

Hylomorphism

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## HYLOMORPHISM

It is, after all, the familiar that is so strange. Take complexity, understood as the condition of having parts, among the most ubiquitous of phenomena. Suddenly, one can be flummoxed by the following very ordinary fact: When certain items come to stand in certain relations, such as being glued together, being coupled with, or being bonded to each other, there then comes to be some *further* item which has those original items as parts. That is presumably how we have such complex items as model airplanes, trains, and molecules. Well, just why are those relations and their ilk, "item-generators," while other relations, such as being six feet from, seem impotent in the production of new items? Whence this invidious ontological distinction? The science of matter does not even consider the invidious distinction as an object of explanation, it simply takes it for granted, and instead explores the forces that hold apparently complex items together. So what does explain the invidious ontological distinction?<sup>1</sup> Could it just be a projection of our idiosyncratic way of experiencing and conceptualizing reality, so that things considered in themselves are not complex, but are so only relative to a scheme of clumping or bundling?

Somehow, I doubt it.

## I. PRINCIPLES OF UNITY

Of any item in any category, be it a state, event, activity, material object, artifact, organism, person, quantity of stuff, property, fact, proposition, kind, group, set, or mereological sum, we may inquire whether it is simple or complex, in the sense of having parts. Of any item that has parts we may inquire as to what principle unifies those parts into the whole that is the complex item. The principle had better not be *merely* another part, for the question would remain: Consider that part along with the other parts; what relation is such that its holding of *all* these parts gives us the whole? And that would be the principle we really seek.

So glue may hold together parts of a model airplane; but glue is another part, and it counts as a part along with the wings, the tail, and the fuselage because of a pattern of bonding holding among it and the other parts. This pattern of bonding is not another part,

<sup>1</sup> A question explored in detail by Peter van Inwagen in his *Material Beings* (Ithaca: Cornell, 1991).

but rather a way of realizing a principle of unity, a relation that must hold among the parts if they are to be parts of the model airplane. Roughly, they are to *hang together in the modeled shape of an airplane in such a way as to resist separation in the face of the range of forces to which we usually subject such models*. (Here, as below, I italicize the relational predicate that expresses the principle of unity.)

Consider a particular train; that is, an engine and some carriages coupled together, with the engine coupled into a position from which it can pull or drive the train. What it is for a particular train to be is for *enough of those carriages and the engine to be so coupled*. This complex quantified relation that holds of the engine and the carriages is the principle of unity of the train. There is no need to think of that relation as in any way part of the train. Yet it has to be mentioned in specifying what it is for that train to be. (Notice that it allows the train to have a variable constitution over time.)

We may make a distinction between a complex item's parts, its principle of unity, and its origin (or more generally its place in a pattern of generative operations.) All three factors may enter into the account of what it is for a specific item to be, the account of the essence of the item. For now, we shall prescind from origins, and concentrate on parts and principles.

A principle of unity for a given item is a relation holding of some other items, such that (origins aside) what it is for the given item to be is for the relation to hold among those items. Each genuine kind of complex item will have associated with it a characteristic principle of unity; for arguably, it is sameness in principle of unity and kinds of parts that in turn qualifies the members of a given kind to be included in the complex whole that is the kind.

Consider HCl, a kind of molecule. The principle of unity for individual hydrogen chloride (HCl) molecules is the relation of *bipolar bonding*. So consider a particular HCl molecule, whose genuine parts involve a hydrogen ion (H<sup>+</sup>) and a chlorine ion (Cl<sup>-</sup>). The principle of unity holds of the ions, and its holding is the essential condition for existence of the molecule. It is simply an essentialist elaboration of a proposition of chemistry that what it is for a given hydrogen chloride molecule to be is for there to be a hydrogen ion and a chlorine ion together in a bipolar bond. Using our terminology, it follows that bipolar bonding is a principle of unity for hydrogen chloride molecules.

We can go further. We can ask of the complex whole that is the *kind* HCl molecule, what is it that unifies the members of the kind, that is, certain individual molecules, into this whole? The answer would specify the principle of unity of the kind HCl molecule; that is, the

relation that holds among the members of the kind, such that its holding makes for the existence of the kind. Well, what it is for the molecular kind HCl to be seems just to be this: there are some individual molecules alike in sharing certain kinds of parts, namely hydrogen ions and chlorine ions; and they are alike in sharing a principle of unity, namely that their hydrogen ion be bound to their chlorine ion. The individual molecules are the members of the kind, the parts of the kind in the extended sense of part intended here. The principle of unity of the kind HCl molecule is just that such individual molecules *share certain kinds of parts, namely hydrogen ions and chlorine ions, and share a certain principle of unity, namely bipolar bonding.*

It is typical of kinds that their examples are alike in parts and principles, so that a discovery of differences in parts or principles “under the skin” of the examples of a given kind prompts the division of the kind into two subkinds. That is how it was with the oft-cited case of Jade, a kind of semi-precious stone. We now distinguish the subkinds Jadite and Nephrite on the strength of their different atomic parts and different molecular structure.

Contrast groups; imagine we found that certain members of the local fire brigade were angels who had assumed a human form. Even so, the deep intrinsic difference between humans and angels would not in itself show that the local fire brigade consisted of two *groups*, the human firefighters and the angelic firefighters. Suppose the angels had no distinctive knowledge of or distinctive association with each other. Suppose they were always mixed in with their human fellows in any firefight. Then, arguably, there would no group of the angelic firefighters. However, it still would be true to say that the brigade had in it two very different *kinds* of firefighters. In the main, groups are more tolerant of intrinsic differences among their members in respect of parts and principles than are the corresponding kinds. This is because the unity of a group depends on some degree of association among the members of the group, not simply on the intrinsic similarity of the members. Thus, the chlorine atoms do not form a group (unless there is something very spooky going on) even though they do form a quite natural kind.

## II. PARTHOOD QUITE GENERALLY CONSIDERED

Despite the usefulness of the examples of the model airplane, the train, and the individual HCl molecule, it does not seem to be crucial to the notion of a part that the parts of an item are in any way joined or coupled or bonded to make up the item. Abstract items can have parts or components. So sets might be taken to have their members as parts, without any requirement of bonding or attach-

ment being relevant. Conjunctive properties have their conjuncts as parts, but nothing besides conjunction is required for the parts to make up the relevant whole. And the debate over whether propositions contain individuals and properties as parts, rather than senses or modes of presentation of individuals and properties, is not menaced by the odd supposition that some analogue of material bonding holds among the components of the proposition. In each of these cases there are indeed different principles of unity in play, but it does not follow that there are different notions of part in play. There will be a semantic question as to whether the notion of part in play is entirely univocal across all subject matters, or represents a “focal meaning” that is further elaborated within a subject matter, or even from context to context.<sup>2</sup> But this is a question best addressed at the end of an investigation that tries to get as far as possible on the assumption of univocity.

That methodological suggestion accords with the idea that, at first glance, the relation between an item and its components or parts is a topic-neutral relation of vast generality, applying wherever the notion of complexity gets a foothold. It would then be a great mistake to prematurely restrict the scope of one’s account of parthood to a few categories such as material objects and arbitrary aggregates. For one then runs the risk of misplaced generality, of mistaking idiosyncratic features of a specific category or kind of complex item for general principles governing the relation of parthood itself. So it is with the contemporary fascination with mereological sums, as we shall later see.

In the same catholic spirit, at this stage of the investigation we should keep at bay those sophisticated considerations of fundamental ontology that might severely prune, or even totally revamp, our ordinary categorical scheme of types of complex objects. For there might be something about the notion of complexity that we can most effectively learn by considering a category of ostensible items which could be shown upon reflection not *really* to exist, in the sense of figuring in an acceptable fundamental ontology as either a basic or derived entity. So Compositional Nihilists, those who find that there are good reasons in fundamental ontology to deny the reality of complexes, need to check their argumentative guns at the door, at least for now. The same applies to those who are persuaded that the only complexes are living things.

We should try to make the initial philosophy harder by being friendly to as many kinds of complex items as we can conceive. There may be something to be learnt from the contemplation of the nonexistent.

<sup>2</sup> For an extensive examination of this semantic question, see Friederike Moltmann, *Parts and Wholes in Semantics* (New York: Oxford, 1995).

## III. GENUINE PARTS VERSUS "FIAT" PARTS

Returning to the main line, a principle of unity is required to hold among the "genuine" parts or constituents of an item, not among the "merely fiat" parts disclosed by arbitrary principles of division of the item. The contrast can be brought out by an example or two.

Most arbitrary temporal slices or segments of a complex activity are not the parts united by the principle of unity for that activity. Consider last night's dinner party. We may allow that there is such a thing as last night's dinner party between 9:00 and 9:01 p.m., but there need be no relation between that temporal slice of the dinner party and the minute long slices before and after it, such that the relation is properly cited in a unity condition for dinner parties in general, or for this dinner party in particular. There may have been an embarrassing hiatus between 8:59 and 9:01, during which nothing really happened at the dinner party. Suppose the guests and the hosts "froze" at that point. Even so, that period does get included in the dinner party just because it is enveloped by subactivities characteristic of dinner parties. They froze *during* the dinner party. Those moments were the most embarrassing *part* of the dinner party. Yet the relation between the two slices that occupy the successive minutes of the freeze need exhibit nothing of those features properly cited in the unity condition for the dinner party.

While arbitrary temporal slices or segments need not correspond to any genuine or natural parts of an activity, it is still the case that what it is to be the activity is to be a sequence of certain temporally extended events united in a certain way. So a dinner party may really consist of the following sequence of independent, temporally extended event parts:

the greeting of the guests,  
 the downing of drinks,  
 the pre-dinner chatting,  
 the serving and consuming of the soup,  
 the serving and consuming of the main course,  
 the serving and consuming of the desert,  
 the host's disconcerting party piece,  
*and then,*  
 the hurried farewells.

These temporally extended event-parts might constitute a dinner party that happens to last for three hours and seventeen minutes. But they constitute that dinner party in a way in which the dinner party is *not* constituted out of the first seventeen-minute temporal slice of the party and the last three-hour temporal slice of the party.

The first series of temporally extended events is a series of parts united by a principle of unity typical for dinner parties like this. That will be something like *occupying a position in a sequence of events each effected either by the hosts or by the guests for the intended outcome of their mutual feeding, entertainment, and relief*. They are the parts and that is the principle that would have to be mentioned in an adequate account of what it is for the dinner party to be.

By contrast, the party's last three-hour slice need not be one in a sequence of events effected either by the hosts or the guests for the intended outcome of their mutual feeding and entertainment. It would then be a "fiat part," namely a part disclosed by a mere principle of division.

For a second example, consider a sentence token, such as the one displayed next.

Aristotle liked dogs.

There are various principles of division of this sentence token, for example the one that divides it into letters and gaps, and the one that divides it into letter and gap tops, and letter and gap bottoms. But to see the token as a sentence token you have to see it as having a form which makes for truth or falsity, and to see it that way you have to take it as having a privileged semantic structure, which in this case we may simplify as a subject/predicate structure involving the subpart that is the token of the name 'Aristotle' and the subpart that is the token of the predicate 'liked dogs'. These are the parts which are related by the principle of unity of the sentence token, namely, the semantic relation of *predication of the predicate token of the reference of the name token*. It is the holding of this semantic principle of unity among those subsentential tokens which enables the sentence token to be true or false, depending on how things stood with Aristotle. This principle of unity does not hold among the letters and the gaps, or among the letter and gap tops and the letter and gap bottoms.

This is the sense in which the semantics of a sentence token enters into what it is to be the sentence token, at least if the sentence token is understood as having a truth value. But the semantics of a sentence token (in this case the simple semantics of reference and predication) is not an extra part of that sentence token. It is something that serves to unify the semantically privileged parts into the whole that is the sentence token. The genuine parts of a sentence token, as opposed to its merely fiat parts disclosed by various principles of division, are those united by its semantic principle of unity.

The analysis of the distinction between principles of unity and principles of division is a matter of some importance and delicacy.

Certainly the analysis is not merely formal. Whereas a principle of unity can be thought of as associated with a function from given items to another item that those items make up, a principle of division is associated with a function from a given item to items that make up the given item. If that were all there was to the matter then we could take the converse of any function that was characteristic of a principle of division and have a function characteristic of a principle of unity. But there is, in general, no guarantee that the converse of a function associated with a principle of division for an item will be a natural or nonarbitrary function characteristic of a principle of unity for that item.

#### IV. HYLOMORPHISM

A statement of the genuine parts and principle of unity of an item (at a given level of composition) takes the following canonical form:

*What it is for...*(the item is specified here)...*to be is for...*(some parts are specified here)...*to have the property or stand in the relation...*(the principle of unity is specified here).

As in: *What it is for* this hydrochloric acid molecule *to be is for* this positive hydrogen ion and this negative chlorine ion *to be bonded together.*

Or in: *What it is for* this particular train *to be is for* the engine and enough of those carriages *to be coupled together*, with the engine coupled into a position from which it can pull or drive the carriages. (Allowing enough of the carriages, and not requiring all of them, is to allow that the particular train in question can have a varying constitution over time, and across possible worlds.)

Or in: *What it is for* the singleton of Plato *to be is for* Plato to exist. (Here we allow the limiting case where one item's having a property exhausts the essence of another item. Thanks to its having the property, the one item is "unified" into another unit. Compare my left hand and my left fist.)

The idea that each complex item will have some such canonical statement true of it might be fairly called "Hylomorphism." For it is the idea that each complex item admits of a real definition, or statement of its essence, in terms of its matter, understood as parts or components, and its form, understood as a principle of unity. When an item's parts are themselves complex, they in their turn will have their own principles of unity (forms) and genuine parts (matter), and so on and so forth, either *ad infinitum*, or terminating in indefinables or "simples." This is the familiar layering of hylomorphic structure, beginning with the immediate parts of a whole, and continuing through the more and more remote parts of that whole.

The point of this essay is to explore the prospects of Hylomorphism, understood as this general claim about the shape of the real definitions of complex items.

Obviously, this somewhat stipulative invocation of “Hylomorphism” at most picks up a strand or two from the long and daedal tradition stretching (at least) from Aristotle to Francisco Suarez. So perhaps it will be of some help to indicate which associated commitments of the tradition are being accepted and which rejected, and which are being passed over in silence.

One disputed question in the tradition is whether a whole construed hylomorphically is a *composite* of matter and form, with the form itself understood as another part, along with the more familiar “material” parts of the composite. The form cannot be a *mere* part alongside the other parts; it must also play a unifying role. Could it play that unifying role, and be a part as well? My fellow contemporary Hylomorphists, Kit Fine and Kathrin Koslicki, take it to be so.<sup>3</sup> As will emerge below, the present account denies this; the form is a principle which must be invoked in the real definition of the whole, but it is not a further part.

The next disputed question concerns the targets of real definition: Are these just kinds of individuals, or do they include the individuals themselves? And if the latter are among the targets of real definition, how is it that members of the very same kind can have different essences or real definitions? Are there essential differences even among exact duplicates? I suppose that there are, and that the most plausible place to locate such differences is not in different principles, for then the duplicates could not be said to be of the same most determinate kind, but in different origins and different original parts.

On such a view, we may still allow that individuals of a given kind share an essence type, in the sense of having the same type of parts and the same principle of unity.

This last remark bears on perhaps the most controversial issue in the Hylomorphic tradition, namely whether the forms or principles of unity are to be thought of as “trope-like,” as individualized characteristics or relations, or instead as universals in the sense of items potentially in common to many distinct individuals. Yet once origins

<sup>3</sup> See Fine, “Things and Their Parts,” in Peter French and Howard Wettstein, eds., *New Directions in Philosophy: Midwest Studies in Philosophy, Volume XXIII* (Malden, MA: Blackwell, 1999), pp. 61–74; and Koslicki, *The Structure of Objects* (forthcoming). Whereas Koslicki’s postulation of formal parts is to some degree motivated by a desire to preserve the principle of uniqueness of composition, this does not appear to be motivating Fine’s view. For Hylomorphism without forms as parts, see my “Constitution Is Not Identity,” *Mind*, CI (1991): 89–105.

and original parts are invoked as the essential differences among individual examples of any kind of complex item, it will no longer be necessary to postulate individualized forms as the source of the individuation of distinct individuals of a given kind.

#### V. REAL DEFINITION AND ESSENCE

Since Hylomorphism is here being presented as a thesis about the shape of certain real definitions, it may be useful to add a word about the objectivity of real definition, even in the case of mind-dependent items. Everything has an essence, and everything that is complex will have a real definition. Whether or not we can find and formulate the real definition is another matter. Think of the mixed history of success and failure, over the last hundred years, in the analysis of concepts, an enterprise properly understood not as seeking nominal definitions, but as the search for the real definitions of complex concepts. The mixed history suggests that the structure of a concept sets an objective standard of success for the analysis of the concept. The structure is arguably an essential feature of the concept; and this remains so even on the view that concepts are artifacts of our mental activity. Compare the sentence token displayed above; it is clearly a human artifact, but its parts and principle of unity are essential to it, and thereby set an objective standard for its proper parsing. (I do not deny that there are other things, with other parts and principles, in the same place as that sentence token; more on that below.)

Some will find the notion of real definition quaint and unworkable. Perhaps the best reason for such an attitude is skepticism about essence; since to give the real definition of an item is to anatomize its essence. If items lack essences, or only have essences relative to the concepts we deploy in characterizing those items, then they do not admit of a real definition. At best, we only can explore the consequences of our ways of conceiving of items.

Still, the enemies of essence should allow that our ways of conceiving of items may well be essentialist. Moreover, there may be a strong hylomorphic element in our ways of conceiving of items, manifest in our ways of tracing items through time, and in our ways of distinguishing between events in which an item of a given kind increases in size and events in that item simply has something else accrete to it.

There is an extensive body of empirical evidence, much of it assembled in Susan A. Gelman's book *The Essential Child*, to the effect that our earliest conceptual framework is quasi-essentialist.<sup>4</sup> Young children

<sup>4</sup> Gelman, *The Essential Child: Origins of Essentialism in Everyday Thought* (New York: Oxford, 2003).

operate with a kind-based classificatory scheme. Their inductive thinking is guided by kind-relative distinctions between superficial properties (“accidents”) and deep explanatory properties that are supposedly common to members of a kind. Ostensibly deep explanatory properties common to members of a kind are the ones that are quickly generalized, often from a single instance to the whole kind. Accidents such as color, location, posture, and orientation are not so easily generalized.

Another aspect of our earliest conceptual scheme is less remarked upon in empirical psychology. Even quite early on, our conceptual scheme provides readily available judgments of increase in size versus mere adjoining or juxtaposition. When cream is mixed into a soup, it is understood to become part of the soup, so that the soup becomes more voluminous. When a person gets on a bike, neither the bike nor the person is seen to increase in size. The person does not acquire the bike as a part, nor vice versa. And there is no *salient* third object that has both of them as parts. The same with a ship and a barnacle, a head and a hat, and a dog and a collar. With very little prompting, we readily distinguish being placed on, or being attached to, from becoming part of. It is as if we are primed to experience the environment in a manner guided by rough and ready knowledge of kind-based principles of unity. For we know, as it were in advance, that mere juxtaposition or attachment or the like are not relations that make their relata constitute certain kinds of whole. Even a relatively young child would not be impressed by the following consideration, which has passed in certain quarters as a premise in a philosophical argument: If gluing the parts of a model airplane by together makes them parts of a whole, then gluing two people together should make them parts of a whole. For that thought seems to neglect the kind-relativity of principles of unity. (Whether it is true is another matter.)

The quasi-hylomorphic features of our conceptual scheme may be further shown by our noncollusive agreement over which parts of an object are its ordinary parts, as opposed to parts disclosed only by an arbitrary principle of division of the item. The wheel of the bicycle is readily regarded as a part of the bicycle, less so with the left half of the wheel. We treat objects as if they had relatively privileged decompositions into parts, as if there were a real distinction between a principle of unity for any such object and a mere arbitrary principle of division of the object.

These are rough and ready empirical claims, some of them well supported by evidence, others no better than plausible speculations.<sup>5</sup>

<sup>5</sup> For an experimental exploration of hylomorphic elements in our conceptual scheme, see Sandeep Prasada, Krag Ferenz, and Todd Haskell, “Conceiving of Entities

To the extent that these empirical claims are true, it might seem that philosophical Essentialism and Hylomorphism may be easily debunked. There are quasi-essentialist and quasi-hylomorphic elements in our conceptual scheme. These represent functional ways of coping with an environment that can be usefully modeled in essentialist and hylomorphic terms. But it is a philosophical error to project these aspects of our model of the environment onto the environment itself.

Maybe so; we shall have to see. For now, it is best to keep a lively sense that what is presented as philosophical Anti-essentialism is often the unwitting displacement of Essentialism onto a restricted domain. Perhaps the manifest kinds we find salient are merely nominal kinds, in the sense that their members do not share an essence. But that is very far from the thought that there are no real kinds, kinds whose members do share an essence type, in the sense of the same principle of unity and the same type of parts. Perhaps tigers do not form such a real kind, but what of isotopes or electrons? And what of sets, properties, propositions, and possible worlds; do any of these form real kinds?

Indeed, whenever a theorist talks of projections of essentialist aspects of our conceptual scheme onto the environment, we should ask about the framing elements in the theorist's hypothesis of projection. These elements include our concepts, the putative acts of projection, and the real, perhaps unknowable, things in the environment. Do any of these items make up real kinds united by common essences? Does the theorist feel, or even fall into, the temptation of treating these items as if they had an essence or real definition? (Does he, for example, provide a very elegant theory of nominal essence in terms of multiple counterpart relations among items existing in different possible worlds, and then take great care to set out just *what it is to be* a possible world? Then this is not to provide a totalizing theory of nominal essence, one that leaves no room for real essence. It is, in effect, to unwittingly imply that the worlds have real essences, but not the individuals in them. And once the worlds are granted real essences, then the modal account of *their* essence will look unhelpful.<sup>6</sup>)

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as Objects and Stuff," *Cognition*, LXXXIII (2002): 141–65, as well as Prasada and Elaine M. Dillingham, "Principled and Statistical Connections in Common Sense Conception," *Cognition* (forthcoming).

<sup>6</sup> Compare David Lewis, *On the Plurality of Worlds* (New York: Blackwell, 1986), particularly the discussions of counterpart theory and the account of what it is to be a possible world. Lewis characteristically insisted on the relativization of questions of essence to different counterpart relations across worlds; but in his wonderful book, he in fact offers a real definition of a possible world, a real definition which is not naturally

In any case, the exploration of Hylomorphism that follows may be of some interest to the inveterate Projectivist. He or she can think of it as a philosophical idealization of a possibly significant feature of our conceptual scheme.

Myself, I think that Hylomorphism captures one aspect of the implied ontology of our conceptual scheme, and may be useful in the development of a fundamental ontology; especially so in culling some of the many categories spoken of in contemporary philosophy. This is because Hylomorphism provides some philosophical apparatus that enables us to get to the base of some of our unreflective thoughts about complex wholes.

We shall also find that Hylomorphism allows a reasoned respect for our folk ontology. Here, as elsewhere, our unreflective affirmations can be saved, but only at the cost of reconsidering our unreflective denials. This, in its turn, will bear on the invidious distinction.

#### VI. TYPES OF PRINCIPLES OF UNITY

A form or principle of unity may be self-maintaining, in that the causal explanation of its holding of some parts will appeal to its having held of those parts. So consider again a hydrochloric acid molecule: what it is for that molecule to be is for there to be a positive hydrogen ion and a negative chlorine ion bonded together in a bipolar bond. The bonding pattern is the principle and the ions are the parts. But notice that thanks to the bonding and consequent electron transfer the ions are kept proximate and bonded together. In such a case, the principle of unity sustains its own holding. Similarly with the bonding of carbon atoms making up a diamond; the interatomic tetrahedral bonding is self-maintaining, in that it provides for a hardness, toughness and rigidity that preserves that very pattern of interatomic bonding.

A form or principle of unity may be *static*, in that its holding of certain parts requires that the parts it holds of remain as they are, and remain ordered as they are. So consider a word-token, certain token letters arranged in such a way as to spell the type of word in question. Changing or rearranging the letters will not preserve the identity of the word-token.

A form or principle of unity may be instead be *dynamic*, in that its holding of certain parts may allow or require that the parts it holds of vary over time; either by those very parts undergoing intrinsic

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tied to any counterpart relation. Given this, Lewis was, perhaps unwittingly, a crypto-essentialist, in the old, absolutist sense of "essentialist." An essence, properly understood, is what Lewis is attributing to his possible worlds in his discussion of what it is to be a possible world.

change, or by their being replaced with parts of the same kind, or by their being shed without replacement. A paradigm case is a living thing whose organic matter is unified into an organism by some categorical basis of a multi-track disposition to such life-functions as ingestion, assimilation, excretion, growth, metabolic repair, and so on and so forth. In this case, the principle of unity is a complex structure of biochemical relations, whose holding of the organic matter of the living thing provides the categorical basis for the multi-track disposition in question. The operation of that disposition *requires* the matter to be exchanged over time. So the principle of unity of a living thing is dynamic, in that its holding of the parts of the living thing requires that the living thing's matter be exchanged over time.

#### VII. MATERIAL OBJECTS

Material objects (middle-sized, naturally occurring, relatively compact, nonliving physical systems) are not mere bundles or sums of matter. They are materially structured matter-structurers. That is, thanks to their material structure at one time, most of that structure is likely to survive immediately after, at least in their typical environment. This turns out to be how they body themselves forward in time. So much is revealed by chemistry and the science of materials more generally. A material object's structure confers on it a disposition to maintain the material structure that is the categorical basis of this very disposition. This is the sense in which material objects have self-maintaining principles of unity.

As a result, material objects are relatively cohesive. They maintain themselves even while being moved around in their typical environment. When they are not too small and not too large they can be visually tracked and manipulated. Hence they are, along with persons, animals, and artifacts, among the most salient topics for thought and reference.

Once material objects are construed not as mere bundles of matter, but hylomorphically, the answer to the disputed question of whether there can be two material objects in the same place at the same time throughout their entire respective careers is obvious. It simply requires distinct principles of unity that happen to hold of the very same parts for the very same period of time.

That might happen this way. There could be superdense spheres which attract each other with magnetic forces so as to bind together to form something approximating a cube. The cube represents a physical system; its parts are the spheres, and its principle of unity is that they should be bound together in a cube by magnetic forces. But coexisting with this magnetic system is a gravitational system;

one with the same superdense spheres as parts and a different principle of unity, namely that the spheres should be bound together in a cube by gravitational forces.

To confirm that these are indeed distinct physical systems, we need to have a clear case in which one could exist without the other. Suppose the spheres gradually demagnetize, so that the magnetic forces that hold between the spheres eventually diminish to zero. The magnetic system is no more; but the gravitational system remains intact, the superdense spheres continue to be bound together in the cube by gravitational forces.

Nor should we say that talk of such physical systems is really talk of the spheres during a phase, such as while they are magnetically bound together, or while they are gravitationally bound together. At least we should not do this without being prepared to take the same dismissive view of all material objects. For a material object is just a middle-sized, relatively compact, nonliving (and perhaps nonartificial) physical system.

#### VIII. DISTINCT PRINCIPLES CAN MAKE FOR COOCCUPANCY

Are there other cases, besides the imagined cube, where two wholes have the very same parts united by distinct principles of unity?

Consider the spork, a camper's implement that combines the functions of a spoon and a fork. Think of it as having a bowl at one end and tines at the other.<sup>7</sup> You can make a spork in several ways. You can take a metal fork and hammer down the nonworking end and then fashion it into a bowl that will serve to spoon up food and liquids. Or you can take a metal spoon and cut thin rectangles out of its nonworking end so as to create the tines that will serve to *spear* food. (We are camping, remember.) Or you can cast the item outright. By whatever route, the result is arguably a fork and a spoon and a spork, all in the same place at the same time.

I say this with full consciousness of the fact that in some quarters the case of the spork, the spoon, and the fork will excite the temptation to treat these supposedly distinct items as only some one underlying item arranged spoon-wise and fork-wise, and hence spork-wise. The most plausible underlying item will be a physical system or structure. But this temptation, like other temptations, is inherently general. It involves a readiness to treat like cases alike. That would

<sup>7</sup> I am now told that what passes for a spork in the U.S. is a spoon with tines cut into half of its bowl. Let the reader decide whether I can keep the term "spork" for my imagined item with a bowl at one end and tines at the other; if not, I will be forced to speak of *foons*.

mean that we are to treat all artifacts as phases on underlying physical systems. And the physical systems themselves, are they any more than phases on some underlying matter? But that is a move toward fundamental ontology, toward revamping our conceptual scheme, rather than explicating it.

Let us restrict ourselves to sporks made in the third way, by being cast outright. Consider one such, and its coextensive spoon and fork. They came into being at the same time and they have common parts. The common parts of the spork, the spoon and the fork are the bowl, the stem, and the tines. The bowl is an unusual design feature of the fork, while the tines are unusual design features of the spoon. The bowl is a contingent part of the fork, it could be hammered back into a more familiar, nonworking end; as a result the fork (but not the spoon) would survive the change. The tines are contingent parts of the spoon, they could be snipped off and the spoon (but not the fork) would be truncated, but it would survive the change. So the spoon and the fork are distinct items, since one could exist without the other. Yet we can imagine a case where they always have the same parts; the tines, the stem, and the bowl.

Notice how the idea of a principle of unity helps explain this case; a case of three things with common parts, but with different (kinds of) essential and accidental parts. The spoon is the stem, the bowl, and the tines united by a dynamic principle of unity; roughly the principle that *these parts or most of them or functional replacements of most of them should be arranged in such a way as to be able to function as a spoon*. So although the principle holds of the tines, its holding of them depends not at all on their being tines as opposed to something that can be grasped in order to spoon up food or liquid. The fork is the stem, the bowl, and the tines united by a different dynamic principle of unity; roughly the principle that *these parts or most of them or functional replacements of most of them should be arranged in such a way as to be able to function as a fork*. So although the principle holds of the bowl, its holding of the bowl depends not at all on its being a bowl, as opposed to something that can be grasped in order to mash and spear and scoop up food.

By thus filling out the principle of unity for an item we can come to understand how it is that the item has some of its parts (or some of its part types) accidentally, and others essentially. Consequently, we can understand how two items can contingently share all their parts.

There is another sort of contingent part sharing; one in which there are two things with the same parts, although one of these things could grow or acquire an extra part that would count as part of it, but not of the other thing with which it formerly shared all its parts. To modify an example of Saul Kripke's: In the Australian desert there

is a particular kind of rootless tumbleweed that will only flower after a flooding rain. Many of these tumbleweeds die without ever being graced by a flower. For their whole sad lives, they consist simply of a spherical stem structure. But even such a sad tumbleweed is not identical with the stem structure which happens to exhaust its parts. For if the tumbleweed was to flower then the flower would be part of the tumbleweed but not part of the stem. What is happening here?

I say that there are two similar but distinct principles of unity in play, the one governing the stem structure and the other governing the tumbleweed. Plant biologists could tell us more about these similar but distinct principles of unity, operating at different levels of organization within the plant organism. But we can still understand the part sharing arrangement between the stem structure and the tumbleweed without these details.

Suppose the stem structure has jointed parts branching off each other. They count as parts of the stem because they are organically unified in a way appropriate to making up a stem. But they also count as part of the tumbleweed because they are organically unified in a way appropriate to making up a tumbleweed. That is why the parts of the tumbleweed are parts of the stem structure and vice-versa. Were the tumbleweed to flower, the flower and the jointed parts of the stem would then be organically unified in a way appropriate to making up a tumbleweed. Still, the flower and the jointed parts of the stem would not be organically unified in a way appropriate to making up a stem structure.

Notice that, as with the sporks, spoons, and forks, the fundamental ground for the distinctness of the tumbleweed and the stem structure is not modal. It lies in their distinct principles of unity, which allow for different kinds of variability in the parts of which they hold. Here, as elsewhere, modality is consequential upon essence and accident.<sup>8</sup>

#### IX. DISTINCT PRINCIPLES MAKE FOR COUNTEREXAMPLES TO WIGGINS'S THESIS

John Locke wrote "We never finding, nor conceiving it possible, that two things of the same kind should exist in the same place at the same time, we rightly conclude that, whatever exists anywhere

<sup>8</sup> As Fine has reminded us in a series of important papers; see, for example, "Essence and Modality," in James E. Tomberlin, ed., *Logic and Language: Philosophical Perspectives*, Volume III (Atascadero, CA: Ridgeview, 1994), pp. 1–16, "The Logic of Essence," *Journal of Philosophical Logic*, xxiv (1995): 241–73, "Senses of Essence," in Walter Sinnott-Armstrong, ed., *Modality, Morality, and Belief* (New York: Cambridge, 1995), pp. 53–73.

at any time excludes all of the same kind, and is there itself alone."<sup>9</sup> Following Locke, David Wiggins claimed that although there could be several material items in the same place at the same time, there could not be two material items of *the very same substance kind* in the same place at the same time.<sup>10</sup> A material item (a quantity of stuff or a material object or an artifact, or, more controversially, an animal or a person) will have only material parts. So it will be interesting to inquire whether there could be two material items of the very same substance kind and with the very same material parts throughout their coextensive careers.

This question, like Locke's claim and the Wiggins Thesis, is systematically underspecified thanks to the lack of specificity of 'very same kind'. For that phrase can admit of a variety of restrictions. Are not poodles all of the very same kind? Well, there is the Standard Poodle and the Miniature Poodle. But is that a difference in kind? Well, the difference between the English Racing Greyhound and the Whippet is a difference in kinds of breeding (the Whippet is related to both the English Greyhound and to the Terrier) and hence a difference in breed. Is that not a difference in kind?

Notice that these are all substance kinds in Wiggins's sense. That is, they are each such that members of the kind cannot migrate out of the kind. Once a Standard Poodle, always a Standard Poodle. But as to what makes for a difference in kind or even in substance kind, we still do not know, because as yet there is nothing definite to be known. We need to specify what we mean by a kind.

A worthwhile form of the question about same parts and same kinds focuses on what was once called *infima species*, kinds that have no subkinds, and so are the most specific of kinds. Items are members of the same *infima species* if they have just the same fully determinate essence, hence just the same principle of unity, and at the most specific level of sameness.

Could there then be two material items of the very same utterly determinate kind with the very same material parts throughout their coextensive careers? What would make them distinct? Their principles of unity would be the same and their parts would be the same. (Moreover, since by hypothesis they are entirely coextensive in space and time, they presumably came into being from the same material origins.)

Nevertheless, if we allow ever so little determinability in the kind in question, and hence some difference in the principles of unity in

<sup>9</sup> *Essay concerning Human Understanding*, 11, xxvii, 1.

<sup>10</sup> Wiggins, "On Being in the Same Place at the Same Time," *Philosophical Review*, LXXVII (1968): 90–95.

question, then we can find two material items of the very same kind with just the same parts (and in the very same place) throughout their entire careers.

#### X. THE BEGIN HIGHWAY

Consider road signs; their parts, namely “signage” and word-tokens, are material, even though their principles of unity involve intentional conditions. What a road sign can reasonably be expected to convey to passersby enters into the identity of the sign; it is part of what it is to be the sign in question. So if the same physical piece of signage first says “Roadwork Ahead” and then is repainted to say “Eat at Joe’s” we have two different signs made of the same piece of signage and different word-tokens. They also differ in what the signage and the tokens can be reasonably expected to convey. It is not a contingent feature of a sign (as opposed to a piece of signage) that it warns rather than exhorts.

Even so, the principle of unity for a sign seems to be dynamic, in that the same sign can survive some change in the word-tokens displayed upon it. So if we begin with a piece of signage that says “Eat at Joes” and the sign-maker later feels the need to correct his spelling by adding the apostrophe to indicate the possessive, so that the sign now reads “Eat at Joe’s” then this is the same sign, now corrected.

A sign can survive augmentation of its constitutive word-tokens, as well as their correction. Having corrected the spelling in the sign, the sign-maker may feel that “Eat at Joe’s” is just too unemphatic, and may add an exclamation mark to compensate. So it is the same sign that first says “Eat at Joes” then “Eat at Joe’s” and finally “Eat at Joe’s!” Each of the three sequences of tokens can be reasonably expected to convey the same message to the passerby.

So what it is for a road sign exhorting passersby to eat at Joe’s to exist at a certain place along a highway is for there to be at that place some signage visibly displaying (possibly varying) word-tokens that may reasonably be taken to convey to passersby that they should eat at Joe’s.

Now consider the (fictional) story of the Begin Highway. Between Haifa and Tel Aviv a highway is to be built in the generic American style with all the usual entries, exits, crossovers, landscaped banks, and, of course, the ubiquitous green and white signage in English. The friends of Menachem Begin wish to memorialize Begin by naming the highway after him. So they pay a Mr. Janus, who is in the business of building and maintaining signs, to put up a green and white sign naming the highway the Begin Highway.

It so happens that Janus is the very same man contracted by the highway builders to put up the usual signage around the highway. And

this calls for, among other things, a green and white sign indicating the start of the highway, a sign saying, as they do, "Begin Highway."

Janus thinks it will be frustrating to many motorists to see one English sign naming the highway the Begin Highway as well as another indicating where the highway begins. He thinks that some motorists will say "Enough already with all this Begin stuff!" while others will be thoroughly confused as to where the highway really begins. So Janus forms the plan to use the very same piece of signage and the very same word-tokens to both name the highway after Begin and to indicate where the highway begins. He thus produces two signs in the same place at the same time, and there they remain throughout their careers. The one sign, the "Begin Highway" sign, names the highway and so carries out the communicative intentions of the friends of Begin. The other sign, the "Begin Highway" sign, indicates where the highway begins and so carries out the communicative intentions of the builders of the highway. The friends of Begin drive by and only see the first sign. Most other motorists only see the second. I mean they all see the signage and the word-tokens, but only some see it as naming the highway.

The friends of Menachem Begin eventually come to realize what has happened, and they are furious with Janus. They say "The highway company paid you to put a sign there and we paid you to put up a sign there, but there is only one sign there." Janus demurs. He argues as follows:

There must be two signs there. For I could make either one cease to exist by augmenting the other. I could prefix the first word-token on the piece of signage with 'M.' and then since the signage would now read "M. Begin Highway" it could not be reasonably taken to indicate where the highway begins. By changing the signage in this way I would have augmented the sign that names the highway and caused the other sign to cease to exist. Now you can't augment something that doesn't already exist. So the sign that names, the sign you paid me for, has been there all along.

Notice that I could instead interpolate 'the' between the word-tokens on the piece of signage and then since the signage would now read "Begin the Highway" it could not be reasonably taken to name the highway after Begin. By changing the signage in this way I would have augmented the sign that indicates where the highway begins and caused the other sign to cease to exist. Again, you can't augment something that doesn't already exist. So the sign that indicates, the sign they paid me for, has been there all along.

So there have been two signs there all along.

Janus is ready to let the distinctness of the signs simply rest on a modal argument. We, however, are in a position to see what grounds his modal argument, namely the proper hylomorphic account of what it is to be this or that sign. The essence of this sort of sign requires that word-tokens be displayed on the signage for some communicative purpose. Given different communicative purposes, different sorts of variability in the word-tokens will be allowed for by the two different principles associated with the two signs. Hence, the two signs can contingently (and forever) share the very same parts, and yet be distinct thanks to these different principles.

Although I think that this is what makes Janus right about the distinctness of the road signs, my point is not to insist that there are two signs there, as opposed to one sign doing double communicative duty. The point is instead a conditional one. To the extent that we think that there is more than one sign we must think that the principle of unity for the sign that names is different from the principle of unity of the sign that indicates. It cannot be that what unites the word-tokens and the piece of signage into a road sign is just that the former is painted on a visible part of the latter. It must rather be that the tokens should be painted on the signage with the reasonable expectation that they convey to passersby that the highway is named after Begin, or alternatively, with the reasonable expectation that they convey to passersby that the highway begins near the sign. Absent something like this more demanding principle of unity for signs, there is no distinguishing the signs.

For given a single utterly specific principle of unity and just the same material parts at the same times, there is no discerning two material objects with that principle and those parts. So there is no discerning two material objects of the very same *infima species* with the very same material parts throughout their coextensive careers. But if the location of a material object is wholly determined by where its material parts are located then a version of the Wiggins Thesis follows. There is no discerning two material objects of the very same *infima species* in the very same place throughout their entire careers.

Fine has a similar example; two distinct letters consisting of the very same orthographic tokens on the very same paper.<sup>11</sup> One letter is in English and the other is in Code. The two missives achieve different communicative effects. Fine takes this to be at odds with the Locke/Wiggins Thesis. As we have seen, it is and it is not at odds with the Locke/Wiggins Thesis. Everything depends on how we con-

<sup>11</sup> Fine, "A Counterexample to Locke's Thesis," *The Monist*, LXXXIII (2000): 357–61.

strue 'same kind' as it figures in the Locke/Wiggins Thesis. What is clear is that coextensive missives in English and in Code will have different principles of unity governing the same orthographic tokens. Something of the spirit of the Locke/Wiggins Thesis, as well as the ambiguous letter of the Locke/Wiggins Thesis, is certainly compatible with that.

#### XI. AGAINST UNIQUENESS OF COMPOSITION

A commitment to Hylomorphism undermines the general claim of uniqueness of composition, the so-called "axiom" that distinct wholes must have distinct parts. This is because distinct principles of unity can be another source of distinct wholes.

A theorist might try to save the "axiom" of uniqueness of composition by treating a principle of unity as another sort of part, a property-part. So consider a molecule. On the theorist's conception, the parts of the molecule would be atoms *and* the relation of being bonded together. This "property-part" would be what distinguishes this molecule from other wholes with the just the same ordinary parts; for example, the mereological sum of the atoms.

The conception takes some getting used to. We ordinarily think that all the parts of a material object lie on or within the surface of the object. If we extend this requirement to property-parts then we will get the absurd result that relations like being bonded together can be approached. So the friend of property parts will have to get comfortable with the idea that property parts are not within the material objects they are part of. Indeed, they had better not be in space-time at all. For one cannot make sense of anything getting closer to some property. Properties, relations among them, are unapproachable.

On this conception of relations as property-parts, each material object will share parts with some state (at least if states are understood as structured complexes). So, if what it is for a certain cross to exist is for one plank to be attached to another at right angles then on the conception in question the cross consists of the planks and the relation of being attached at right angles. But those same constituents will be parts of a certain state of the planks, namely, the state of the planks being attached together at right angles.

This illustrates the central difficulty with the conception. The principle of unity for the state is distinct from the constituent relation of the state; the principle of unity in question requires that the constituent relation be instantiated by the constituent planks. But on the conception of objects as having their own principles of unity as parts, it will often be true—and this is fatal to the conception—that the principle of unity will not hold of itself and the other parts of the

object. So it is with being attached together at right angles. This is a relation that could not possibly hold of three things, one of which is a relation.

So also with bonding, a principle of unity for bonded units such as molecules. What is it for this property-part, bonding, along with the ordinary parts, to make up a genuine whole, the whole that is the molecule? The holding among the ordinary parts of a principle of unity, being bonded together, was supposed to account for why the ordinary parts made up the whole that is a bonded unit. But it does not account for why the ordinary parts and the property-part make up such a whole. For being bonded together could not possibly hold of three things, one of which is a relation.

Suppose some other relational property  $R$  held of the property-part and the ordinary material parts, and it was in virtue of the holding of that relational property of all these parts that all these parts formed a genuine whole. Well then, it is  $R$  and not being bonded together that is the principle of unity that we seek. So if  $R$  is the principle of unity, the present conception will count  $R$  as another part, alongside the ordinary parts.

The obvious problem is that there will be no general guarantee that  $R$  holds of all the parts *and itself*. Unless  $R$  is such as to hold among all the parts and itself, it cannot be the principle of unity that we seek. For since it is itself supposed to be a part, then it should hold of all the other parts and itself. Otherwise there would be no account of what in virtue of which *all* the supposed parts form a whole. There just will not be such "autological" relational properties for all of the various kinds of complex objects that there are. If  $R$  is the variably polyadic property of this, that and the other parts existing at some time or other, then  $R$  could hold of itself. But as soon as we entertain more demanding principles of unity, this special feature disappears.

This is the crux of the difficulty with the conception of principles of unity as further parts of the objects they govern. The relational properties that are the plausible "uniters" of ordinary parts into complex objects will not in general hold of the ordinary parts and the relational properties themselves. There is therefore no basis for including them as parts along with the ordinary parts in some putative object.

There is one last embodiment of the conception that is worth considering. It is this. Let in as property-parts of items what we have been taking to be principles of unity, and then give an entirely uniform answer the question of what relation must hold between the property parts and the material parts (the form and the matter, if

you will) for them to make up a whole. The uniform answer will just be that the form or property parts be appropriately *instantiated* by the material parts.

But to what purpose? The theorist now has a picture on which the principle of unity for any complex item is always instantiation. And *that* principle of unity is never included as a property part of any item. Or at least it had better not be, on pain of an ugly, part-generating regress, one involving such embarrassing things as a three-place relation of instantiation holding among a two-place relation of instantiation, the material parts, and the formal parts.

The theorist may say that she is simply granting instantiation a special status, and will not include *it* as a property part. She may then seem to have saved uniqueness of composition, the "axiom" that distinct wholes have distinct parts, if not distinct material parts then distinct property parts. And that, at least, may appear to be a worthy purpose. But upon analysis, the proffered conception of property parts still faces some difficulties, and in the end it also fails to secure uniqueness of composition.

The principle of unity of some whole may be a relational property, and so on the proffered conception, it will be factored in as a property part of that whole. Now it is appealing to think of relational properties themselves as wholes that involve relations which are partially saturated by individuals or properties, wholes whose parts, in the extended sense, are the original unsaturated relation and the individuals and/or properties which partly saturate that relation. So conceived, the U.S. mint is a part of the relational property

*x*'s having been applied to *y* at the U.S. mint in conformity with the dollar bill pattern.

Notice that this relational property might function as the principle of unity of a particular U.S. dollar bill, understood as certain quantity of ink and a certain piece of paper being so related. (Artifacts often have principles of unity involving material items extrinsic to them.) Include that principle of unity as a part of the dollar bill, and the U.S. mint will turn out to be a material part of the dollar bill, or at very least, a material part of a part of the dollar bill. This is a result to be avoided; for even if the U.S. mint were totally destroyed, no material part, immediate or remote, of the dollar bill would be destroyed.

That is something of a difficulty, but it is not the main problem for the conception of wholes as including formal as well as material parts. For if there can be two wholes with the very same material and formal parts then the conception simply fails to achieve its motivating

purpose of saving the “axiom” that distinct wholes have distinct parts. To see this consider the individual HCl molecule and these items:

The set consisting of the ions and the relation of bonding

The mereological sum consisting of the ions and the relation of bonding

While there might be something to be said for disbelieving in one or another of these two items, it is hard to do without both. On the conception under scrutiny, they share their property parts and their material parts with the molecule. But neither the set nor the sum is the molecule. They could exist even if the molecule did not. And it will not help to add instantiation to the sum or the set; for the neither the augmented set nor the augmented sum will be the molecule.<sup>12</sup>

So, given Hylomorphism, the “axiom” that distinct wholes must have distinct parts is not an appealing collateral thesis. We should give up on the generalized principle of uniqueness of composition.

Here we might note one awkward question that the foregoing raises for those ontologists attracted either to the idea of material objects as bundles of properties, or to the weaker idea that properties are among the parts of such objects. If there is no basis for including the principle of unity of a given object as a property-part of that object then will it not seem odd to include the other properties of the object as property-parts of that object? How is it that the relation or relational property that enters into the essence of an object is not part of that object, while the accidents of the object are parts the object?

Better to recognize that material objects are wholly spatiotemporal, in that all their parts are located in space and time. In this respect, they contrast with states, events, facts, and propositions, structurally conceived. Whereas these have properties as parts, material objects do not.

<sup>12</sup> Our theorist might look ahead and make something of a thought to come, namely that the principle of unity of a set is that its members exist. So the principle of unity of the set of the relation of bonding and the ions is just that the relation and the ions all exist. Why then not be true to the conception of forms as parts and treat the parts of a set as going beyond its members to include also the principle, namely, the variably polyadic relation of them all existing. So the set of bonding and the ions will have the obvious three parts and also have the variably polyadic relation of coexisting as a part. Now the set does have different parts from the molecule!

Forget the oddity of the conception so elaborated. The thing to notice is that it is extensionally inadequate because a different set, namely the set of bonding and the ions and the variably polyadic relation coexistence, will then have the very same parts as the set of bonding and the ions. The variably polyadic relation coexistence cannot be included “twice” in the set.

## XII. ONTOLOGICAL DEPENDENCE AND ITEM-GENERATING FUNCTIONS

Hylomorphism was stipulated to be the thesis that the real definition of each complex item is to be given in terms of its parts (“matter”) and principle of unity (“form”), where to give the real definition of an item is to state its essence. Associated with the ideas of real definition and essence is the idea of the ontological dependence of one item on another; where an item  $x$  is ontologically dependent on an item  $y$  just when  $y$  features at some point in the full account of the essence of  $x$  (the real definition of  $x$ ), but not vice versa. The full account of the essence of a complex item would involve its complete hylomorphic decomposition, so that when an item’s parts turn out to be a complex, the account will include the parts’ own principles of unity (forms) and genuine parts (matter), and so on and so forth, either *ad infinitum* or terminating in simples. (The infinite case shows that the full account of the essence of an item is best understood as an abstract entity that we might only be able to capture in part.)

So, to continue to operate on the level of ordinary examples (examples which a more fundamental ontological theory might impugn), my left fist is intuitively ontologically dependent on my left hand. First, what it is for my left fist to be is for my left hand to be clenched. Being clenched can here be thought of as a minimal case of a principle of unity, a monadic property applying to my left fist’s single immediate part, my left hand. Second, whatever the full account of the essence of my left hand turns out to be, it will not involve mention of my left fist. So, by the proposed criterion, my left fist counts as ontologically dependent on my left hand.<sup>13</sup>

That may seem to be the general case with Hylomorphism. In each instance a hylomorphic complex may seem to be ontologically dependent on its genuine parts, the parts related by its principle of unity. Those parts figure in the real definition of the whole, and since they could be around anyway without making up the whole, the whole will not figure in the real definition of the parts. Hence Hylomorphism seems to sit well with the thought that the whole is always ontologically dependent on its parts.

We can put that thought in terms of the idea of an “item-generating function.” Whenever some  $n$  items are the genuine parts of an item  $x$

<sup>13</sup> Ordinary ontology is often rather detailed, and it is sometimes instructive to trace its lineaments. Mike Tyson’s right fist is now twelve inches across. That could be true even if he is not now making a fist. In general, one might want to distinguish my left fist (one of the *two* fists that I *have*) from the many fists I have *made* on various occasions. The two fists I have, like the fists I make, are ontologically dependent on my hands, but in a more complex way. Their reality appears to consist in the possibility of my making fists with my respective hands.

whose principle of unity is the  $n$ -ary relation  $R$  there will be a function  $F$  based on  $R$ , a function from the  $n$  parts to the item  $x$ . Let us say that such a function is an item-generating function just when  $x$  is ontologically dependent on the  $n$ -parts.

So, we might think that there are item-generating functions such as “event-builders” and “group-builders.”

Event-builders work like this. An event, such as the stabbing of Caesar by Brutus in the senate, may be thought of as a complex item, having constitutive individuals, such as Caesar and Brutus, a constitutive property, such as the relation of stabbing, and a constitutive spatiotemporal region, the space-time region in which the event occurred. The principle of unity for the event is the constitutive individuals standing in the relation in question; in the case at hand, Brutus stabbing Caesar at a certain time and place. Associated with this principle of unity is a function from Brutus, stabbing, Caesar, and the spatiotemporal region to the event of the stabbing of Caesar by Brutus. This function is plausibly taken to be item-generating, for the event in question seems to be ontologically dependent on the constitutive individuals, property and region.

Group-builders work like this. A group, such as the Australian Council of Trade Unions, the ACTU, may be thought of as a complex item including as its components such groups (so we may suppose for the sake of our example) as the Fitters’ and Turners’ Union and the Dock Laborers’ Union. In this case, the principle of unity of the group requires that the constitutive unions enter into certain legally sanctioned relations of cooperation. Associated with this principle of unity is a function from the constitutive unions to the ACTU. This function is plausibly taken to be item-generating, for the ACTU seems ontologically dependent on its constitutive unions; it comes from them thanks to their entering into relations of mutual cooperation.

This is the common case, but is it the only case? Not if the origins of an item enter into what it is to be that item. Suppose that the ACTU acquires the legal right to create unions, and then incorporate those unions into itself. So the ACTU creates the Bank Tellers’ Union, and then allows it to join the ACTU. There is no difficulty with the hylomorphic model of the ACTU; the unions are its constituents, and its principle of unity may even be explicitly promulgated by law. What is threatened by the example is the idea that associated with this principle of unity is an item-generating function. For suppose an item’s origins enter into the essence of that item. In the case at hand, that amounts to supposing that the Bank Tellers’ Union is essentially a group formed by the ACTU; that is, if the same bank tellers had begun their union without the intervention of the ACTU

we would have a different union. Then, since the event of being formed by the ACTU constitutively involves the ACTU, the full account of the essence of the Bank Tellers' Union will involve the ACTU. So the ACTU is not ontologically dependent on its constitutive unions.

The same situation can arise in the case of events. Consider the conception of Caesar. First, it is an event that constitutively involves Caesar along with his parents or generators, whatever they were. But second, it arguably enters into the essence of Caesar. Caesar is essentially someone generated in that very way. Then the full account of the essence of Caesar would involve the event that was the conception of Caesar. So that event is not ontologically dependent on Caesar. Yet Caesar was a part of that event, in our extended sense of part.

So also with living things and those living parts which develop in them. Consider my left upper incisor. Arguably, part of what it is to be that very tooth is to be a tooth that grew into my mouth. (Well, of course, I am leaving certain gruesome possibilities aside. So, more exactly, I suppose that my left upper incisor had to develop *somewhere* in my body. The point is that it, that very tooth, could not have originated, say, by growing out of the forehead of Dick Cheney. And this is not a particular defect in the Vice President, nor in his forehead.) My body enters into the account of what it is to be that very tooth. The same with my bones; arguably they are essentially bones which grew in my body. The same with my flesh. Yet my body may be taken to be no more than this flesh and bones (matter) held back from corruption by certain metabolic processes which they together support (form). No doubt, that is an archaic and inadequate account of my body's matter and form. But the thing to notice is that if such an archaic account of the matter and form of my body were correct, my body would not be ontologically dependent on my flesh and bones.

The upshot is that not every principle of unity need be associated with an item-generating function. Hylomorphism does not itself entail that the hylomorphic whole is ontologically dependent on its parts. There can be genuine parts that are not independent of the whole.

So, for example, a Cosmic Monism, the thesis that there is one thing, the Cosmos, on which all else is ontologically dependent, need not entail that this one thing is simple, in the sense of not having parts. It only entails that the full account of what it is to be those parts must mention the one thing. Thus a version of Cosmic Monism might hold that the many material items within the Cosmos are all such that it lies in their essence to emerge in this Cosmos, just as it lies in the essence of my incisors to emerge in me.

A similar observation applies to Classical Theism, which conceives of God as the first being, a being on which everything else is ontologically dependent, and so a being which is not ontologically dependent on anything else. As it is said, the first being is *a se*, from itself and from no other. In the tradition of Classical Theism, a paradoxical consequence has been drawn from this, namely that God is utterly simple, so that his essential attributes must all be identical, *and be identical with him*. The canonical form of this argument from “aseity” to divine simplicity is given by Aquinas in *Summa Theologica*, 1.3.7, immediately after offering his famous “five ways” to the existence of God.

Every composite thing is posterior to its components and dependent on them. But, as was shown above, God is the first being.

So the first being cannot be in any way complex. Aquinas goes further and argues that even the complexity that comes from the distinctness of the existence of a thing and what that thing is, that is, its essence or essential attributes, cannot be found in the first being

In every simple thing, its being and *that which it is* are the same. For if the one were not the other, simplicity would be removed. As we have shown, however, God is absolutely simple. Hence, in God, being good is not anything distinct from him; he *is* his Goodness (*Summa Contra Gentiles*, 1.38).

And the same would hold for his Justice, and for his Power, and for each of his other essential attributes. He *is* his Justice and his Goodness and his Power! His Goodness is just his Power! It follows that God is a single attribute, which can be named as his Power or his Goodness or his Justice!<sup>14</sup>

But these paradoxical conclusions only follow given Thomas’s false assumption that every composite thing is posterior to its components, and dependent on them.

### XIII. CULLING OSTENSIBLE CATEGORIES

Our discussion of the Begin Highway highlighted this consequence of Hylomorphism: Absent a difference in origin, there cannot be two items with the very same parts and the very same principle of unity.

Once a Hylomorphic View of complex entities in whatever category is adopted, this consequence can be used to cull ontological categories, be they folk categories or fundamental categories. For we

<sup>14</sup> Alvin Plantinga quite plausibly argues that this view of the first being as an attribute makes nonsense of traditional theism; see *Does God Have A Nature?* (Milwaukee: Marquette, 1980).

often work with pairs of categories whose examples exactly match in parts and principles. This can be most readily seen in the case of the categories of the state (event) and the fact; more controversial perhaps, will be the case of the categories of the set and the mereological sum.

An initial distinction between facts and states might be made this way: Facts obtain, whereas states hold of their constituent individuals.

On the face of it, states are picked out by nominals with such forms as ‘the *F*-ness of *a*’, or perhaps ‘*a*’s being *F*’, whereas facts are picked out by nominals like ‘the fact that *a* is *F*’. Some philosophers would add to this merely linguistic distinction the observation that states are the *slowest* events; that is they are like events in having constitutive individuals and properties, but unlike them in that the constituent individual’s having the constituent property does not necessitate that there is or was a change going on. Whereas something could be red or square or positively charged throughout a period in which it did not change, nothing could be a stabbing of Brutus by Caesar without some change in Brutus and Caesar thereby taking place. Neither states nor events obtain, but facts do. (Events occur. In what follows, I will let states stand in for events as well; the point will be that once we have states and events, there is no room for a basic category of facts.)

Now Stephen Neale, in his comprehensive work *Facing Facts*, has set out a very strong case to this effect: The best way to avoid a trivialization of the notion of fact by way of the “slingshot argument” is to adopt a structural conception of facts; that is to say, a conception of them as complexes built up out of their constitutive individuals and properties.<sup>15</sup> The structural conception of states is equally plausible; states can be understood as complexes built up out of their constitutive individuals and properties.

So far, so good. Hylomorphism implies that there can be distinct items with the very same parts. All that is required is that the items have distinct principles of unity. Indeed, if the principles of unity of the items are sufficiently different, then it may make sense to locate them in different categories.

But given the structural conception of states and facts, the situation seems to be this: for each state, we can find a fact with the very same parts and principle as the state; and for each fact, we can find a state with the very same parts and principle as the state. And the corresponding states and facts will not differ in their origins. (Of course, you might say that facts originate from facts, and states from

<sup>15</sup> Neale, *Facing Facts* (New York: Oxford, 2000).

states; but this is just to move the bump in the carpet.) Surely then, talk of the state and the corresponding fact is double counting; there cannot be two items such that the full account of what it is to be the one is identical with the full account of what it is to be the other.

To illustrate, consider these respective depictions of the state of an apple's weighing half a kilogram and the fact that that apple weighs half a kilogram, where the distinct bracketing marks the alleged difference between the state and the fact.

[The apple, the property of weighing half a kilogram]

{The apple, the property of weighing half a kilogram}

Since the state and the fact have the same constituents, and origins are not differentiating factors, the state and the fact are distinct only if they have different principles of unity. Yet there seems to be no difference in principle of unity. What it is for the state to exist is not just for the two constituents to exist, but also for it to be the case that the constituent individual has the constituent property. What it is for the fact to exist is not just for the two constituents to exist, but also for it to be the case that the same constituent individual has the same constituent property. But now Hylomorphism tells us that we are here double counting, one thing is being mistaken for two. And the problem is obviously quite general.

The only choice that respects the original categorical distinction ("Facts obtain, whereas states hold of their constituent individuals") is to jettison one of the two putative categories of state and fact, at least if both are given a structural treatment.

Faced with this choice, we might jettison facts as a basic category because we believe that all the respectable work done by facts can be done by true propositions. This remains so even on a structural conception of propositions as complex wholes, at least so long as propositions have different principles of unity from the states to which they sometimes correspond. But if propositions are complex wholes, then what is *their* principle of unity? It is a question that has proved difficult to answer.

#### XIV. WHAT IS THE PROBLEM OF THE UNITY OF THE PROPOSITION?

Recently, there has been a revival of the so-called problem of the unity of the proposition. For example, in his posthumous book, *Truth and Predication*, Donald Davidson continually worries around this problem, suggesting that the problem can be solved, or at least bypassed, by way of Alfred Tarski's definition of truth in terms of satisfaction.<sup>16</sup>

<sup>16</sup> Davidson, *Truth and Predication* (New York: Oxford, 2005).

The problem of the unity of the proposition may be introduced this way. Propositions, if they are anything, are at least what sentences can be used to assert. An assertoric use of a sentence is true just in case the proposition asserted is true. An assertoric use of a sentence is false just in case the proposition asserted is false. So propositions, if they are anything, will be bearers of truth value. Now semantics is *inter alia* the discipline of looking for semantically significant subsentential expressions, parts of sentences that can be construed as making systematic contributions to the propositions expressed by those sentences. On a structural conception of propositions as complex wholes, it is natural to think of semantically significant subsentential expressions as contributing constituents to the proposition expressed by the sentences in which those expressions figure. So, in the simplest case of a subject/predicate sentence, such as

Aristotle liked dogs

we may think of the name 'Aristotle' as contributing the item Aristotle (or alternatively, a mode of presentation of that item) to the proposition expressed by the sentence. And we may think of the predicate 'liked dogs' as contributing either a set of all the dog-likers or the property of having liked dogs (or alternatively, a mode of presentation of that set, or of that property) to the proposition expressed by the sentence. We will then have two items that are constituents of the proposition; for specificity sake we make take them to be Aristotle and the property of having liked dogs. Neither is a bearer of truth value. Nor is the mereological sum of these two items a bearer of truth value, nor is the set of these two items a bearer of truth value, nor is the group consisting of these two items, nor is the sequence consisting of these two items. None of these things could be true or be false, without the stipulation of some further convention for assigning truth and falsity. We can *introduce* a sense in which they might be called "true" or called "false" say by requiring that their constituent property holds of their constituent individual.<sup>17</sup> But the arbitrariness of the procedure is brought out by the following question. The sum, the set, the group and the sequence are all distinct, yet by the obvious convention they can each be called "true"; so which of these true but distinct items is the true proposition that Aristotle liked dogs?

<sup>17</sup> Of course, in the case of the sum, the set and the group we have no obvious way to generalize to the relational case. Only sequences will work for that; but even so, why cannot certain sums like the sum of Aristotle and the property of liking dogs be true, given the obvious convention?

The problem of the unity of the proposition is then two-fold: How is it that items like Aristotle and the property of liking dogs make up some third complex item, the proposition that Aristotle liked dogs, and how is it that a complex item like this, unlike the sum or the set or the group or the sequence of the constituents, is a nonarbitrary bearer of truth value?

The whole force of the problem will now be seen to rest on the idea of a “nonarbitrary” bearer of truth value. What exactly does that idea come to? This obscurity, it seems to me, is what has led to the neglect of the problem of the unity of the proposition. However, the notion of a principle of unity can be used to explicate the relevant idea of arbitrariness, so as to restore a sense of the problem.

We can divide the propositional constituents of the simplest propositions into *topics* (like Aristotle) and *predicables* (like the property of liking dogs). Topics can be either the referents of singular terms or items in the domain of quantifier expressions. Let us define individuals as topics that cannot be predicated of anything, and allow that properties can be both predicables and topics, depending on the proposition. (As in: Liking dogs is a virtue in a dog-catcher.)

Suppose we then say of the sum of Aristotle and liking dogs that it is true just in case the predicable element—the property of liking dogs—holds of the topic, Aristotle. Or suppose we say of the ordered pair of liking dogs and Aristotle that it is true just in case the first member is had by the second. What is wrong with that?

The sum and the ordered pair each have their own principle of unity. In the case of the sum, it is the existence of Aristotle and the property, in the case of the ordered pair it is their existence and their being ordered in a certain way. The crucial observation is this: Such principles of unity do not themselves explain how the wholes that they generate are capable of truth and falsity. So the wholes in question are not the sorts of things that are intrinsically capable of being true or false; that is, capable of being true or false without further convention. We need to associate truth or falsity with sums or ordered pairs by way of a convention, a further rule that is not itself an expression of the principle of unity for the wholes in question. That is why sums and sets and sequences are none of them propositions.

What is the contrast case? What sort of principle of unity would unite topics and predicables in such a way that the resultant whole would be intrinsically capable of taking on a truth value, where which value it takes on depends only on how things stand?

We do know one thing about the relation that has to hold of Aristotle and the property of having liked dogs for them to comprise the complex that is the proposition that Aristotle liked dogs. It has to

be utterly undemanding. For we want this proposition to exist and have those items as constituents whether or not Aristotle liked dogs. For the proposition that Aristotle liked dogs could be falsely believed, and falsely asserted.

Moreover, the proposition that Aristotle liked dogs, could be falsely believed and falsely asserted even if it lay in Aristotle's essence to *dislike* dogs; that is even if it was simply impossible that Aristotle liked dogs. All that is required is the property of having liked dogs be predicated of Aristotle. That is enough for the proposition to exist. If we must have propositions, then I favor this "predicational" account of the unity of the proposition. Let us now try to see a little further into the idea.

Some predicables and topics fit together in the sense that the predicable can be predicated of the topic or topics. For one thing, fitting together requires that the predicable have the same number of argument places or "unsaturated positions" as there are topics. So being the brother of is not predicable of Aristotle, nor of Aristotle, Socrates, and Plato. For another thing, fitting together requires a match of logical type between the argument places in the predicable and the topics, so that the relation of instantiating cannot be predicated of Aristotle and Socrates, because both are individuals. Some philosophers might add a third requirement on fit; it must not be a category mistake to predicate the predicable of the topics; as when we (try to) predicate sleeping in of Saturday.

An objectivist about predication, one who regards predications of fitting predicables of topics as existing anyway, and not as just the outcome of judgments, might well believe that when it comes to predicability, all the possibilities are realized; predicability guarantees predication. Whenever *F*-ness is predicable of *a*, then there will be something that is the predication of *F*-ness of *a*. Given that, we can identify the proposition that *a* is *F* as the predication of *F*-ness of *a*. We may think of that as a complex item built up from *F*-ness and *a*, by way of the relation of being predicated of.

So what it is for the proposition that Aristotle liked dogs to exist is for liking dogs to be *predicated* of Aristotle. That is why propositions are so numerous; it is very easy for them to exist.

The obvious hitch is that the predication of *F*-ness of *a* may seem to be just the act of judging that *a* is *F*. But the objectivist must deny this. What the objectivist about propositions needs to do in order to make the present account persuasive is to bring out an act-object ambiguity (or better polysemy) in the use of the term 'predication', rather like the act-object ambiguity in the use of the term 'explanation'.

An explanation is sometimes a type of act that I can go in for, as when I explain why I missed the meeting. But in doing that, I relate

myself and my audience to an objective item, an explanation, which exists even if I do not attempt to explain myself. (One may think of an objective explanation as some kind of derivation, deductive or probabilistic, of a proposition expressing the *explanandum* from a proposition expressing the *explanans*.) My act of explaining must characterize enough of the objective explanation to count as giving *that* explanation, as opposed to some other objective explanation, or no explanation.

Similarly, when I perform the act of predicating *F*-ness of some individual *a*, I thereby relate myself in judgment to an objective entity, the predication of *F*-ness of *a*. I judge true the predication of *F*-ness of *a*. But this predication of *F*-ness of *a* is just the proposition that *a* has *F*-ness.

Just as there are explanations that are too complicated for us to grasp or give, there are predications that are too complicated for us to grasp or judge to be true. But the predications, like the explanations, exist anyway. They are not mind-dependent entities, even though in order to grasp or believe them we must perform a mental act that corresponds to their structure.

Again my point is a conditional one, serving just to highlight what a solution to the problem of the unity of the proposition would look like. *If* there are such things as objective predications, then they would be potential bearers of truth value *intrinsically*, in a way that sets or sums or series of topics and predicables are not. *For the holding of the very relation that is the condition of unity for the whole that is the predication that *a* is *F*, namely that *F*-ness be predicated of *a*, itself will guarantee that the whole is a potential bearer of truth value, depending just on how things stand.* This is not so with the set, or the sum, or the series. The possibility of their being true or false has to be associated with such entities from without, by way of a convention.

The predication of *F*-ness of *a* will be true just in case *a* instantiates *F*-ness, and not true otherwise. The predication of *F*-ness of *a* is thus intrinsically capable of taking on a truth value, where which value it takes on depends only on how things stand.

Should we believe in objective predications, and so in propositions so conceived? Here I take no fixed view. But it might be said that we have already helped ourselves to some such notion when we talk of the possibly infinite well-formed formulas of some formal language based on first-order logic. For if they are to be bearers of truth and falsity then the well-formed formulas of such a language are not mere concatenations of expressions. They must essentially involve predications of predicables (here taken to be mere predicates) of items that are either the referents of singular terms or lie in the domain of the quantifier

expressions. Such predications are obviously objective. They run far beyond any predications users of the formal language might make.

As Davidson points out, if we could suppose that we only had to deal with first-order languages, we might follow Tarski's definition of truth in terms of the satisfaction of predicates by sequences, and then seem to have a way of bypassing the problem of the unity of the proposition. After all, the sequence <Aristotle> satisfies the predicate 'liked dogs'. And without further convention this guarantees that 'Aristotle liked dogs' is true. Here Tarski's definition of truth in terms of satisfaction shows how truth is intrinsically associated with the wholes that are *sentences* of first-order languages. But notice that this is only so if we are treating the sentences not as mere concatenations of expressions, but as involving such semantic features as the predication of predicates of the references of singular terms. The whole Tarskian approach depends on seeing such expressions as 'liked dogs' in sentences like 'Aristotle liked dogs' as predicated of something and not just concatenated to the name 'Aristotle'. Clearly, this needs to be objective predication, a relation that holds of predicables and topics independently of what particular things we happen to judge.

Expand your notion of predicables from predicates, understood as subsentential expressions, to properties, and the more general notion of objective predication will serve to solve the problem of the unity of the proposition, even as it might arise for languages whose sentences do not have merely first-order logical forms, languages that are not easily provided with a Tarskian definition of truth in terms of satisfaction.

Given the forgoing, the notion of a principle of unity can be used to explicate, if not actually vindicate, a strong version of the idea of truth-making that is at the core of the correspondence theory of truth. We have states, that is, wholes which have properties and sequences of items as parts, wholes whose principles of unity require that constituent property be instantiated by the constituent sequences. And we have simple propositions, that is, wholes which have properties and sequences of items as parts, wholes whose principles of unity require that constituent property be predicated of the constituent sequences. We can now say that the truthmaker for a proposition is the state which is the "instantiation variant" of the proposition. This will be the whole that differs from the proposition in just this respect; whereas in the proposition the constituents are unified by predication, in the state the very same constituents are unified by instantiation.<sup>18</sup> A proposition is true

<sup>18</sup> That is how truth-making will go on a Russellian conception of propositions as having (sequences of) topics and predicables as constituents. On a conception of propositions that replaces (sequences of) topics and predicables with modes of pre-

if there is a state that is its instantiation variant. That is the base case. Other propositions are made true by being entailed by those with instantiation variants. So a proposition is true if it has an instantiation variant or is entailed by a proposition which does.

#### XV. SHOULD WE CULL SETS OR CULL SUMS?

This overview of the usefulness of the notion of a principle of unity would not be complete without deploying it to put some pressure on those theorists who believe there are both sets and mereological sums.

This rather common attitude may be no more than a pleasing symptom of the catholic approach to initial steps in ontology, the approach that was praised in section II. Nonetheless, as a position in fundamental ontology, it must strike the historian of philosophy as rather odd. About eighty years ago, Stanisław Leśniewski introduced mereological sums in order to replace sets. After all, the most natural theory of sets had turned out to be *logically* inconsistent, and there was no obvious way of *minimally* modifying the most natural theory so as to avoid just the sets whose existence is ruled out by logic alone. Even more pertinent to the present discussion, Leśniewski was repelled by what he saw as an orgy of double counting in set theory, involving such distinctions as that between the set  $(a, b, c)$  and the set  $(a, b, (c))$ .<sup>19</sup> Mereology was to be the solution to both problems.

One way to introduce Mereology is to start with the notion of a part and then introduce two definitions, thus

D1:  $x$  and  $y$  *overlap* just in case they have some common part.

D2: An item is a *fusion* of some other items just in case it has all of them as parts and has no part that does not overlap with any of those items.

The characteristic axioms of Mereology are then stated as follows:

That a part of a part of a mereological sum is also part of that sum.

That there is no restriction on the formation of mereological sums, that is, given any items there is some mereological sum that is their fusion.

That the mereological sums so formed are unique, that is, given any items there is just one mereological sum that is their fusion.

That every mereological sum is part of itself.

sentation of the same, we can first imagine the Russellian "shadow" of the proposition consisting of say the sequence of the presented topics and the presented predicables. We will then say that the truthmaker for such a proposition is the instantiation variant of the sequence which is the Russellian shadow of the proposition.

<sup>19</sup> For a presentation of Leśniewski's theory, see Henry S. Leonard and Nelson Goodman, "The Calculus of Individuals and Its Uses," *Journal of Symbolic Logic*, v (1940): 45–55.

We have already seen more than enough to forever resist the temptation to suppose that Mereology is the *general* theory of parts and wholes. We know that wholes do not in general satisfy uniqueness; more than one whole can arise from the very same items by way of different principles of unity holding of those items. The general theory of parts and wholes would be given in the full development of Hylomorphism, not in Mereology.

As formulated however, the above postulates are meant to bring into view a particular kind of whole, the mereological sum. The question arises as to what the principle of unity of a sum is.

One thing is certain; sums lack distinguished principles of unity. If  $S$ , the sum of  $a$  and  $b$ , is summed with  $S'$ , the sum of  $c$  and  $d$ , then of the resultant sum  $S^*$  it is equally correct to say:

What it is for  $S^*$  to exist is for  $S$  and  $S'$  to exist.

What it is for  $S^*$  to exist is for  $S$ ,  $c$ , and  $d$  to exist.

What it is for  $S^*$  to exist is for  $a$ ,  $b$ , and  $S$  to exist.

And so on, for any divisions of  $a$ ,  $b$ ,  $c$ , and  $d$ . For any principle of division of the sum, we have something that corresponds to a principle of unity for the sum. A sum, unlike a set of sets, or almost every other kind of item, has no articulated structure; at least none that does not derive from the individual structures of the items that are its parts. (And here is another route to the conclusion that dinner parties, molecules, stars, organisms, word-tokens, and so on and so forth, are not sums. They all have a natural structure of distinguished genuine parts determined by demanding principles of unity. Notice that this is a consideration distinct from that involving the modal differences between these items and the corresponding sums. It also means that much of contemporary ontology is disabled by a much too simple conception of wholes. This is so even if there are mereological sums, contrary to the indications noted below.)

This bears on the ground of the principle of uniqueness of mereological summation, and on why uniqueness of composition fails once we allow other sorts of items. It is because mereological sums have no articulated structure that there is no basis for distinction among *mereological sums* with just the same parts. But, for other kinds of items, a structure-inducing principle of unity can be such a basis.

Here is a plausible principle of unity for mereological sums, one which explains their utter lack of structure: All a sum requires of its parts is that they all exist. That is why the sum of my molecules is no better and no worse a sum than the sum of the Eiffel Tower and my left foot. All of these summands are on a par, in that they exist. All

the fiat parts of the sum are on a par, in that they exist. There is no basis in the principle of unity of a sum for the distinction between genuine and fiat parts. So there is no such distinction between the parts of a sum. Assigning sums that uniform principle of unity explains why there cannot be two mereological sums with the same parts. Every sum requires only existence of its parts, so if one sum has the same parts as another sum, then “they” will be the very same sum, because “they” have the same parts and principle of unity.

The sum is thus a sort of null whole, the limiting case of a whole, a whole with the least demanding principle of unity, namely just that its elements exist. There is no reason why a Hylomorphist should doubt that there are such null wholes.

Yet when we bring Hylomorphism to bear on *sets*, we discover an interesting tension. What is the principle of unity of the singleton of Socrates? What property must hold of Socrates for the singleton of Socrates to exist? Obviously, all that is required is for the singleton of Socrates to exist is for Socrates to exist. Similarly for the pair set of Socrates and Plato; all that is required for this pair set to exist is for Socrates to exist and Plato to exist. Similarly for all of what we might call the “flat sets,” those sets whose members do not include sets. The principle of unity for the flat sets is simply the existence of their members. So much seems obvious once we treat sets as wholes whose parts are their members. But why should we do that?

The hypothesis that in general sets are wholes, with their members as parts, and whose principle of unity is just the existence of the members, serves to explain the criterion of individuation for sets. That criterion is captured by the Axiom of Extensionality which has it that sets are identical if and only if they have the same members. From left to right, we have an instance of the general principle that wholes are identical only if they have the same parts. From right to left, we can reason in the following way. Suppose sets  $x$  and  $y$  have the same members and thus the same parts, then  $x$  and  $y$  will be distinct items only if they have distinct principles of unity. But the principle of unity for sets in general is the existence of their members. So  $x$  and  $y$  are identical if they have the same members. We thus derive the Axiom of Extensionality from the account of what it is to be a set.<sup>20</sup>

<sup>20</sup> In *Parts of Classes* (Cambridge: Blackwell, 1990) David Lewis offers us a quite different conception of the constituents of a set. He takes them to be the subsets of the set! Think, he says, of a set as a mereological sum of the singletons of its members. Then a set will be identical to the sum of the members of its power set. But, as Lewis notes, we need to take the relation between an item and its singleton as a nonmereological relation. Of course, from the point of view of the present paper, that is a non-

This is just what we should expect in the more general case, the criterion of individuation for members of a kind of complex whole should be accounted for by the essence of the complex whole. That is, the criterion of individuation for items of a given kind of complex whole should be derivable from the account of what it is to be an item of that kind, an account which invokes the parts, origins, and principles that are characteristic of items of the kind in question. In the case of sets, the relevant derivation (which need not invoke origins) is what vindicates conceiving of the members of sets as parts of the sets.

Given that the principle of unity for sets is the existence of their members, it may now seem that Leśniewski was right to see in set theory an orgy of double counting. Focus on the structured sets, the sets with sets as members, for example, the pair set of Socrates and the singleton of Plato (Socrates, (Plato)). What is the principle of unity of the structured sets? If the set is not a gerrymandered kind, utterly unfit to be a category, then the flat sets and the structured sets should have the same principle of unity. So what it is for the pair consisting of Socrates and the singleton of Plato to be? Surely it is for Socrates to be and the singleton of Plato to be. Now, what is it for the singleton of Plato to be? Surely it is for Plato to be. Let us now put together these last two claims. What it is for the pair consisting of Socrates and the singleton of Plato to be is for Socrates to be and for Plato to be.

The problem is obvious; that account of what it is for the pair consisting of Socrates and the singleton of Plato (Socrates, (Plato)) to be is identical to the account of what it is for the pair consisting of Socrates and Plato (Socrates, Plato) to be. Yet set theory tells that these two sets are distinct.

mereological relation of part to whole. Socrates stands in the same relation to {Socrates} as he does to {Socrates, Plato}, namely membership, and membership is a nonmereological relation. For it allows for iterative structure.

Lewis's appeal to a set's subsets, rather than its members, as the parts of the set, seems to flout the order of explanatory dependence. Surely, we explain the truth that sets  $x$  and  $y$  have the same subsets if and only if  $x = y$  by the more fundamental truth that sets  $x$  and  $y$  have the same members if and only if  $x = y$ . We simply appeal to the standard definition of subsets. The more fundamental truth about members and identity is explained in terms of the parts and principle of a set. Lewis's less fundamental truth about subsets and identity is an explanatory epiphenomenon when it comes to the parts of sets.

From the point of view presented here, *Parts of Classes*, like so much of Lewis's work, takes the oddest kind of whole, the mereological sum, to be the only kind of whole, and hence as the only model for thinking of sets as wholes. Why should not sets exhibit their own distinctive kind of whole?

This is one way of reconstructing the feeling that there is an orgy of double counting in set theory.

What has gone wrong? Certainly there can be nothing wrong with the mathematical practice of set theory, understood as the exploration of an abstract structure with certain features. And indeed, there does seem to be a class of items where the distinctions due to iterative structure are real distinctions. This is the case with groups (in the ordinary, not the mathematical, sense.) Go back to the case of unions, and suppose then that the constitution of the ACTU is as follows:

<Dock Workers' Union, Fitters and Turners' Union>

For all that has been said, the Fitters and Turners' Union could be a higher-order union consisting of the Fitters' Union and the Turners' Union. On that assumption we could depict the above constitution of the ACTU as follows:

<Dock Workers' Union, <Fitters' Union, Turners' Union>>

But now suppose that the Dock Workers' Union, the Fitters' Union, and the Turners' Union are deeply unhappy with the ACTU. Still the hierarchy of the Fitters and Turners' Union is on good terms with the hierarchy of The ACTU. So the three unions, the Dock Workers' Union, the Fitters' Union, and the Turners' Union form a new group, the Australian Organization of Trade Unions, the AOTU. The Fitters and Turners' Union refuses to join the AOTU.

(Do not say that this is just a philosopher's example; union politics is actually much more Byzantine.)

We have then the following consistent situation, where the bracketing indicates a group:

The ACTU = <Dock Workers' Union, <Fitters' Union, Turners' Union>>

The AOTU = <Dock Workers' Union, Fitters' Union, Turners' Union>

The Fitters and Turners' Union = <Fitters' Union, Turners' Union>

Obviously, distinguishing the ACTU and the AOTU in this way is not double counting. They have different members; for example the Fitters and Turners' Union is a member of the ACTU and not the AOTU. This is entirely compatible with the Fitters and Turners' Union being a group consisting just of the Fitters' Union and the Turners' Union.

The example illustrates how the structure of groups allows for what would otherwise be double counting. Although

The Fitters and Turners' Union = <Fitters' Union, Turners' Union>

what it is for the Fitters and Turners' Union to exist is *not* just for the Fitters' Union to exist and for the Turners' Union to exist. The two unions have to be in an appropriate association. This is a more demanding principle of unity than mere existence, the principle required for the two unions to form a set of which they are members.

Those reflections suggest the following thesis; the accusation that set theory involves an orgy of double counting fails, once we understand the structure of sets as if it were abstracted from the structure of groups, where groups have relatively demanding principles of unity.

On this defensive line of thought the set, understood as a *philosophical* category, that is, a fundamental kind apt to be appealed to in philosophical explanations, is still under some tension. The mathematical enterprise of set theory is concerned with a structure that is found in (ordinary) groups, thanks to their demanding principles of unity. But in focusing on that structure, it has abstracted away from the substantial principles of unity that made that structure possible. This is shown by the utterly undemanding unity condition for sets. Although it is full of mathematical interest, set theory is neither the general theory of groups in the ordinary sense, nor the simple theory of those items that exist just when their constituents do, namely the mereological sums. The category of the set combines the flat and undemanding principle of unity of sums, the mere existence of the elements, with the articulated structure that comes with the substantial principle of unity of groups. If this is so, then the putative category of the set is too gerrymandered a kind to count as a real category.

So the defensive line of thought treats sets as what we might call "phantom" wholes; sets mimic the structure of groups without having the substantial principles of unity that make that structure possible. The defensive line of thought does not threaten the mathematical interest of set theory. But it does imply that as philosophers we should not place too much explanatory weight on the category of set. What remain are the categories of the sum and the group.

#### XVI. SAVING IMPURE SETS AT THE EXPENSE OF SUMS

I believe we can do better than this defensive line of thought. Its verdict against the impure sets may be turned around, to the discredit of sums. The leading idea is that if there is some whole whose principle of unity is just the existence of its members or elements then it will be natural to identify such a whole with a certain state or condition of its members or elements, namely their existence. So both impure sets and sums cry out to be identified with the existence of

their elements. But the existence of something is quite generally not identical with the thing in question. Once we see that, the “flatness” of sums, their lack of iterative structure, looks at odds with their principle of unity.

To begin to illustrate the idea, let us first fix on a particular view of existence. We might suppose existence is a “first-order” property, properly expressed in English not by the particular quantifier ‘some’ but by the predicate ‘exists’. One reason for thinking that existential import is not carried simply by the semantics of the particular quantifier is to be found in the *logical* coherence of certain statements or thoughts, which would be logically incoherent if the particular quantifier invariably carried existential import as a purely semantic matter. So an ontologist might theorize that there are generative processes which can reach a very late stage, a stage at which there is a definite individual who would come into being if the process were allowed to continue. As it happens, some of these processes have been aborted at some such late stage. As a result, so the ontologist supposes, there are some individuals which have been prevented from existing. This entails that there are some individuals that do not exist.

The thought that there are some individuals that do not exist may be false, and necessarily so. But is it *logically* incoherent, false just in virtue of its logical structure? It seems not, and the cost of recognizing that is to decouple existential import from the particular quantifier. There is then room for existence as a significant first-order property.

When you have properties and items they hold of then you have states or conditions. If *F*-ness holds of *a* then we can then speak of the *F*-ness of *a*. And we might countenance this state or condition of *a* as a further item distinct from *a*. (Since it is not a material object, but a state, we might think of it as having *F*-ness and *a* as parts.) So if existence is a property and *a* exists then we might countenance an item which is *the existence of a*. And so also for *a* and *b*; if they exist then we might countenance an item which is *the existence of a and b*. The first item would bid fair to be the singleton of *a*, for it is an item whose existence requires no more than that *a* exists. The second item would likewise bid fair to be the pair set of *a* and *b*. The operator “the existence of” is thus to be understood as expressing a variably polyadic relation which holds of *a, b, c...* when they all exist.

Here we have a way to generate impure sets just on the assumption that their principle of unity is that their members all exist. Associated with this relation is an item-generating function which takes us from any existent items to a set of those items understood as the existence of those items.

Well, why is it the impure *sets* that are generated, rather than the corresponding sums? It all depends on whether we take the function associated with the operator ‘the existence of’ to iterate significantly, so that

The existence of the existence of  $a, b, c, \dots$  is a distinct item from the existence of  $a, b, c, \dots$

If so, we can produce a hierarchy of impure sets by the iteration of this function.

Once we think of the function as item-generating, that is, taking you from  $a$  to another item which is the existence of  $a$ , then it is very natural to think of the function as iterating significantly, so that it takes you from the item that is the existence of any given item to another item which is the existence of the given item. So the existence of the existence of  $a$  is distinct from the existence of  $a$ . It seems then that we can recover a hierarchy of impure sets by allowing iterations of this item-generating function. Conceived of in this way, the impure sets look like they form a real kind, for they have a uniform principle of unity.<sup>21</sup>

Impure sets are here being represented as “existential states” of their members. Given this representation, the members of the sets are parts of the set, but so also is the property of existing which is the principle of unity of its members.

Just to be clear about the scope of the present point, we are not here trying to offer a philosophical reconstruction of a particular mathematical theory of sets, but only to bring into clear view the idea of a whole that has two defining features, namely

- (a) Its principle of unity is the existence of its members.
- (b) It allows for internal structure in the way that a sum does not.

<sup>21</sup> The reader will have noted that I have said nothing of the null set. On the (logically inconsistent) view that sets just are the extensions of predicates taken as wholes, the null set is no more problematic than a predicate that is satisfied by nothing at all. On successor notions of the set, such as that embodied in the hierarchy of ZF, the empty set looks like a mathematically harmless limiting case where we are treating having zero members as a way of having members. One notion of the null set that is consistent with the present discussion is the conception of the null set as the singleton of an arbitrary item, an item that is no item in particular. So there is no particular item which is member of the null set. Pure set theory then looks like an abstraction from all details concerning the nonsets that might be members of sets.

There are a number of tenable views of arbitrary items. On one view, an arbitrary item is an arbitrarily chosen item spoken of under a conspiracy of silence as to which item it is. For a different conception, see Fine’s *Reasoning with Arbitrary Objects* (New York: Oxford, 1983).

The point is that the second is naturally seen as a consequence of the first, once we understand the first as encouraging the identification of the whole with the existence of its members.<sup>22</sup>

As this point suggests, the sums will now seem most puzzling. As with the impure sets, their existence requires only the existence of their parts or elements. So, just as we found reason to identify the set of  $a$  and  $b$  with the existence of  $a$  and  $b$ , we have reason to identify the sum of  $a$  and  $b$  with the existence of  $a$  and  $b$ . But then, since the function in question significantly iterates, there should be another sum corresponding to the existence of the existence of  $a$  and  $b$ . This latter sum would be a sum which had only  $a$ ,  $b$ , and perhaps existence as summands, but was distinct from the sum of  $a$ ,  $b$ , and existence. And it is axiomatic that there is no such sum.<sup>23</sup>

<sup>22</sup> One way in which the identification of impure sets with the existence of their members differs from the notion of a set implied by some mathematically useful set theories is that the identification seems to make no room for self-membered sets.

<sup>23</sup> Here is an option for the mereologist: Follow Judith Jarvis Thomson and distinguish what she calls "all-sums" and "some-sums"; where the first exist only when all their parts exist, while the second exist when at least one of their parts exist. See Thomson's "The Statue and the Clay," *Noûs*, xxxii (1998): 149–73; and also Fine's "Compounds and Aggregates," *Noûs*, xxviii (1994): 137–58, where compounds are very like all-sums and aggregates like some-sums. I believe that in most philosophical applications of mereology, it has been some-sums which were in play. So the four-dimensionalist supposes that I am a some-sum of temporal parts.

Impure sets, it might be said, compete with all-sums in respect of parts and principles, but do not compete with some-sums. For an impure set exists at  $t$  only if all its members exist at  $t$ . So we can distinguish some-sums and impure sets, and allow for both.

That thought does not survive the argument in the main body of the text. The proposed principle of unity for some-sums is this: the  $x$ s exist at some time or other, where the  $x$ s are the relevant summands. There is then a state of the  $x$ s which is their existing at some time or other. And there is another state of that state existing at sometime or other (presumably this state exists at any of the times at which one of the  $x$ s exist.) So once again, on the proposed principle of unity for some-sums, there ought to be two sums with the very same summands. But it is axiomatic that there are not such sums.

Hence the argument in the main body of the text goes through even if sets are all-sets and sums are some-sums.

Another remark about sum-sums and all-sums is worth making. Consider the happy period when Plato and Socrates both existed. If we believe in some-sums *and* all-sums, then we should admit that during that period there were two sums with Plato and Socrates as summands, sums distinguished by their distinct principles of unity. To accommodate this, we could contemplate a natural restriction on the axiom that distinct sums have distinct summands, namely that this is true only if they are both all-sums or both some-sums.

Once we see that, a similar view of impure set theory might seem plausible. So there is room to recognize some-sets as well as all-sets. But then each some-set will have the same parts and principle of unity as a some-sum, and each all-sum will have the same parts and principle of unity as an all-set. The sets will again "drive out" the sums.

Notice that this same defense of sets over sums may be mounted by those who take one of the standard (though I think, strained) views of existence. These are that existence is either the second-order property of being of being an instance of some first-order property, or the second-order property of being a satisfier of some first-order predicate. Even on such views, an item's existence can be seen to be a (relational) state of the item. What it is to be that state is distinct from what it is to be the item. So, here too, we can provide different principles of unity for an item, and its singleton, identified as the existence of the item.

Where then did the Leśniewski-like argument that (Socrates, (Plato)) must be the same as (Socrates, Plato) go wrong? It was precisely at the step that held that what it is for the singleton of Plato to be is the same as what it is for Plato to be. It is trivially true that for Plato to be is necessarily sufficient for Plato to be. And, of course, for Plato to be is necessarily sufficient for the singleton of Plato to be. But the essentialist's question of what it is for something to be is more fine-grained than what is captured by these remarks about necessity. What it is for some set to be is always distinct from what it is for some individual to be, even if they necessarily have the same modal conditions of existence. And this comes out more vividly when we identify the singleton of Plato with Plato's existence. That state of Plato clearly has a different essence from Plato. Existence is not part of his essence, but it is part of the essence of the state that is the existence of Plato.<sup>24</sup>

#### XVII. THE INVIDIOUS ONTOLOGICAL DISTINCTION REVISITED

Thus far, we have deployed Hylomorphism to put pressure on the idea that sets, sums, propositions, states, and facts should all be countenanced in a fundamental ontology. The resultant culling left us with sets, propositions and states. This was not the result of an arbitrary preference for "desert landscapes." We have simply taken on the full responsibilities of the thought that sets, sums, propositions, states, and facts would be certain kinds of complexes.

In the light of all this, what are we to make of what we called the invidious ontological distinction, the apparent fact that some relations and not others are suited to be principles of unity?

Consider a piece of ice. The piece of ice presents itself as a whole; here, as with material objects in general, it parts and principle are to be discovered *a posteriori*, but we may suppose that they involve hydrogen and oxygen being bonded together in a certain way. However,

<sup>24</sup> Of course, it does not follow that this state necessarily exists. It exists only if Plato does.

that it itself will not specify the *what it is to be* of the piece of ice. The principle of unity of the piece of ice is in a certain way *maximal*; the piece of ice is the unit which you get by including *all* the connected hydrogen and oxygen that is bonded in a certain way. That is how the piece of ice differs from each of the three dimensional items which it is possible to demarcate within it, even those three-dimensional items which are large enough to include cases of one oxygen ion and two hydrogen ions appropriately bonded together.

What of those items? Are they wholes? Well, many of them will be small physical systems, maintaining themselves thanks to their extant structure of bonding. The fact that they are packed in with other physical systems of similar sorts does not undermine this status. So they are wholes, even though none of them are maximal structures of bonded units. That defect in respect of maximality is just how they differ from *pieces* of ice. They are no less genuine wholes than the piece of ice; but thanks our scheme of concepts they do not count as pieces of ice, or as genuine parts of the piece of ice. (How many pieces of ice do you have? Just one piece. How many parts does it have? No, no; it is not articulated or broken up at all. It is one solid block of ice.)

But now consider bonding. That is a highly determinable relation which involves attractive forces of various strengths, depending on the most determinate type of bonding in play. There does not seem to be any happy way to allow that bonding makes for wholes, while other attractive forces do not. (A point made by van Inwagen, and by Fine.) Gravity, of course, is a universal attractive force. Consider then all the myriad ways of constructing putative wholes from items gravitationally related to other items. Are they all genuine wholes? Given Hylomorphism, there does not seem to be any happy way to insist that they are not all *wholes*, even though very few of them will be material objects or stable physical systems. That may not make them genuine wholes in the ordinary sense, for the ordinary notion of a genuine whole has things like material objects, living things and artifacts as its paradigms. A whole consisting of your eyeglasses and Pluto is too far from these paradigms in respect of compactness and maximality to count as a genuine whole in the ordinary sense. But it is fully, completely and *genuinely* true that it is a whole.

We saw that Hylomorphism could allow for impure sets, wholes which place the least demands on their constituents, requiring only that the constituents exist. We are now allowing that the holding of any attractive force to any degree can be a principle of unity, that is, can give rise to a whole. Given those two concessions, it seems that the only nongerrymandered position in the domain is one that embraces a full plurality of principles of unity, which allows that the holding of

any relation or property of some items makes for a whole. Of course, from the point of view of our conceptual scheme, the enormous majority of such wholes will be idle items, beneath or beyond our habits of thought and reference.

The view that emerges is not the Projectivist view to the effect that we have wrongly supposed that our scheme of bundling and clumping applies to reality. What emerges is rather a highly selective "Detectivist" view which has it that our scheme of clumping and bundling sensitizes us to a very small selection of the enormous variety of wholes that are genuinely there. And Hylomorphism helps explain how this goes; we are sensitized to those physical systems which are relatively compact, and have self-maintaining principles of unity which hold maximally within their compact structure. (So we are sensitive to the piece of ice, but not to the small spherical unit around its center.) Among these compact material wholes whose self-maintaining principles of unity are maximal within their compact structure are the material objects, artifacts, and living things—the pivot points of our scheme of reference and thought.

So much, then, for the invidious ontological distinction. We can now see how that distinction was the product of an illusion of salience. The material wholes that strike us as paradigmatically genuine are compact, well-articulated items that have self-maintaining principles of unity, items like Aristotle's favorite examples of substances, "the individual man and horse." But the least arbitrary form of the general theory of unity that is Hylomorphism tells us that besides these "genuine" wholes there is a vast plurality of wholes that ordinarily escape our attention.

To see things aright requires that we take Hylomorphism to be the general theory of wholes, while at the same time cashing in the natural, Aristotelian idea that all true material wholes must be compact, well-articulated, and self-maintaining.

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