: (i) Tibbles fuses the T^+ s but not the T^- s relative to the T^+ s; and (ii) Tibbles fuses the T^- s but not the T^+ s relative to the T^- s. Since (i) is consistent with (ii), there is no objection to **MC** here.

Note that this is consistent with admitting a two-place parthood relation on particles and endorsing a version of **CEM** formulated using it. My proposal is to relativise the parthood relation between objects and particles (or dyadic-fusions of particles), not to relativise every instance of parthood.⁵⁶

None of these reasons to believe **NFC** is compelling. I know of no others. So the incompatibility of **NFC** with **MC** does not undermine my view.

5.6 Ghostly objects

Ordinary objects are material objects; they are spatiotemporally located, causally efficacious, massive, and made out of matter. This last clause creates tension with my proposal. Not all paths are occupied by objects. Indeed, many paths never even pass through a region with material content. A natural view is that, as a matter of metaphysical necessity, such paths are unoccupied: ordinary objects must be constituted by particles whenever they exist. The tension arises because the explanatory primacy of paths over constitution makes it unclear how I can ensure that paths without material content are not occupied by objects, other than by brute stipulation. Say that an object is *ghostly* if it is sometimes (or always) not constituted by any particles. The objection is that I cannot explain the impossibility of ghostly objects. Two responses are available.

The first response grants that my proposal allows for the possibility of ghostly objects, but takes this as a virtue rather than a vice. Belief in K s should go with the

⁵⁵ This can be implemented in two ways, (i) Using a three-place parthood relation, with a slot for a collection of constituting particles. (ii) Using a two-place parthood relation whose bearing is relativised to a collection of constituting particles. There is no need to make a decision here. See also note 56

⁵⁶ Suppose relations can vary their number of argument positions across instantiations. Then a single parthood relation can be two-place in some instantiations and three-place in others. For a defence of such varigrade relations, see (MacBride, 2005, §2.6).

utility of K s in systematising external reality (§5.3). It is not *a priori* that ghostly objects cannot play a useful, or even essential, role in this theoretical project. For example, admitting an appropriate kind of ghostly object may allow us to systematise a particular variety of disturbance in a field, even if those disturbances occur only in regions devoid of particles. If this turns out to be the case, then we should believe in that kind of ghostly object. Since this cannot be ruled out *a priori*, it is a virtue of my proposal that it can allow for ghostly objects.

The second response is less concessive; it seeks to show that my proposal can disbar ghostly objects. K -paths are represented by equivalence classes of $\langle r, t \rangle$ pairs under a relation R_K that codifies the characteristic changes of K s. Formally convenient as it is to treat R_K as a relation on $\langle r, t \rangle$ pairs, this may not be the most ontologically perspicuous representation of characteristic changes. An alternative, and potentially more revealing, approach codifies the characteristic changes of K s using a dyadic cross-time relation on collections of particles; this relation can be represented by a four-place relation $S_K(xx, t, yy, t')$ on collections of particles (xx, yy) and times (t, t'). This approach treats the characteristic changes of K s as primarily changes in their constituent particles. Let $r_{xx,t}$ be the region occupied by xx at t . Then S_K can be used to define R_K , and thereby delineate the K -paths, thus:

- $R_K(\langle r, t \rangle, \langle r', t' \rangle)$ iff, for some xx, yy : (i) $r = r_{xx,t}$, (ii) $r' = r_{yy,t'}$, and (iii) $S_K(xx, t, yy, t')$.

The K -paths are determined using ($K=$) as before. This modified approach to characteristic changes implies that, for any kind K , K -paths only ever pass through regions occupied by particles. Together with **Path-Con** — the path-constitution connection proposed in §4.3 — this rules out ghostly objects. The present objection therefore fails.

This strategy can be extended to respond to another style of objection, due to Theodore Sider and Dean Zimmerman.⁵⁷ I shall consider a variant of Sider's objection. Let r be a red object constituted by red particles pp ; let b be a blue object constituted by blue particles qq . Initially, r and b are separated. Later, pp and qq become intermingled. This intermingling does not destroy r or b , which continue to be constituted by pp and qq respectively. Whilst intermingled, pp and qq have the same (collective) locations; so the paths of r and b pass through just the same region. So **Path-Con** implies that r is constituted by qq , by qq , and also by the plural union $pp \cup qq$ of all the particles, red and blue alike. But, Sider claims, r should continue to be constituted by only the red particles pp ; for the blue particles qq do not become parts of r , even though r and b spatially coincide.

One could respond by rejecting Sider's claim. This case is sufficiently unlike ordinary cases of constitution that theory can be allowed to adjudicate. But even granting Sider's claim, **Path-Con** can be modified to avoid implying that qq or $pp \cup qq$ constitute r . The problem is that the right hand side of **Path-Con** is too

⁵⁷ (Zimmerman, 2002, pp.603–606), (Sider, 2002, pp.46–7)

permissive. In order to constitute an object o of kind K , it is not enough that particles xx occupy a region through which o 's path p_o passes; they must do so for the right reason. The right reason involves the characteristic changes of K s: p_o should pass through the location of xx *because* those particles stand in S_K , the relation that codifies the characteristic changes of K s. Since r, b belong to different kinds, their characteristic changes are codified by different relations S_r, S_b .⁵⁸ That pp and qq have the same (collective) locations does not imply that they possess exactly the same properties or stand in exactly the same relations. So intermingling pp with qq does not imply that qq or $pp \cup qq$ bear S_r to anything. So this modification of **Path-Con** does not imply that r is constituted by qq , or that it is constituted by $pp \cup qq$. So Sider's objection does not undermine my proposal.⁵⁹

6 Conclusion

The presentation and defence of my proposal are now complete. **PM** is resolved by allowing ordinary objects to be multiply constituted by many different collections of particles at a time (§3). This follows from a broadly Aristotelian conception of objects as subjects of change, and corresponding views about the explanatory priority of paths over constitution (§4). Because this conception of objects entails my solution to **PM**, the result is a unified theoretical package. Even if these proposals are ultimately unsuccessful, I hope to have shown that the prospects for an ontology that de-emphasises mereology are better than one might otherwise have thought, and to have thereby enriched our understanding of material reality.

⁵⁸ If r, b belong to the same kind, then there is no justification for denying that they are both constituted by $pp \cup qq$.

⁵⁹ A related worry concerns, e.g., neutrinos that pass through Tibbles' body without partially constituting him. This apparently commonplace occurrence is incompatible with the original version of **Path-Con**, but not with the modified version just described.

References

- Baker, Lynne Rudder (2000). *Persons and Bodies: A Constitution View*. Cambridge University Press.
- Bennett, Karen (2004). "Spatio-temporal coincidence and the grounding problem". *Philosophical Studies*, 118: 339–71.
- Boolos, George (1971). "The iterative conception of set". *The Journal of Philosophy*, 68: 215–32. Reprinted in (Boolos, 1998, pp.12-39).
- (1984). "To be is to be the value of a variable (or some values of some variables)". *The Journal of Philosophy*, 81: 430–49. Reprinted in (Boolos, 1998, pp.54–72).
- (1998). *Logic, Logic and Logic*. Cambridge, Mass.: Harvard University Press.
- Devitt, Michael (2011). "Methodology and the nature of knowing how". *Journal of Philosophy*, 108: 205–218.
- Fine, Kit (1994). "Essence and Modality". *Philosophical Perspectives*, 8: 1–16.
- (1995a). "Ontological Dependence". *Proceedings of the Aristotelian Society*, 95: 269–290.
- (1995b). "Senses of Essence". In W. Sinnott-Armstrong, ed., *Modality, Morality and Belief*, chapter 5. Cambridge University Press.
- (1999). "Things and their parts". *Midwest Studies in Philosophy*, 23: 61–74.
- (2000). "A counter-example to Locke's Thesis". *The Monist*, 83: 357–61.
- (2003). "The non-identity of a material thing and its matter". *Mind*, 112: 195–234.
- Graff-Fara, Delia (2003). "Gap Principles, Penumbra Consequence, and Infinitely Higher-Order Vagueness". In J. C. Beall, ed., *Liars and Heaps: New Essays on Paradox*, chapter 9. OUP.
- Hawthorne, John (2006a). "Epistemicism and semantic plasticity". *Oxford Studies in Metaphysics*, 2: 289–324. Reprinted in (Hawthorne, 2006b, ch.9).
- (2006b). *Metaphysical Essays*. Clarendon Press, Oxford: OUP.
- Hovda, Paul (2009). "What is Classical Mereology?" *Journal of Philosophical Logic*, 38: 55–82.
- Hudson, Hud (2001). *A Materialist Metaphysics of the Human Person*. Ithaca, NY: Cornell University Press.

- Johnston, Mark (1992). "Constitution is not identity". *Mind*, 101: 89–105. Reprinted in (Rea, 1997, pp.44–62).
- Koethe, John (2002). "Stanley and Williamson on knowing how". *Journal of Philosophy*, 99: 325–28.
- Koslicki, Kathrin (2008). *The Structure of Objects*. OUP.
- Lewis, David (1983). "New work for a theory of universals". *The Australasian Journal of Philosophy*, 61: 343–77. Reprinted in (Lewis, 1999, pp.8–55).
- (1991). *Parts of Classes*. Basil Blackwell.
- (1993). "Many, but almost one". In John Bacon Keith Campbell and Lloyd Reinhardt, eds., *Ontology, Causality and Mind: Essays on the Philosophy of D.M. Armstrong*, 23–37. Cambridge University Press. Reprinted in (Lewis, 1999, ch.9).
- (1999). *Papers in Metaphysics and Epistemology*. Cambridge University Press.
- (2002). "Tensing the copula". *Mind*, 111: 1–13.
- Linnebo, Øystein (2010). "Plural Quantification". In Edward N. Zalta, ed., *The Stanford Encyclopedia of Philosophy*, winter 2010 edition.
- Lowe, E. J. (1995). "The problem of the many and the vagueness of constitution". *Analysis*, 55: 179–82.
- (2009). *More Kinds of Being*. Wiley-Blackwell.
- MacBride, Fraser (2005). "The particular-universal distinction: a dogma of metaphysics?" *Mind*, 114: 565–614.
- Markosian, Ned (1998). "Brutal composition". *Philosophical Studies*, 92: 211–249.
- McGee, Vann and McLaughlin, Brian (2000). "The lessons of the Many". *Philosophical Topics*, 28: 129–51.
- Quine, W. V. O. (1981a). *Theories and Things*. Harvard University Press.
- (1981b). "What price bivalence?" *Journal of Philosophy*. Reprinted with additions in Quine (1981a, ch.3).
- Rea, Michael C., ed. (1997). *Material Constitution: A Reader*. Lanham, Boulder, New York, Oxford: Rowman & Lanham Publishers inc.
- Rumfitt, Ian (2003). "Savoir Faire". *Journal of Philosophy*, 100: 158–166.
- Sattig, Thomas (2010). "Many as one". In Dean W. Zimmerman, ed., *Oxford Studies in Metaphysics: volume 5*, chapter 8. Oxford, New York: OUP.

- Sider, Theodore (2001). *Four-Dimensionalism: An Ontology of Persistence and Time*. OUP.
- (2002). “Review of *Persons and Bodies: A Constitution View* by Lynne Rudder Baker”. *The Journal of Philosophy*, 99: 45–48.
- (2007). “Parthood”. *The Philosophical Review*, 116: 51–91.
- Simons, Peter (1987). *Parts: A Study in Ontology*. OUP.
- (2000). “Continuants and occurrents”. *Proceedings of the Aristotelian Society: Supplementary Volume*, 74: 59–75.
- (2008). “The thread of persistence”. In Christian Kanzian, ed., *Persistence*, 165–84. Ontos Verlag.
- Stanley, Jason and Williamson, Timothy (2001). “Knowing how”. *Journal of Philosophy*, 98: 411–444.
- Unger, Peter K. (1979a). “I do not exist”. In G. F. MacDonald, ed., *Perception and Identity*, 235–51. Macmillan Press. Reprinted in (Unger, 2006b, pp.36–52).
- (1979b). “There are no ordinary things”. *Synthese*, 41: 117–52. Reprinted in (Unger, 2006b, pp.3–35).
- (1979c). “Why there are no people”. *Midwest Studies in Philosophy*, IV: 177–222. Reprinted in (Unger, 2006b, pp.53–111).
- (1980). “The problem of the many”. *Midwest Studies in Philosophy*, 5: 411–67. Reprinted in (Unger, 2006b, pp.113–83).
- (2004). “The mental problems of the many”. In Dean Zimmerman, ed., *Oxford Studies in Metaphysics volume 1*, 195–222. OUP. Reprinted in (Unger, 2006b, ch.5).
- (2006a). *All the Power in the World*. OUP.
- (2006b). *Philosophical Papers: Volume 2*. OUP.
- van Inwagen, Peter (1990). *Material Beings*. Ithaca, London: Cornell University Press.
- Wasserman, Ryan (2004). “The Constitution Question”. *Nous*, 38: 693–710.
- Weatherson, Brian (2009). “The Problem of the Many”. In Edward N. Zalta, ed., *The Stanford Encyclopedia of Philosophy*, winter 2009 edition.
- Wiggins, David (1968). “On being in the same place at the same time”. *The Philosophical Review*, 77: 90–95. Reprinted in (Rea, 1997, ch.1).
- (2001). *Sameness and Substance Renewed*. Cambridge University Press.

Williamson, Timothy (1990). *Identity and Discrimination*. Basil Blackwell.

—— (1994). *Vagueness*. Routledge.

Wright, Crispin (1983). *Frege's Conception of Numbers as Objects*. Aberdeen University Press.

—— (2010). "The illusion of higher-order vagueness". In Richard Dietz and Sebastiano Moruzzi, eds., *Cuts and Clouds: Vagueness, its Nature and Logic*, chapter 30. OUP.

Zimmerman, Dean (2002). "Persons and Bodies: constitution without mereology?" *Philosophy and Phenomenological Research*, 64: 599–606.