

On the Boundary between Material and Formal Ontology

Achille C. Varzi

Department of Philosophy, Columbia University, New York

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Two Notions of Ontology

There are two main ways, philosophically, of characterizing the business of ontology, and it is good practice to try and keep them separate.

On one account, made popular by Quine, ontology is concerned with the question of what there is. Since to say that there are things that are not would be self-contradictory, Quine famously pronounced that such a question can be answered in a single word—‘Everything’. However, to say ‘Everything’ is to say nothing. It is merely to say that there is what there is, unless one goes on to specify the population of the domain over which one quantifies—and here there is plenty of room for disagreement. You may think that ‘everything’ covers particulars as well as universals, I may think that it only covers the former; you may think that the domain includes abstract particulars along with concrete ones, I may think that it only includes the latter; and so on. Exactly how such disagreements can be framed is itself a rather intricate question, as is the question of how one goes about figuring out one’s own views on such matters. But some way or other we all have beliefs of this sort, at least as soon as we start philosophizing about the world, and to work out such beliefs is to engage in ontological inquiries.

The other way of characterizing ontology stems from a different concern, and made its way into our times through Brentano and his pupils. On this second account, the task of ontology is not to specify what there is but, rather, to lay bare the formal structure of all there is, whatever it is. Regardless of whether our domain of quantification includes universals along with particulars, abstract entities along with concrete ones, and so on, it must exhibit some general features and obey some general laws, and the task of ontology would be to figure out such features and laws. For instance, it would pertain to the task of ontology to assert that every entity, no matter what it is, is self-identical, or that no entity can consist of a single proper part, or that some entity can depend on another only if the latter does not depend on the former. More generally, it would pertain to the task of ontology to work out a general theory of such formal relations as identity, parthood, depend-

ence—what Husserl called a pure theory of objects *as such*, if not a theory of being *qua* being in Aristotle's sense. And the truths of the theory would possess the same sort of generality and topic-neutrality that characterizes the truths of logic. They would hold as a matter of necessity and should be discovered *a priori*.

Following common usage, we may speak of *material* ontology and *formal* ontology, respectively, to fix the distinction. My question, here, is whether one can pursue one sort of theory without also engaging in the other—whether, or to what extent, the tasks of material ontology presuppose the backing of some formal-ontological theory, and whether or to what extent formal ontology can be, in the material sense of the term, ontologically neutral.

Material Ontology and Beyond

Concerning the first half of the question, I reckon it admits of a rather straightforward answer—or rather two. It depends on the strictness of one's demands. To specify a domain of quantification is to say what it contains. Now, we can say that it contains, say, statues as well as statue-shaped lumps of clay, and leave it at that. Or we may insist that we are not done with the job unless we also say whether each statue is identical with the corresponding lump of clay. In the first case, we do not need a theory of identity; in the second case we do. More generally, we may be satisfied with providing a *complete* list of all the things that populate our domain of quantification, or we may require, in addition, that the list be not *redundant*—that no entity be included twice over—and this calls for a theory of identity. (Such is the gist of Quine's dictum, no entity without identity.) To be sure, the identities in question would not belong to formal ontology *per se*. A formal theory of the identity relation will not include among its theorems any identity statements except for those of the form 'A is A', so it will not by itself deliberate on whether, say, this statue and this lump of clay are one or two. But one can hardly come up with a coherent way of making such deliberations, hence with a good account of the exact number of things that populate one's domain of quantification, except on the basis of a general, purely formal theory of identity—a theory that says not only that identity is reflexive, but also that it is symmetric, transitive, and so on. And such a theory falls squarely within the domain of formal ontology.

Some philosophers would go even further. For instance, some would insist that, although the statue is sure to be distinct from each of its proper parts, still it is nothing over and above those parts. (As Lewis put it, it just is them, they just are it.) Accordingly, given a commitment to the statue, a commitment to its parts would be no *further* commitment: the statue and its parts would be the same por-

tion of reality. Others might disagree: for them the statue *is* something over and above its proper parts. Either way, while strictly speaking the domain of quantification would include the statue along with its proper parts, one would need to resort to a general theory of parthood to spell out one's *ultimate* ontological commitments.

Similarly for dependence. If, for example, you believe in the existence of such things as holes, as I do, you may also believe that they are ontologically parasitic on their material hosts. There is no donut without a hole, the saying goes. But that is just a way of registering a conceptual truth. Ontologically, things are exactly the other way around: no hole without a donut. If so, then you may want to say that your views about what there is are tightly connected to your views about what depends on what, and pretty clearly that calls for some general theory of the dependence relation.

In short, if we take material ontology to be concerned exclusively with the task of drawing up a complete list of what there is, then we may keep it separate from the business of formal ontology. But often we want more than just a list. Often we want a genuine, useful inventory of the reality we are committed to—and that is no longer something that we can achieve without the help of some formal theory of things as such.

Formal Ontology and Beyond

The other half of the question—whether, or to what extent, one can work out a formal theory of things as such without also engaging in material-ontological considerations—is not so straightforward. There are, in fact, two sorts of difficulty.

1. The first concerns the bounds of the theory. I have mentioned identity, parthood, and dependence as three examples of formal-ontological relations, but of course one need be more precise. Are these truly formal in the intended sense, i.e., do they *all* apply to anything that might conceivably exist, no matter what it is? And are they the *only* relations of this kind?

Arguably, the formal character of the identity relation is manifest. It is precisely because it is perfectly general and domain-independent that identity is often treated as a formal *logical* relation, given that formal logic is meant to yield absolutely general and domain-independent truths. Identity knows no preference, said Quine; it treats of all objects impartially. However, precisely because it is an objectual relation as opposed to a sentential operator—because it relates things in the world rather than truths about the world—I take this to be a reason to treat identity theory as part of formal *ontology*, not logic.

The formal character of dependence is perhaps equally unquestionable. The idea is that x depends on y if, and only if, x could not exist without y . Since everything exists, it would appear that the field of dependence knows no restriction either. But what about parthood? Most people would agree that the part-whole relation applies not only to material objects, or to entities located in space and time, but to all entities whatever—that it is topic-neutral and thus applies across ontological categories. Others, however, disagree. For example, the thought that there are mereologically structured universals is sometimes found to be problematic. In Lewis's example, each methane molecule consists of one carbon atom and four hydrogen atoms. Are the universals *carbon* and *hydrogen* part of the universal *methane*? If they aren't, does that mean that the three universals (as opposed to their instances) are wholly distinct? If they are, does it mean that *hydrogen* is part of *methane* four times over? What could that possibly mean? How could one thing be part of another more than once? Of course, if we agree that parthood includes identity as a limit case, we may always treat all problematic cases as mereological atoms, things that have no further parts except for themselves. That would be enough to warrant the claim that parthood knows no restriction. But it's a slippery move. By the same pattern, one might extend any relation R to R cum identity and treat all R -problematic cases as atomic in the relevant sense. That would hardly be a reason to treat the extended reflexive relation as a piece of formal ontology in addition to identity.

On the other hand, surely there may be other, non-artificial relations that fit the bill. Popular candidates would include membership, inherence, and connectedness, all of which have been studied extensively. I do not intend to settle the question here. Just as logicians have a hard time figuring out a good way of demarcating the bounds of logic, demarcating the bounds of ontology, in the formal sense of the term, is no straightforward business. What I want to stress, rather, is that here the difficulty may depend at least in part on our ontological biases, now in the material sense. We are looking for relations that are topic-neutral and take absolutely all possible objects as arguments, and that requires unlimited open-mindedness. After all, there may be more things in heaven and earth than are dreamt of in our philosophies. If no one had ever dreamt of such things as universals, let alone recognized their ontological dignity, the above worry concerning the formal character of parthood would not have arisen. If all we had dreamt of were material substances, a cornucopia of spatiotemporal relations would have qualified as formal in the relevant sense. And so on. There is, in fact, a hidden quantifier in the characterization of what counts as formal, a quantifier ranging over all possible (i.e., conceivable) entities. And it is by no means clear that we can grasp its range without engaging in material-ontological considerations.

2. The second sort of difficulty concerns, not the bounds of formal ontology, but its contents. Regardless of how far it extends, the truths of the theory are supposed to possess the same sort of generality and topic-neutrality that characterizes the truths of logic. Yet, as soon as we start digging, we realize that this characterization is very hard to pin down without begging the question.

Consider identity. Surely not every identity-theoretic principle qualifies as formal-ontological in the intended sense, i.e., as a neutral principle that necessarily holds true of all there is, no matter what it is. Somewhere we must draw a line. For instance, few are willing to endorse the principle known as *identity of indiscernibles*: it fails in some possible worlds (such as Black's two-sphere world) if not in this world of ours (as quantum mechanics would seem to suggest: the state of a system of particles of the same kind appears to be one in which there is nothing to distinguish the particles one from another). The converse principle, the *indiscernibility of identicals*, is more robust and certainly less controversial, but even that has been found problematic in some contexts, e.g., *vis-à-vis* the phenomenon of qualitative change. Drawing a line is always difficult. And in this case it seems clear that the difficulty depends once again on a careful consideration of what there is, here or in some other possible world. Perhaps we should just stick to the very basics: identity is *reflexive*, *transitive*, and *symmetric*—an equivalence relation. Yet these properties have been questioned, too. For instance, you don't have to be a hard-core dialetheist to think that there are or might be non-self-identical objects; it might suffice to consider again the elusive citizens of the quantum world, as Schrödinger famously argued. We may find that utterly absurd. But it is hard to do give expression to our feelings while claiming full and unbiased neutrality.

Or consider parthood. Few would be willing to buy into the whole body of classical extensional mereology. Some of its basic principles, such as *extensionality* and *unrestricted composition*, are highly controversial, and treating them as expressing formal-ontological truths would be missing the point. Such principles are best construed as expressing specific views of how things are, even on what things there are. Goodman, for instance, took mereological extensionality to be the hallmark of a nominalist stance—hence of a very precise material-ontological view. Likewise, to accept unrestricted composition is to countenance the existence of a fusion for any non-empty collection of things—something that has all those things as parts and has no part that is disjoint from each of them. Perhaps the fusion is nothing over and above the things that compose it, as we have seen. But to the extent that it qualifies as something *else* than those things, it is clear that our attitude towards this principle is bound to reflect our material ontology.

So what mereological principles do we have in mind, insofar as parthood is supposed to be a formal-ontological relation? At the beginning I implicitly mentioned the principle known as *weak supplementation*, to the effect that no entity can consist of a single proper part. Simons regards this as a bare minimum that we can require of a relation, along with the partial-ordering axioms, if it is to count as parthood at all (in contrast to extensionality and unrestricted composition, which would reflect substantive philosophical theses). I would concur. Yet it can't be denied that even here there is room for disagreement. Popular counterexamples include, for instance, Brentano's theory of categories, where a substance (a man) counts as a proper part of an accident (a sitting man) even though there is nothing to make up for the difference; Whitehead's theory of extensive connection, according to which a topologically closed region includes its open interior as a proper part in spite of there being no boundary to distinguish them (the domain of the theory comprises only extended regions); or some recent theories of material constitution, which hold that a material object (a statue) and the matter that constitutes it (a lump of clay) are proper parts of each other although neither has parts disjoint from the other. One may be inclined to dismiss all such cases as unintelligible precisely because they violate weak supplementation, but one might as well go the other way around and regard the plausibility of any such case as evidence against the principle. How can we settle the issue without begging the question, if not by resorting to material-ontological considerations of some sort?

Even the partial-ordering axioms have sometimes been disputed. The *antisymmetry* of parthood, for instance, is immediately challenged by the third case mentioned above—constitution theories. But it could be argued that the axiom is too strong regardless: in view of certain developments in non-well-founded set theory (i.e., set theory tolerating cases of self-membership and, more generally, of membership circularities), one might for instance suggest building mereology on the basis of an equally less restrictive notion of parthood that allows for closed loops. Such a suggestion could hardly be dismissed if we are insisting on the formal status of parthood: if sets have to have a mereological structure, it is natural to identify the parts of a set with its subsets. So, either we refuse to countenance non-well-founded sets—and that is a straightforward claim about what there is—or we must concede that such sets violate antisymmetry.

These are just examples. Nonetheless, for parthood as well as for identity (and the case for dependence is not different) they ought to be indicative of how difficult it is to come up with good, neutral criteria for drawing a line between purely formal principles and substantive theses. Of course we have a similar problem in logic. Sometimes a logical principle is challenged on the grounds of a disagree-

ment concerning the meaning of certain logical operators. This is the case, for instance, with the principle of *double negation* in intuitionistic logic, or *disjunctive syllogism* in some relevant logics. In such cases, perhaps Quine's attitude says it all: change of logic, change of subject. In other cases, however, the disagreement has nothing to do with matters of meaning; it concerns precisely the material-ontological neutrality of the principles in question. Think of the controversies on the existential presuppositions of *subalternation* in Aristotle's syllogistic, or of *universal instantiation* in contemporary predicate logic. Think of the failure of *distributivity* in quantum logic. Think of the problematic status of the *Barcan formulas* in modal predicate logic. Even the most fundamental principles of classical logic, such as the *law of non-contradiction* or the *law of bivalence*, have sometimes been questioned on such grounds: that there are no inconsistent facts, or that every fact is fully determinate, appear to be claims that reflect explicit material-ontological commitments. It should not be surprising, therefore, that the same sort of worry arises when we shift our attention from the general theory of truths as such to the general theory of objects as such, which is to say from formal logic to formal ontology.

Conclusion

Our question was whether, or to what extent, one can pursue ontology in one sense of the term without also engaging in ontology in the other sense. I haven't exactly answered it. For in one direction, the answer depends on how exactly one understands the tasks of material ontology (Just a complete list of what there is, or a structured inventory?) In the other direction, it depends on how exactly one defines the scope of formal ontology as well as its content. (What relations qualify as formal in the relevant sense? What features of those relations qualify as truly necessary and *a priori*?) Perhaps this is all we can say. But if we had to draw a moral on the basis of the picture that I have been describing, I am afraid it would lean on the negative side. Good as the *desideratum* might be, the idea that material ontology and formal ontology could be worked out separately is either illusory or doomed to yield pretty poor theories on each side.