

Structuralism and Relational Individuation

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Prelims:

- I still don't know what ontic structuralism could possibly be.
- relational individuation – individuation by relations? but what is it to individuate, what is it for this to be achieved by (the exemplification of) a relation?
- where grounding comes in? If individuation is by grounding (of existence, essence or character), then perhaps this provides a sense in which the relationally individuated entities may be seen to depend on these relations.
- Being grounded in relations may also give some justification to call some entity ‘extrinsic’, in the sense in which, perhaps, a solitary left hand is extrinsic.

check first

MATHEMATICAL STRUCTURALISM: main objection of ? : why believe that positions / slots are objects? we cannot use them to explain order (for they would have to be ordered themselves), so why believe in them?

structuralism's problem with symmetric structures: (??), (?), (?), (?), (?), (?)

ontologically insubstantial¹

Two indiscernible spheres

Consider, again, Max Black's two spheres. I will assume that there are two, and that they serve as counterexample to some non-trivial principle of the identity of indiscernibles.

While the spheres are distinct, ‘nothing tells them apart’: they are only weakly discernible, i.e. in virtue of there being irreflexive relations holding between them. Though they are intrinsically indiscernible, we can name them: there is no problem calling one (and only one of them) “*a*” and the other “*b*”. Naming requires only an isomorphism between the names and the things named, and that we cannot distinguish the two possible isomorphisms in this situation does not make it impossible for us to arbitrarily decide on one of them.

Though, at least initially, we cannot tell them apart, we may, for other or these reasons, postulate things belong to various ontological categories that will tell them apart for us. We may, e.g., take them to be hylomorphic compounds that differ in their matter, though not in their form; or we may individuate them by their different haecceities; or we may believe that there are states of affairs of the form “*a* is called “*a*””, of which only one but not the other is a constituent. We may also tell them apart by formal relations, e.g. by claiming that only *a*, but not *b* is a truthmaker for “*a* is a sphere” or that *a*'s sphericity, but not *b*'s partly grounds *a*'s volume. Hence Stout is perhaps right: “There must ultimately be a qualitative element in the nature of related terms which makes it possible or necessary for them to be related as they are.” (Stout 1918: 537)

Two matching hands

Consider now, a left and a right hand. They are not related by an Euclidean motion, so at least weakly discernible. In contrast to the spheres, the hands much more clearly differ in dispositional properties: one, but not the other will fit a certain glove, e.g. While they do not differ in ‘internal’ relations, i.e. relations that hold between their parts, they do differ with respect to relations between them, in the sense that there are, between two non-congruent hands, differences that can be made to emerge in bigger world scenarios. This gives some pressure to individuate them intrinsically after all, by postulating some property of chirality e.g. So perhaps Leibniz is right: “Leibniz would probably have said to such an assertion that, although it is perfectly clear that in a world in which there are both left-hand and right-hand gloves one can make the distinction between the two, in a universe which consists solely of a single glove, this is not the case.” (Ishiguro 1990: 115)

Two natural numbers

Consider now two natural numbers, say 2 and 3. In what do they differ? There does not seem much, strictly about how they are in themselves, that tells them apart. Not only do they differ, however, with respect to irreflexive relations and dispositional properties, they are also ordered: 2 is smaller than 3. Their most important difference, in my view, is that they differ *as numbers*, i.e. in what they number; only one of them, for example, correctly numbers the Trinity.

In some ways the numbering relation between 3 and the Trinity resembles the relation between the sphere *a* and “*a*”: there is no telling, for example, whether in them being numbered by 3, the Holy Ghost comes first or third. This connection is nicely brought out by

1. Cf.: “When the abstraction principle is read in the way which Frege proposes, its effect is so to fix the concept of direction that there is absolutely no gap between the existence of directions and the instantiation of properties and relations among lines.” (? : 278)

considering numerical quantifiers:

$$\begin{array}{llll}
 0 & \rightsquigarrow & \exists_0 x Fx & := \forall x \neg Fx \\
 1 & \rightsquigarrow & \exists_1 x Fx & := \neg \forall x \neg Fx \wedge \forall x \forall y ((Fx \wedge Fy) \rightarrow x = y) \\
 n+1 & \rightsquigarrow & \exists_{n+1} x Fx & := \exists x (Fx \wedge \exists_n y (Fy \wedge x \neq y))
 \end{array}$$

For each numerical quantifier in the series, we need one more variable not already occurring in its predecessor. For the n -th numerical quantifier, then, we'll need $n+1$ variables. Their semantic role is to coordinate argument places, to tell us in what places our assignment of values have to be coordinated. Kit Fine (2003) has studied this coordination in more detail. In his defense of semantic relationalism, the thesis that there are external semantic relations, i.e. relations not supervenient on intrinsic semantic features of their relata, he emphasised the fact that the simultaneous assignment of values to different variables must provide them with a coordination scheme, i.e. tell which occurrences are to be coordinated with which other occurrences of the same or different variable.

In view of his earlier work on neutral relations, Fine (2000) argued that for some relations, the coordination scheme has to be distinguished from the relation itself. *Greater than*, the order of the number series, may provide an example of such a neutral relation: we do not want to say that, whenever some number n is greater than some other number m , we have two relational complexes, n and m together with the relation *greater than* and n and m together with the relation *smaller than*. Instead, we have to distinguish the relation from the order it imposes on its relata.

Fine discusses two ways to achieve this and opts for the second. The first, which he dismisses, is positionalism, which reifies argument places, and explicitly correlates them with the relata of the relation. Exemplification of the relation must then be understood to be relative to an assignment of objects to argument-places (Fine 2000: 11). The main problem of this view is that it is not clear what argument places might be. In the arithmetical case, however, we do have an answer to this worry, or so it seems to me: argument places may just *be* numbers, and we have independent reasons, I hope, to believe in numbers. Hence Russell is perhaps wrong: “[I]t is impossible that the ordinals should be, as Dedekind suggests, nothing but the terms of such relations as constitute a progression. If they are to be anything at all, they must be intrinsically something; they must differ from other entities as points from instants, or colours from sounds. What Dedekind intended to indicate was probably a definition by means of a the principle of abstraction...But a definition so made always indicates some class of entities having ...a genuine nature of their own.” (Russell 1903: 249)

Two particles

Two electrons in the orbital of a helium atom: weakly discernible, e.g. by “has the opposite spin of” – but distinct? distinct *individuals*?

“If two electrons really are two distinct individuals, and it is true that they share all the same properties, then it seems that there must be some principle of individuation that transcends everything that can be expressed by the formalism in virtue of which they are individuals.” (Ladyman & Ross 2007: 135)

“No intrinsic nature” – what does this mean?

1. **external relations:** “By *relational holism* I will mean the claim that objects which in at least some circumstances we can identify as separate individuals have inherent relations, that is, relations which do not supervene on the non-relational properties of the distinct individuals. Relational holism is free of the incoherence which threatens less clearly stated forms of holism. It is sufficient for an object to be a distinct individual that it have a non-relational property.” (Teller 1986: 73)
2. **no need:** “...if there are space-time points, one can maintain that all the qualitative properties of any space-time point consist in relations to other space-time points. There is no need for an intrinsic nature of space-time points. (The same is arguably true of numbers). Imagine a world in which all physical properties are realized as geometrical properties of space-time points. In such a world, we can in principle know all the types of physical properties, they are all relational, and there is no need for intrinsic properties, because the relata are space-time points.” (Esfeld 2001: 401)
3. **non-existence:** “a metaphysics of relations merely has to reject the second part of this claim: one can maintain that (a) relations require relata, that is, things which stand in the relations, but that (not b) these things do not have any intrinsic properties that underlie the relations in which they stand.” (Esfeld 2004: 602)
4. **full dependence:** “as far as the physical world is concerned, there is a mutual ontological as well as conceptual dependence between objects and structure (relations): objects can neither exist nor be conceived without relations in which they stand, and relations can neither exist in the physical world nor be conceived as the structure of the physical world without objects that stand in the relations.” (Esfeld & Lam 2008: 32)
5. **only conceptually different** from relations: “The question of the ontological relationship between objects and relations is ill-posed. We predicate properties, including relations, of something, we quantify over objects, and we define a structure on a domain of objects by indicating how these objects are related to each other. However, this is the way in which we represent the world...[...]. It does not match a real distinction in the world. Consequently, there is no point in enquiring into the relationship between objects and properties, including relations or structures, and, in particular, to talk in terms of a mutual ontological dependence between objects and properties, including relations or structures, or an ontological priority of the one over the others. There are not two types of entities, objects and properties including relations or structures, that entertain a certain relationship of ontological dependence. The dependence is only conceptual.
There is no ontological distinction between objects and their properties in the sense of modes: the modes are the way in which the objects exist. Objects do not have any existence in distinction to their ways of existence, and their ways of existence do not have any existence in distinction to the objects. One can draw a conceptual distinction between objects and their ways of existence, but not an ontological one, applying to reality. In reality, there is only one type of entity, namely objects that exist in particular ways.” (Esfeld & Lam 2011: §8.3)

Back to the spheres. Why is this not just the standard Aristotelian conception of universals as immanent?

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