

Modal Empiricism and Two-Dimensional Semantics

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I. The concept of strong necessity

A strongly necessitates B, when it is not possible that A and not B, though it is conceivable that A and not B. In another formulation: A entails B, but it is not *a priori* that A entails B (A does not imply B). Strong metaphysical necessities determine the space of possible worlds. If the space of possible worlds is sparser than the worlds which are (ideally primarily positively) conceivable, then whether a world is possible or not, is determined by some metaphysical fact, over and above the world's being (ideally primarily positively) conceivable.¹ Thus: accepting that there are strong necessities commits one to modal empiricism; denying it, to modal rationalism.

The concept of strong necessity may be illuminated further by considering the relation between complete description of a world *w* and a particular true statement *S*. If, given the complete qualitative description of world *w*, *S* is true in world *w* considered as actual (viz. *S* is true, interpreted according to its primary intension), but *S* is not entailed *a priori* by the complete qualitative description of *w*, then the facts described by the complete qualitative description of world *w* strongly determine the facts *S* describes.

Whether strong metaphysical necessities exist, also have implications for the consciousness-brain relation, in the following way. Chalmers argues that the possibility of zombies is sufficient to refute materialism. Now, zombies seems conceivable (or, at least, I will not challenge this assumption here), but are they also possible? According to modal rationalism the conceivability of zombies implies their possibility, according to modal empiricism, it does not. Hence, one way of rejecting the zombie argument is to

¹ I use David Chalmers' conceptual apparatus here.

Negative conceivability of a statement *S*: *S* is not ruled out by our concepts. For example, is negatively conceivable that bats have bat-experiences, radically different from human experiences, for the concepts describing the ultrasound mechanisms of bat perception do not rule this out.

Positive conceivability of a statement *S*: a positive conception can be formed in which *S* is the case, (we have the relevant notions for conceiving it). For example, zombies are positively conceivable: we have the notions to conceive a being who is an exact physical duplicate of a normal human being, but has no phenomenal consciousness.

Ideal conceivability is conceivability by an ideal reasoner (an ideally rational being).

Metaphysical possibility. What God might have created, had He so chosen (metaphorically put). For example, God could have created a mile-high unicorn, but he couldn't have created a male vixen.

Primary intension. A function rendering extensions to possible worlds considered as actual. When "considering a world *w* as actual", we determine the extension of our terms at world *w* as follows. We take the reference-fixer of the terms in world *w*, and determine what they would pick out in world *w*, were *w* the actual world.

Secondary intension. A function rendering extensions to possible worlds considered as counterfactual. When "considering a world *w* as counterfactual", we take the reference-fixer of the terms in the actual world, determine what they pick out in the actual world, and render these references to world *w*.

A statement *S* is *primarily conceivable* (1-Con), if it is conceivable when interpreted according to its primary intension. A statement *S* is *ideally positively primarily conceivable*, if *S* is positively conceivable by an ideal reasoner, interpreted according to its primary intension. A statement *S* is *primarily possible* (1-Pos) if it is possible (there is a possible world in which it is true), when it is interpreted according to its primary intension. A statement *S* is *secondarily possible* (2-Pos), if it is possible, interpreted according to its secondary intension.

There is one single space of metaphysically possible worlds.

" \rightarrow ": entails *a priori*.

(See e.g. Chalmers 1996, chap. 2.)

hold that zombies are not possible, even though they are conceivable; viz. certain physical (brain) events strongly necessitate conscious events. This view is a version of a *posteriori* materialism, which holds that physical facts determine facts about consciousness, but they do not determine them *a priori*.

II. Chalmers' arguments against strong necessities

One argument of David Chalmers against strong metaphysical necessities is the following. There are no candidates of strong necessities, except – the alleged – strong necessity of the brain-consciousness relation; and this suggests that strong necessity is an *ad hoc* invention to save materialism. I shall argue, however, that it follows from Chalmers' views on the semantics and ontology of microphysical terms, that there are some *other* strong necessities: microphysical identifications, such as „Hydrogen is the such and such quantumstate” are strongly necessary. (If I am right, it also follows that a *posteriori* materialism cannot be rejected on the general assumption that there are no strong metaphysical necessities whatsoever. However, my argument clearly does not establish the truth of a *posteriori* materialism, I do not have this aim here.)

Chalmers modal rationalist claim that there are no strong necessities whatsoever, is elaborated in terms of the following principles (Chalmers 2002, 174-188):

(CP+) Ideal positive 1-Con $P \rightarrow$ 1-Pos P

(CP-) Ideal negative 1-Con $P \rightarrow$ 1-Pos P

(CP+) and (CP-) do not have the same strength of evidential support; (CP+) is almost certainly true, according to Chalmers, while (CP-) is not. This is not relevant to my argument, however, for I shall deal primarily with (CP+).

III. My thesis: microphysical identifications are strongly necessary

My thesis is that there are counterexamples to (CP+); they are ideally positively primarily conceivable, but not primarily possible. I suggest that microphysical identifications are such cases: they should count as strongly necessary, if we adopt Chalmers' semantics and metaphysics of microphysical terms.

My example is the claim that "Hydrogen is QM". The terms "hydrogen" and "QM" should be understood as follows. The reference-fixer of "hydrogen" is "hydrogen-likeness", viz. having a certain emission spectrum, SpE; QM is a certain quantum-mechanical state, which is described by the Schrödinger-equation, the eigen-values of which are the energy levels corresponding to the spectrum SpE. In our world, what is hydrogen-like is QM.

Now consider the following argument.

(1) "Hydrogen is not QM" is ideally primarily positively conceivable.

(2) If "Hydrogen is not QM" is ideally primarily positively conceivable, then "Hydrogen is not QM" is primarily possible.

(3) If "Hydrogen is not QM" is primarily possible, then "Hydrogen is not QM" is secondarily possible.

"Hydrogen is not QM" is secondarily possible.

But the conclusion must be false. For if "Hydrogen is QM" is true in our world, then it is secondarily necessarily true that "Hydrogen is QM" (by the definition of the secondary intension of "Hydrogen is QM"), hence it cannot be the case that it is secondarily possible that "Hydrogen is QM". Hence, we have to reject one of the premises.

The support for the premises

As regards (1)

(1) is true, because it is *not a priori* that "Hydrogen is QM".

For all we can know *a priori* (in principle), do not rule out that "Hydrogen is not QM". After all, "Hydrogen is QM" is an empirical truth. And we can also conceive of a scenario in which "Hydrogen is not QM" (namely a scenario, in which "Hydrogen is QM*", QM* being a microphysical state other than QM). Hence it is both negatively and positively conceivable that "Hydrogen is not QM".

Note that there is another conception of conceivability which sometimes gets mixed up with the one we used here, namely: „it accords with our present knowledge". If "Hydrogen is not QM" were only conceivable in this sense, this would not ground that "Hydrogen is QM" is strongly necessary. However, "Hydrogen is not QM" is conceivable in the relevant sense. To see this, consider the following example. The Goldbach-conjecture (any even integer is the product of two primes) and also its negation is conceivable, in the sense that they both accord with our present knowledge. But they both cannot accord with all what we can know *a priori* in principle. For if the Goldbach-conjecture is true, it is *a priori* true. Hence it is ruled out *a priori* that it is false; and we cannot form a scenario in which it is false, either. (We can know that the Goldbach-conjecture is true (or false) *a priori* in principle, for we can have an *a priori* proof for it – even if haven't got it as yet). Thus, if the Goldbach-conjecture is true, then it is both negatively and positively inconceivable that it is false, in our sense of conceivability. But the case of "Hydrogen is QM" is different. "Hydrogen is QM" is true, but *not a priori* true. So, unlike in the case of the Goldbach-conjecture, even if we know that "Hydrogen is QM" is true, we can conceive, in the relevant sense, that it is false.

As regards (2)

(2) is an application of the general (CP+) principle to a particular case. So if we accept (CP+), viz. modal rationalism, we have to accept (2) as well.

As regards (3)

(3) follows from Chalmers' semantics of microphysical terms. Accordingly

- (i) "Hydrogen" has the same reference-fixer in all possible worlds.
- (ii) The reference-fixer picks out the same entity, namely QM, at all possible worlds.

Hence,

The primary intension of „hydrogen" is a constant function.

Since the secondary intension of "hydrogen" is the same as its the primary intension (it also renders QM to each possible world), therefore (3) holds: if it is primarily possible that "Hydrogen is not QM", then it is also secondarily possible.

Now, if we cannot reject (1) and (3), then the only option remaining is to reject (2). Rejecting (2) amounts to rejecting (CP+), viz. modal rationalism, for it is tantamount to the claim that while it is conceivable that "Hydrogen is not QM", it is not possible. This means, that "H is QM is strongly necessary: hence we have a case of strong necessity different from the brain-consciousness relation.

Objections

We may investigate further whether the support for (3) is really acceptable.

(i) expresses the so-called "semantic account of considering a possible world as actual". Against such an interpretation Robert Stalnaker has formulated objections (Stalnaker 2001).

As against (ii), there are several argumentative strategies. One line is to claim, that (a) the semantics of „H" is similar to the semantics of „water", in the sense that its primary reference may change across worlds (As „water" may refer to XYZ, „H" may refer to QM* at some non-actual worlds considered as actual). I shall come back to this later.

Another line against (ii) is to claim (b) that „H" does not refer to some categorical property, but to some dispositional, structural property, and this allows that „H" does not denote QM, but something else in some (non-actual) worlds considered as actual. According to the now dominant view, the properties microphysical theories attribute to microphysical entities are categorical properties, playing both a reference-fixing role and being essential properties of these entities (e.g. the reference-fixer of „electron" is the „electron-role", and the properties constituting the electron-role are the same properties which are the categorical properties of electrons, according to microphysical theories). But there are views to the contrary: Schlick's, Russell's, or Maxwell's structuralist materialism, or Chalmers' F-monism assert that properties appearing in the reference-fixing descriptions of microphysical terms are dispositional/structural properties, which are not identical with the essential properties of the referents of the microphysical terms.

There are well-known arguments against such a structuralist account. Just to mention one: in other cases, where the reference-fixing properties are not the essential properties of the referent, there are some plausible candidate of knowable nature for the role of the essential properties. (E.g. the essential property of what „water" refers to, is its microphysical property of being H₂O, its reference-fixing property is being watery.). However, on the structuralist account of the meaning of microphysical terms, there are no such candidates, the nature of the posited essential properties are in principle unknowable; and this seems counterintuitive.

Now, coming back to (a), the „H" and „water" comparison. One may hold that (3) is false; the inference does not hold, for 1-Pos(hydrogen is not QM) is true, but 2-Pos(hydrogen is not QM) is false. There is an apparently similar case, water's not being H₂O: it is 1-Pos(Water is

not H_2O), but it is *not* 2-Pos(Water is not H_2O). The reason is that the reference-fixer of "water", watery stuff, may pick out different substances at some possible worlds (e.g. XYZ); hence 1-Pos(Water is not H_2O). But the secondary intension of "water" renders H_2O to all possible worlds (if our world is the actual world), hence it is not 2-Pos(Water is not H_2O).

However, the case of "Hydrogen is not QM" is different. For the primary intension of "hydrogen" is a constant function, it renders QM to each possible world considered as actual. And the secondary intension of "hydrogen" is also (the same) constant function, by definition. Hence if it is 1-Pos(H is not QM), then it is 2-Pos(H is not QM); there is no analogy with the case of water's not being H_2O .

We may still hold, the above answer notwithstanding, that the semantics of "H" is analogous with the semantics of "water". For the metaphysical intuition behind the semantic idea that "H" refers to QM in all possible worlds considered as actual, is that hydrogen is a fundamental entity of the world: and hence, in worlds where it exists, it must have the same nature as in our world. However, the objection goes, hydrogen is *not* at the most basic ontological level, and the metaphysical-cum-semantic intuition concerned applies only to terms denoting the most fundamental entities. (We assume, for the sake of argument, that such a hierarchical ontological model of physical entities is correct.)

To this we can reply the following. First of all, Chalmers' account of the water is H_2O case clearly supports my interpretation of his semantics for "H", since he holds that " H_2O " refers to the same entity in all possible worlds considered as actual; hence the same should apply to "H" (H and H_2O being on the same ontological level). Second, even if we accept this objection, a similar argument may be run not with hydrogen, but with some other entity, which is assumed to be at the most fundamental ontological level, for example with quarks. A parallel identity claim may be for example "c-quark is C-QRK" (where "C-QRK" denotes the essential properties of c-quarks.) Then this identification would count as strongly necessary.

Conclusion

If we accept Chalmers' semantics and metaphysics concerning microphysical terms, it follows that microphysical identifications are strongly necessary. Hence, within Chalmers' metaphysical and semantic framework there must be some strongly necessary relations, besides the – alleged – strong necessity of the brain-consciousness relation. This result supports modal empiricism. It also counts in favour of a *posteriori* materialism, for it blocks the objection that a *posteriori* materialism is committed to there being strong necessities, but there are no such modalities at all.

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