

Why A Posteriori Necessities are a Problem for Two-Dimensional Modal Semantics

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ABSTRACT

Two-dimensional modal semantics purports to be a powerful tool for analysing modal statements, but when faced with certain important, substantial modal statements, the framework fails to deliver. The problem concerns the distinction between metaphysically substantial modal statements and trivial modal statements: in the two-dimensional framework, both types of statement are treated in the same way. It will be suggested that this makes it impossible for the two-dimensionalist to distinguish between trivial a priori truths and substantial a posteriori necessities.

1. The Kripkean vs. two-dimensional analysis of modal statements

The framework of two-dimensional modal semantics familiar from David Chalmers (e.g., 2002a, 2006a) and Frank Jackson (1998) is very powerful, but it has also faced some serious criticisms. One of the potential problems concerns the interpretation of a posteriori necessities and specifically the distinction between a priori and a posteriori metaphysical necessities. In this paper it will be argued that the two-dimensional framework cannot satisfactorily uphold this distinction because it conflates trivial a priori truths and substantial a posteriori necessities, such as those arising from the essential properties of entities.

The problem can be illustrated by considering the apparent and important difference between the following types of sentence:

(A) All water is water.

(B) Water has its actual molecular structure essentially.¹

Both of these sentences are supposedly a priori and necessary, although we will analyse their epistemic and modal statuses in more detail in what follows. In any case, the former appears to be a trivial conceptual truth, whereas the latter seems to be a more substantial modal truth: it concerns the essential properties of water. The two-dimensional framework fails to accommodate this difference because both (A) and (B) necessarily have the same primary and secondary intension.² It could be said that (A) is

1 Where 'actual' refers to the molecular structure of water in this world, whatever it turns out to be – this is of course an a posteriori matter.

2 Two-dimensional modal semantics suggests that there are two distinct ways to understand modalities, the primary and the secondary intension, and the secondary intension is supposed to correspond with the traditional (Kripkean) understanding. Chalmers (2002b: ch. 7) argues that what is relevant for the Fregean view of language are the epistemic intensions, i.e., the primary intensions, and so epistemic

analytic and (B) is synthetic, but in what follows we will analyse the difference between these statements without resorting to the analytic/synthetic distinction. Moreover, the line of criticism that will be developed does not concern the *epistemic* difference between these sentences, although there no doubt is such a difference and it is well known that the two-dimensional framework cannot, on the face of it, explain this difference. However, this is a worry which has been discussed before: Chalmers (e.g., 2006a) talks about the difference between cognitively significant and cognitively insignificant propositions, reflecting the old Fregean problem concerning the difference between ‘Hesperus is Hesperus’ and ‘Hesperus is Phosphorus’. Perhaps the two-dimensionalist can get around this problem. One potential solution which Chalmers has developed is to make the two-dimensional framework more fine-grained in such a way that (A) and (B) will be associated with different semantic values. But this is not our primary interest, as there is another shortcoming in the framework.

Instead of the apparent epistemological difference between (A) and (B), we will focus on the difference concerning the metaphysical status of the statements. The triviality of (A) should be clear in this sense as well, since nothing metaphysically substantial is being said, but what is the metaphysical status of (B)? To clarify this, it may be helpful to consider the role of the statement in a familiar argument. Specifically, we will examine how the two-dimensional analysis of the classic a posteriori necessity, ‘Water = H₂O’, differs from the widely accepted Kripkean line.³ The latter generally follows this type of pattern:

(or conceptual) modality; whereas Kripke's account of a posteriori necessities involves secondary intensions and thus metaphysical modality. Two-dimensional modal semantics is supposed to be able to accommodate both of these cases, but we are primarily interested in the latter.

3 I am not interested in Kripke exegesis, but the analysis about to be presented is familiar from the ‘Kripkean’ literature, e.g., Hughes (2004), Soames (2005), Salmon (2005). It is the ‘Kripkean’ view familiar from this literature that I am referring to when I use the term ‘Kripkean’.

1. 'Water' is a directly referential term and it refers to a chemical substance.
2. Chemical substances have their molecular structures essentially.⁴
3. In the actual world, the molecular structure of water is H₂O (discovered empirically).
4. 'Water' and 'H₂O' are rigid designators.
5. 'Water = H₂O' is an example of the necessary a posteriori (from 1–4).

What we are interested in is the second premise, which is exactly what (B) is based on – here we are dealing with chemical substances in general, and water is simply a member of the set of chemical substances. According to the story inspired by Kripke, what makes 'Water = H₂O' a *metaphysical* necessity is the assumption behind the second premise, namely that the molecular structure of a substance is a part of its *essence*.⁵ Accordingly, the difference between the metaphysical status of 'All water is water' and 'Water has its actual molecular structure essentially' could perhaps be cashed out in terms of the role that the latter plays in the argument at hand: the essentiality of composition of water molecules, or, to be precise, the essentiality of composition of

4 Salmon has discussed the implications of this premise, which he puts as follows: 'Being a sample of the same substance as something consists in having the same chemical structure' (2005: 166). Salmon is reconstructing Putnam's account here; his characterisation of a posteriori necessities has the same elements as the case at hand, the most important of these for our purposes is the definition of a chemical substance with regard to its chemical structure. For some discussion concerning the origin of this premise see Salmon (176 ff.), where he demonstrates that we are here dealing with a non-trivial essential principle concerning chemical substances, and also suggests that this principle is tested 'not by laboratory experiment but by thought experiment' (p. 185). Hence, as Salmon concludes, we are here dealing with a question for metaphysics, not for philosophy of language.

5 Let it be noted here that I find this assumption far from trivial. It would require substantial work to establish that substances indeed have their molecular structure essentially. See Lowe (2007) and Tahko (2009) for further discussion.

chemical substances, is a crucial step in the argument. The assumption concerning the essence of chemical substances which is behind the second premise may be something that the two-dimensionalist does not wish to commit to, but she will have to say something about the source of this premise. Moreover, one might think that the two-dimensionalist would simply wish to deny that (B) is a priori, but this is unlikely: the Kripkean story clearly holds (B) to be a priori, and Chalmers (2006b: 589) explicitly states that the two-dimensionalist's claims are 'in no tension with the Kripkean claims that "water is H₂O" is metaphysically necessary, or that "water" picks out H₂O in all worlds'. Since the Kripkean story takes the metaphysical necessity of 'Water is H₂O' to be based exactly on the essential, a priori principle that (B) expresses, denying its apriority would certainly be in tension with the Kripkean story. Hence, it appears that both the classic Kripkean view and the two-dimensionalist will agree that:

(C) Sentences (A) and (B) are both a priori and metaphysically necessary.

According to the Kripkean story, (B) is a metaphysically necessary because it is part of the essence of water that it has the very molecular structure that it has, but the two-dimensionalist is unlikely to buy into this 'serious' essentialism. So, the two-dimensionalist needs to offer an alternative explanation of the metaphysical necessity of (B).

To solve this problem, the two-dimensionalist could perhaps attempt to make it a constraint for the concept 'water' that it picks out a substance which is watery and has its molecular structure essentially.⁶ This would make it a rather trivial conceptual truth that water has its molecular structure essentially. It would also appear to work for Twin Earth scenarios: XYZ is a substance which is watery and has its molecular structure

⁶ In discussion Chalmers has indicated that this is a route he might take.

essentially. This way the two-dimensionalist could differentiate between water and XYZ just as well as the Kripkean. However, talk of the XYZ-world makes sense only if it is considered as actual⁷: unless the actual molecular structure of water is XYZ, then the XYZ-world is metaphysically impossible, given that water has its actual molecular structure essentially. That is, if we acknowledge that the second premise of the previous argument is true and thus that chemical substances have their molecular structures essentially, then water is essentially H₂O and hence there are no worlds where water is XYZ. Yet, the interesting part of the story is *not* the actual molecular structure of water, but rather the essentialist assumption concerning the nature of chemical substances. The two-dimensional analysis relies on the idea that if we were catastrophically mistaken, water might turn out to be XYZ instead of H₂O. This seems to be an epistemic possibility and the two-dimensionalist wants to accommodate this possibility. But this is just based on empirical defeasibility, i.e., the fact that the third premise of the Kripkean argument, namely that water is H₂O in the actual world, might be false due to the empirical element, the fallible discovery that water is H₂O. So, it appears that the sophisticated story concerning epistemic possibilities and the two-dimensionalist's 'considered as actual' predicate have no bearing on the crucial, second premise of the Kripkean argument – they concern the defeasibility of our empirical discoveries rather

7 Very roughly, the idea is that where traditionally modality is seen as 'considering something to be possible counterfactually', there is another way to think about it, namely to 'consider something to be possible actually' (cf. Chalmers 2006a, 2006b). These different ways to think about modality are supposed to reflect metaphysical and epistemic modality, respectively. This also gives the two-dimensionalist a tool to talk about metaphysical necessities as if they were not true in the actual world, i.e., the epistemic possibility that water is XYZ is not ruled out by a priori reasoning and thus there is a perfectly clear sense in which it is possible that water is XYZ (and, indeed, a clear sense in which this is conceivable). This is not in conflict with the Kripkean idea of metaphysical necessity, or so Chalmers (2006b) argues.

than essentialist principles. Accordingly, the problem that the two-dimensionalist faces is that the two-dimensional analysis of (B) gives us no good reasons to think that (B) can play the role that it is supposed to play in the Kripkean argument for the a posteriori necessity of 'Water = H₂O'. Indeed, it is not clear that the framework can account for any metaphysically substantial a posteriori necessities. However, the two-dimensional analysis is admittedly more fine-grained than this.

2. The two-dimensional analysis and empirical defeasibility

It does not seem that we have yet grasped the core of the second, essentialist premise of the argument, as the emphasis is now on the empirical discovery concerning the molecular structure of water. By making it a constraint for 'water' that it picks out a substance which is watery and has its molecular structure essentially, the two-dimensionalist leaves open the epistemic possibility that water is XYZ, but at the same time she undermines the supposed strength of the underlying essentialist principle: that the *concept* 'water' picks out a watery substance which has its molecular structure essentially does not explain why chemical substances have their molecular structures essentially, if they indeed do. In fact, the constraint seems to have been introduced simply because it is assumed that this is how we wish to use the concept 'water', but the question at hand now is whether this usage is *correct*, i.e., what is the status of the essentialist principle according to which chemical substances have the same molecular structure in all possible worlds. A closer look at what kind of results the two-dimensional framework gives will reveal where the problem lies.

A core assumption in this evaluation is that there is a sense in which we can consider the XYZ-world to be actual. This assumption is based on the idea that we do not know which world is the actual world, given empirical defeasibility. Quite simply, then, if we

adopt a scenario where the XYZ-world is the actual world, then we have a clear sense in which ‘Water is XYZ’ is possible, while we can still say that ‘Water is XYZ’ is metaphysically impossible if the XYZ-world is considered as counterfactual and we assume that our best current science is correct (i.e., that water is not XYZ in the actual world). But consider how statements concerning the nature of chemical substances like water come out in the two-dimensional framework, specifically (B): ‘Water has its actual molecular structure essentially’. This statement is true (if it is true) in all possible worlds regardless of whether the world is considered as actual or counterfactual. It states something about the nature of a substance regardless of what the molecular structure of that substance in fact is. Compare that with ‘All water is water’, which is also true in all possible worlds regardless of whether the world is considered as actual or counterfactual. Frank Jackson puts this as follows, where ‘C-intension’ is what Chalmers calls ‘secondary intension’, namely, the counterfactual understanding of a proposition:

[T]he C-intension of ‘All water is water’ is identical with the C-intension of ‘All water is H₂O’, so ‘they’ have the same modal and epistemic status: in particular, the C-intension in question is necessary, and, plausibly, a priori. It is the C-intension that people most often have in mind, naturally enough, when they talk of the proposition *expressed* by a sentence, and what I am saying in this terminology is that the proposition expressed by ‘All water is H₂O’ is one and the same, namely, the set of all worlds, so there cannot be any difference in modal or epistemic status. (Jackson 1998: 85.)

Although Jackson’s example is ‘All water is H₂O’ rather than ‘Water has its actual molecular structure essentially’, which is what has been used above, it seems clear that the quoted passage applies to both, as our example simply omits the empirical discovery that water is H₂O (which is the third premise of the previous Kripkean argument). If this

is correct, the secondary intensions of ‘All water is water’ and ‘Water has its actual molecular structure essentially’ have the same modal and epistemic status, i.e., they are both necessary and a priori. The reason for using ‘Water has its actual molecular structure essentially’ rather than ‘All water is H₂O’ is exactly to avoid complications introduced by the empirical defeasibility of the discovery that water indeed is H₂O – otherwise we could distinguish the statements in terms of their epistemic status. But now we can focus on the second premise of the Kripkean argument, which is what highlights the shortcoming in the two-dimensionalist treatment of the case. Specifically, if we remove the epistemic uncertainty concerning the empirical defeasibility of the discovery that water is H₂O, then there is nothing in the two-dimensional framework that distinguishes the trivial ‘All water is water’ from ‘Water has its actual molecular structure essentially’.

Why is this? Well, in the case of ‘All water is water’ and ‘All water is H₂O’, the two-dimensionalist does have a way to explain the difference between the statements, namely, their primary intensions, or A-intensions in Jackson’s terminology, are distinct: in the case of ‘All water is water’ the primary intension is the same as the secondary intension, but in the case of ‘All water is H₂O’ the primary intension is contingent and a posteriori because it involves the empirical discovery that water is H₂O, and this is obviously a contingent matter. But when we remove the contingency, which is exactly what our example, ‘Water has its actual molecular structure essentially’, is designed for, the two-dimensionalist has no such escape route. In this case the primary intension and the secondary intension will also be identical, as the operator ‘actual’ in ‘Water has its actual molecular structure essentially’ fixes the molecular structure of water in all possible worlds regardless of what that structure turns out to be, that is, regardless of the epistemic concerns that may be raised about the empirical discovery that water is H₂O.

If both ‘All water is water’ and ‘Water has its actual molecular structure essentially’ have necessary primary intensions, as suggested above, then according to what Chalmers (2006a) calls the ‘Core Thesis’ of two-dimensionalism, both of them will also be a priori:

Core Thesis: For any sentence S, S is a priori iff S has a necessary primary intension.

So, since ‘All water is water’ and ‘Water has its actual molecular structure essentially’ come out as true in all possible worlds considered as actual and counterfactual, and hence have necessary primary intensions, both statements appear to be a priori. Indeed, we already saw that the two-dimensionalist is unlikely to deny this because it would also conflict with the Kripkean story. Now, the two-dimensionalist might still insist that *both* of these modal statements are rather trivial, but the upshot of this would be that trivial a priori truths and substantial a posteriori necessities cannot be distinguished in the two-dimensional framework, which is what we set out to demonstrate in the first place.

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