Dispositional Essentialism and Causal Structuralism

30 October 2006

1. Metaphysical necessity and real definitions

Real definitions: claims of the form 'to be F is to be...', or 'for it to be the case that P is for it to be the case that...'.

Let's say that it is *metaphysically analytic* that P iff P follows from true real definitions.

Combinatorialism: metaphysical necessity is metaphysical analyticity.

- Can there be *circular* systems of true real definitions? If so, combinatorialism is relatively easy to maintain. If not, it has much more bite.

2. Ways of understanding claims about the essences of particulars

Suppose *p* is a proton, and someone maintains that it is *essential* to *p* to be a proton (if it exists). This entails that it is metaphysically necessary that *p* is a proton if it exists.

(i) For the combinatorialist who rejects circularity, this can't be true if *p* is a fundamental entity. The only way I can see for it to be true if *p* is non-fundamental, in the sense that claims about *p* reduce to claims not about *p*. EG: For *p* to exist [or: to be a proton] is for quarks Q1, Q2 and Q3 to exist and be bound together in such-and-such way; for *p* to be part of a nucleus is for quarks Q1, and Q2 and Q3 to be bound together in such-and-such way with each other, and in such-and-such other ways with other quarks...

(ii) For the combinatorialist who embraces circularity, it is easy: one can simply say something like 'for *p* to exist is for *p* to exist and be a proton'.

(iii)For the non-combinatorialist, there is the further possibility that it is true but not metaphysically analytic.

3. Ways of understanding claims about the essences of properties

Suppose someone says, e.g., 'it is of the essence of the property *being a proton* that any two instances of it repel one another'. This entails that it is metaphysically necessary that any two protons repel one another.

(i) For the combinatorialist who rejects circularity, this would require there to be some non-circular real definition of what it is to be a proton and/or of what it is for *x* to repel *y*, from which it follows that any two protons repel one another. It isn't immediately obvious how this could happen.

(ii) For the combinatorialist who embraces circularity, it's much easier to think of real definitions that would suffice for this to be metaphysically necessary: one need only say something like 'to be a proton is to be a proton that repels all other protons'. Or

maybe 'to be a proton is to something that repels all other protons and attracts all electrons and...'

(iii) For the non-combinatorialist, there is the further option of claiming that it is metaphysically necessary but not metaphysically analytic. One could believe it even while claiming that 'proton' is primitive—there is no nontrivial account of what it is to be a proton—or while claiming that to be a proton is just to instantiate a certain universal *p*, conceived of as a fundamental entity.

4. How laws might come out necessary for combinatorialists who reject circularity

One idea: quantifiy over (natural) properties in saying what it is to be *F*.

- E.g.: 'to be a proton is to instantiate a natural property *P1* which is such that there are 17 other natural properties *P2...P18* such that things that instantiate *P1* repel one another and attract things that instantiate *P2*, and things that have *P3* orbit around things that have *P4*, and.....'
- The problem with this: if the properties quantified over are really supposed to be the same as the ones being defined—so that, e.g., it might turn out the *being a proton* itself is the only *P1* that meets the above condition—it looks like circularity in disguise.
- Whereas if the properties quantified over are primitive fundamental entities, it begins to look like a merely verbal trick it's still not metaphysically necessary that all things that instantiate *P1*, the property in virtue of which protons are protons, repel one another. Wouldn't it be better in that case to say that to be a proton is just to instantiate *this very property (P1)*?

A better idea: quantify over (natural) *classes*, taking naturalness as primitive, or analysing it in terms of notions like resemblance, etc.

- E.g.: 'to be a proton is to be a member of a natural class *C1* which is such that there are 17 other natural classes C*2...C18* such that members of *C1* repel one another, and attract members of *C2*, and members of C*3* orbit around members of *C4*, and...'
- One program: give similar analyses of polyadic predicates like 'orbit around', etc., thereby ultimately reducing all facts to facts about the structure of natural classes.

This program provides one motivation—the only one I feel I really understand!—for thinking that a great many ordinary laws of nature will turn out to be metaphysically necessary.

5. Might *all* laws of nature be metaphysically necessary?

(i) Are laws of nature of the form 'All Fs are Gs', where 'F' and 'G' stand for "basic physical properties", metaphysically necessary?

(ii) Are there other kinds of laws of nature that are not metaphysically necessary?

- Existentially quantified laws: 'there are four points of space none of which is coplanar with the other three'...
- Laws which limit the kinds of things there are.
  - 'If there is anything at all, then either there are protons, or there are electrons, or...'
  - If [x is a proton iff y is a proton], and [x is negatively charged iff y is negatively charged], and .... then x and y are duplicates.
- Are such claims really laws? Some of the things causal structuralists say suggest that they think not.
- If they are, I can't see any way for a combinatorialist rejecter of circularity to get them to come out necessary while also getting positive laws to come out necessary.
- Non-combinatorialists, of course, are free to simply stipulate them as necessary. But it would be hard to square this with (i) the idea (Fine) that all necessities are grounded in facts about *essence*, not understood as necessarily involving real definitions, or (ii) the idea that the space of metaphysical possibilities obeys any sort of principle of plenitude, like Hawthorne's Structural Combinatorialism.

6. Reducing lawhood to metaphysical necessity?

One surprising thing about Hawthorne's discussion is his assumption that causal structuralist will want to take 'the causal relation'—or rather, something like Armstrong's relation of nomic necessitation—as primitive. You might have thought, instead, that one big advantage of causal structuralism would be that it would allow this relation to be reduced to talk of metaphysical necessity. (Swoyer certainly thinks this.)

- As we saw in the previous section, causal structuralists probably shouldn't affirm that to be a law of nature is just to be metaphysicaly necessary. But they might claim, instead, that to be a law of nature is just to be a metaphysically necessary consequence of the facts about what (natural) properties there are, or something along those lines.

From the point of view of (anti-circularity) combinatorialism, it's clear why one might want to have something like nomic necessitation as primitive. The richer one's notion of the 'structure' of the world, the easier it's going to be easier to reduce all the facts about the world to 'structural' ones.

- However, as we saw in section 4, this program doesn't fit very comfortably with realism about universals, so if one does want to take some nomic notion as primitive, it probably won't take the form of an Armstrong-style relation among universals.

On the other hand, it's less clear why a causal structuralist who wasn't hoping to get laws of nature to come out as metaphysically analytic, or was happy with circular real definitions, would be motivated to take nomic necessitation as primitive.

- One possibility: we're going to have to take chance as primitive in any case, and nomic necessity is just chance 1.

7. The possibility of symmetric laws

Electrons and positrons play symmetric roles in current physical theories: replace 'electron' and 'positron' while making various other parallel substitutions, and the theory you end up with is equivalent to the one you started out with.

Thus, anyone who thinks that there is a purely structural necessary and sufficient condition for being an electron must, to avoid the absurd consquence that all electrons are positrons and vice versa, put into the condition something that isn't part of any current physical theory, and wouldn't normally be considered a law of nature.

- For example, it might be part of what it is to be an electron that one is a member of the *larger* of two natural classes playing such-and-such role.
- Comparison: left and right.

How bad is this?

8. Hawthorne's Lewisian solution

Lewis: there is no qualitative condition C such that necessarily, an object is identical to x iff it is C. Nevertheless, there are no pairs of *possible worlds* that are qualitatively alike but differ as regards what x is up to at them. In fact there's no straightforward notion of whether a *de re* proposition is true "according to" a possible world.

- Counterpart theory: to say that it is possible that x is F is to say that x has a counterpart that is F.

One could adopt a similar view about properties.

- If modal realism is false, does this make any sense otherwise than as an arbitrary stipualtion about how we're going to use the expression 'possible world'?
- Can this sort of view be combined with the idea that predicates like 'is a proton' are not primitive (and also don't just have simple real definitions of the form 'instantiates protonhood')?