

STRUCTURAL REALISM AND METAMETAPHYSICS*

Ted Sider

For Rutgers conference on “Structural Realism and Metaphysics of Science”,
May 2017

Many structural realists have developed that theory in a relatively conservative spirit, metametaphysically speaking. They’ve sought to put forward an alternate metaphysics to standard entity-based ones. The alternate metaphysics is to be more scientifically adequate than the status quo, but it is intended to be a metaphysical account in the same sense as the old accounts.

But I think that a more thoroughgoing antimetaphysical approach might be a better fit for structural realists.

(Much of what I say, I think, also goes for mathematical structuralism.)

1. “Relations without relata”...

Everyone is familiar with the first few exchanges between structural realists and their opponents. The structural realists say things like “only structure exists”, “relations without relata”, and the opponents freak out.

The freakout isn’t metaphysical conservatism, an unwillingness to “think outside the box”. Nor is it blind reliance on “intuition”. What’s behind the freak-out is just the insistence that a clear theory be specified.

What are the theory’s basic notions? What are the proposed rules governing those notions? And how can those notions then be used in a foundational account of scientific theories? Standard predicate logic is the usual home for talk about relations, and gives clear answers to these questions. You can’t

*This talk is based on chapters 4 and 5 of my book manuscript, *The Tools of Metaphysics and the Metaphysics of Science*.

just continue as if you accepted this framework—by speaking of relations—but subtract the entities and hope for the best. Individuals are too embedded within the standard framework; predicate logic provides no sentences about relations that don't also concern individuals. You need to properly specify a replacement framework, some replacement inventory of basic notions, rules governing those notions, and methods for using those notions in foundational contexts.

So, what distinctive metaphysical theory might lie behind the structural realist slogans? I'll just mention a few possibilities.

2. Bundle theory

The more eliminativist strains of structural realism suggest a metaphysics that denies that individuals exist, which naturally leads one to think of the bundle theory. But bundle theories are notoriously inadequate when it comes to handling relations—a particularly pressing concern given the centrality of relations to structural realism.

The initial problem is obvious: the traditional bundle theory identifies a particular with a “bundle” of “compresent” universals. This makes sense for monadic universals, but what about relations? A relation doesn't “fit” into any one bundle; relations “live between” their relata.

Some way to fit relations into this picture is needed, and it's very hard to see how this can be done. Establishing this would require some hard work looking into the details of the bundle theory, which I'm not going to do now. My main point here is that you can't just say “bundle theory”, and call it a day.

Caveat: Shamik Dasgupta has put forward a theory that is *somewhat* in the spirit of bundle theory, and which is clearly developed. In my view this is the best candidate for a distinctive metaphysics in the spirit of structural realism. (Though I do have my objections.) So to structural realists who don't like where I end up in this talk, I recommend Dasgupta's work.

3. Bare particulars

One could hold that individuals *do* exist, but that they have no monadic properties; they only stand in relations. Better: they have no *fundamental* monadic properties; their only fundamental features are relations. Let's call such things "bare particulars". (This, or something like it, is sometimes called "moderate" structural realism.)

But this is a nonstarter. Not because there's anything wrong with this view—I think there's nothing at all wrong with it. Rather, because it doesn't give structural realists anything like they want. Denying that points of spacetime have monadic properties doesn't, for example, help at all with the hole argument; we are still left with there being a difference, at the fundamental level, between scenarios that are structurally alike but in which the individuals occupy different roles in the structure. [Note: in this talk I am primarily concerned with structural realism as motivated by "permutations are distinctions without a difference", rather than by concerns about continuity through theory change.]

4. Ground, essence

At this point structural realists (and mathematical structuralists, too) sometimes add a claim: not only do individuals lack monadic properties, but also, they "have no identity or features outside a structure" (Resnik, 1981, p. 530).

Taken flat-footedly, it's very hard to make any sense out of this. What would it mean to speak of "having identity" "in" or "outside" structures?

But perhaps this is just an indirect way of saying that facts about individuals in a structure are *grounded in* facts about the structure. Or, alternatively, that the *essence* of an individual is that it has a certain place in a structure. There have been suggestions along these lines (e.g., Linnebo (2008); McKenzie (2014)).

In fact, I think this isn't an attractive option either. The claim that X is

grounded in Y isn't itself a rock-bottom bit of metaphysics. It isn't as if grounding is some sort of fundamental force, irreducible to anything. (Similarly for essence.) Rather, when X is grounded in Y , there must be some answer to the question *how* X grounds Y . So if facts about structures ground the existence of individuals, we can ask: how does this work? What story can be told about structures, so that we can see how facts about them give rise to individuals? Answering this question will require articulating some sort of distinctive structuralist vision about the natures of structures; and that vision had better not re-introduce the sorts of distinctions about indiscernible individuals that structural realists want to eliminate. That is, it will require an answer to the very question we've been asking: the question of what structural realism is! Far from giving us a new conception of structural realism, the ground-theoretic approach just presupposes that some such conception exists.

5. Structural realism and equivalence

Let's take a step back. What do structural realists (and other sorts of structuralists) really want?

I think what they want is that certain descriptions of reality—descriptions that differ only by means of a structure-preserving permutation of entities—are *equivalent*. Such descriptions differ only notationally; they do not correspond to some difference in reality.

Now, metaphysicians, I think, tend to make an assumption about the notion of equivalence that is at issue here. They tend to assume—in a wide variety of cases anyway—that if we have two equivalent ways of describing the world, there must be some *third* way of describing the world, which gets at what the world is *really* like, such that the two equivalent ways can be seen as equally good ways of getting at what the facts are from this third point of view.

For example: everyone agrees that a description of the world using kilograms is equivalent to one using grams. And we can say *why* these are equivalent by appealing to a third theory, which describes the facts about mass without using numerical predicates. The third theory might use comparative predicates such

as “ x is more massive than y ”, and “ x ’s mass is equal to y and z ’s combined masses”. Given representation and uniqueness theorems of familiar sorts, we can make precise the idea that the two numerical theories are getting at the same facts as expressed in the third theory.

Here’s how this applies to the case of structuralism. The structuralist wants to say that descriptions differing only by a permutation are equivalent. But given the metaphysician’s constraint on equivalence, this requires the structuralist to give some *third* description of the facts, a description that is somehow neutral between the first two, such that the first two descriptions can be seen as equally good ways of articulating the third description (say, via some representation theorem). And coming up with such a description requires exactly what I’m saying is so hard to find: a distinctive structural realist metaphysics.

This suggests that the structural realist might be better off rejecting the metaphysician’s constraint on equivalence. But what might be the alternative?

6. Quotienting

One might think that the metaphysician’s approach is in trouble on independent grounds. Surely, it might be objected, there are cases in which we want to say that descriptions are equivalent, but in which no third, more fundamental description is available. Consider an example from logic. A description using \forall is surely, one might naturally think, equivalent to a corresponding one using \exists . But what third theory could one write down, containing neither \forall nor \exists , underlying the first two?

In light of examples like these, one might argue as follows:

“A good theory can be formulated using the concept of \forall . But one can formulate an equivalent theory using the concept of \exists instead. Indeed, we can define a relation between theories that guarantees equivalence: differing solely by exchanges of formulas QvA and $\sim Q'v\sim A$. True, we cannot provide a third, ‘more fundamental’ description of quantificational reality underlying this relation. But

no such theory is needed; it's enough simply to say that theories standing in the relation are equivalent.”

Similarly, one could say that any theories differing solely by a permutation of structurally similar individuals are equivalent, without providing any account of what the structural facts are *really* like, from whose perspective the permutationally-differing theories look identical. One just supplies an equivalence relation over theories (differing solely by such-and-such kinds of permutations) and leaves it at that.

Here is a further speech capturing the spirit of this view:

There may be no way to say what is “really” going on; maybe every good model has artifacts. It's ok to just say: this model does a good job of representing the phenomenon, but certain features of the model are artifacts. Moreover, for any model, we can say which features of the model are genuinely representational and which are artifacts. There is no need to provide some privileged description that has no artifacts from which we can recover the information about models; we can just stop with the models.

Think of it this way. If we have a set of theories with conventional differences, according to the antimetaphysical approach in question, one can “quotient out” the conventional content and regard the best description as an equivalence class of theories. Moreover, you can do this “by hand”: the equivalence relation doesn't have to be induced by some more fundamental theory, but rather can simply be stipulated.

7. Significance of quotienting

As I mentioned at the outset, structural realists have mostly been engaged in a relatively traditional metaphysical project, that of seeking an account of the nature of the fundamental facts that eliminates the sorts of differences that they regard as nongenuine. But what I want to suggest is that the more deeply antimetaphysical approach of quotienting might be a better fit with their overall

outlook. (I myself oppose quotienting, but that's an issue for another time.)

In *The Emergent Multiverse* David Wallace (2012, p. 314) writes of a:

...gap in the market for some intermediate philosophical position, one which respects scepticism about overly 'metaphysical' claims while incorporating the impossibility of any coherent theory/observation divide. The gap is currently in the process of being filled by *structural realism*, a philosophical position whose advocates argue that science is concerned only with structural claims about the world, and that nonstructural claims about a physical theory are not worth making either because we have no access to nonstructural facts (Worrall 1989), or because there are no such facts (Ladyman 1998).

What I am saying is that this gap should be filled, not by a view that "there are no such facts", if that means a structural realist metaphysics in the traditional sense, but rather by the meta-metaphysical position of quotienting. (Indeed, it's natural to read Wallace himself at various points in the book as a quotienter.)

In fact, looking ahead, I think that the status of quotienting has great significance for various larger issues in the metaphysics of science.

References

- Linnebo, Øystein (2008). "Structuralism and the Notion of Dependence." *Philosophical Quarterly* 58: 59–79.
- McKenzie, Kerry (2014). "Priority and Particle Physics: Ontic Structural Realism as a Fundamentality Thesis." *British Journal for the Philosophy of Science* 65(2): 353–380.
- Resnik, Michael (1981). "Mathematics as a Science of Patterns: Ontology and Reference." *Noûs* 15: 529–50.
- Wallace, David (2012). *The Emergent Multiverse*. Oxford: Oxford University Press.