

The Structure of Objects

KATHRIN KOSLICKI

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Structure has played a significant role in recent philosophy of science, often at the expense of objects, but for Kathrin Koslicki structures and objects are inseparable: every composite material object has a structure, and the structure is literally a part of the object. Whilst she draws her inspiration – and her critical targets – from the metaphysical works of Plato and Aristotle, David Lewis and Kit Fine, Koslicki's book contains much that will interest philosophers of science, perhaps especially philosophers of physics and of biology.

Early chapters dissect and reject two key claims of classical extensional mereology. Any old objects, no matter how loose and separate, form a set. But Koslicki denies that just any old objects sum to form a whole: for example, there is simply no such thing as the sum of the American President's left hand and the Eiffel Tower. It's not that hand-plus-tower is a minor, or degenerate, or insignificant object; it's that there is no such object. This is one point of disagreement with classical extensional mereology.

The second point of disagreement turns on whether a composite object is somehow 'more than' its material parts. As Koslicki puts it on p.3, 'It is completely obvious to those not in the grip of a philosophical theory that there is a vast and important difference between a heap of disassembled motorcycle parts, piled up, as they might be, at the Honda factory or in someone's garage, and the motorcycle in running condition that results from assembling these parts in a particular, fairly constrained way'. (The author photo shows Koslicki with her 2003 Honda VFR 800 Interceptor.) Both motorcycle and jumbled heap have the same material parts, so reducing these composite objects to their (identical) parts seems to miss something significant about the difference between motorcycle and heap.

Structure to the rescue: hand and tower are not arranged together in a structure, which is why they do not compose a larger whole, whilst motorcycle and heap result from very different ways of structuring the same material parts. Of course the challenge is to say what it is for objects to be arranged together in a structure, what it is for the same parts to have first one structure and then another, and this is the central task of Koslicki's book.

The middle section presents a scholarly examination of Plato's and then Aristotle's views of parts and wholes. The details here are for specialists, but Koslicki very nicely brings out the different ways in which these two figures invoke structure or form to provide metaphysical underpinnings for the motorcycle/heap distinction. Plato sees structure as essentially mathematical, a matter of ratio and measure. This places few, if any, constraints on composition, since any random collection of objects will instantiate some mathematical pattern or other. So Plato will struggle to rule out the hand-plus-tower. In contrast, Aristotle has a teleological account, whereby objects of different kinds, with different characteristic activities or functions, have different structures. Whilst this offers

the constraints Koslicki seeks, it suffers from crucial unclarity which her own account promises to resolve.

For Koslicki, structures are associated with kinds: to compose an object of a given kind, parts must be arranged according to the characteristic structure of that kind, whilst 'gerrymandered' objects like the supposed hand-plus-tower, as countenanced by classical extensional mereology, do not typically belong to kinds. Kinds here include natural kinds, though these are understood in a fairly minimal way, so that biological taxa can count as paradigmatic natural kinds. But Koslicki must also countenance artefactual kinds, or risk losing the Interceptor; she seems to hesitate over whether heaps form a kind (portions of rice look OK, but piles of trash may have to go).

This association of kinds and composition is not too surprising, though it does conflict with classical extensional mereology. More startling is Koslicki's claim that the structure of a material object is one of its parts, just as the obvious physical components are. The Interceptor has an engine, a battery, a catalytic convertor and a structure amongst its parts, and the relationship of parthood which holds between the structure and the bike is the very same relationship of parthood which holds between the battery and the bike. When you encounter the Interceptor, you encounter the material parts, a structure, and the bike.

So there are (at least) two kinds of part: the structure is not itself a material object, and incorporating this nonmaterial part does not make the Interceptor's mass greater than the sum of the masses of the battery, the engine, and the other material parts. But there is only one parthood relation, which applies whether we consider the material parts or the nonmaterial part, i.e. the structure. Moreover, many of the Interceptor's material parts – the catalytic convertor for example – are themselves complex objects composed of a structure plus material parts. And since parthood is transitive, the structure of the catalytic convertor is also a part of the Interceptor (as is the structure of each molecule, and each atom, in the motorcycle).

Why is this startling? It is uncontroversial that many (or even all) composite objects have internal structure, that their material parts stand in various relations to one another, and indeed that what kind an object belongs to is in part determined by these internal relations. Why then is it surprising or unorthodox to think of the structure as part of the composite whole?

Counting the structure amongst the parts requires us to reify structures, to accept the existence of an entity we can call 'the structure of this motorcycle', in addition to the structured components. And this raises tricky questions about what sort of entities structures are. Koslicki compares and contrasts mathematical, logical, chemical, musical and linguistic structure, and is clearly tempted by the idea that a structure is itself an object, rather than a property or relation, though ultimately she holds back from this commitment. Given that the parts of the motorcycle evidently stand in ordinary spatial and causal relations to one another, I'd be inclined to take the structure of the whole motorcycle to be constituted by these relations amongst its parts. The alternative – taking

the structure to be something distinct from these relations – means we'll have to explain how the presence of a Structure in the motorcycle compels its material components to bear the relevant spatial and causal relations to one another. Or is it the other way around: does the obtaining of the relations somehow bring the Structure into existence? These routes don't look promising.

But if we take the motorcycle's structure to be constituted by the relations amongst its parts (incorporating this into whatever general theory of properties and relations we prefer) it becomes difficult to explain why this feature of the motorcycle is one of its parts, whereas its other features (its mass of 218.2kg, its overall shape) are not. Moreover, there seem to be relations amongst the parts which are not elements of the structure of the motorcycle – the relation *being made of the same material as*, the relation *being equally admired by Honda fans*. These relations amongst the components presumably don't qualify as immaterial parts of the motorcycle. So what's so special about structural relations?

Koslicki has dialectical reasons for wanting to count the motorcycle's structure amongst its parts: she wants to distinguish the motorcycle from the heap by pointing to a difference in their parts, not just any old difference between them. Similarly, she wants to distinguish a statue from its constituent statue-shaped lump of clay by pointing out that the statue has a statue-structure amongst its parts whilst the lump does not. Oddly, however, this suggests that Koslicki hasn't really liberated herself from the temptations of classical extensional mereology: once we abandon CEM, why think that differences are best accounted for by differences in parts? Why isn't it enough to point to differences in structure, without having to wrangle these into mereological differences? As Koslicki sometimes hints, her metaphysics allows us to preserve much of the letter of CEM, by extending the domain of parts to encompass immaterial structures. But why not reject CEM more whole-heartedly, given Koslicki's persuasive enumeration of its flaws?

Set these philosophical concerns aside: Koslicki has come up with an intriguing position, and her meticulous defence should ensure that it plays a clear and significant role in future debate. I have a lingering orthoptic concern: Oxford's rather mean choice of size and font made this a physically challenging read, especially since the tiny footnotes often contain substantive discussions.

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