

A Posteriori Necessities

by Saul Kripke (excerpted from *Naming and Necessity*, 1980)

Let's suppose we refer to the same heavenly body twice, as 'Hesperus' and 'Phosphorus'. We say: Hesperus is that star over there in the evening; Phosphorus is that star over there in the morning. Actually, Hesperus is Phosphorus. Are there really circumstances under which Hesperus wouldn't have been Phosphorus? Supposing that Hesperus is Phosphorus, let's try to describe a possible situation in which it would not have been. Well, it's easy. Someone goes by and he calls two *different* stars 'Hesperus' and 'Phosphorus'. It may even be under the same conditions as prevailed when we introduced the names 'Hesperus' and 'Phosphorus'. But are those circumstances in which Hesperus is not Phosphorus or would not have been Phosphorus? It seems to me that they are not.

Now, of course I'm committed to saying that they're not, by saying that such terms as 'Hesperus' and 'Phosphorus', when used as names, are rigid designators. They refer in every possible world to the planet Venus. Therefore, in that possible world too, the planet Venus is the planet Venus and it doesn't matter what any other person has said in this other possible world. How should we describe this situation? He can't have pointed to Venus twice, and in the one case called it 'Hesperus' and in the other 'Phosphorus', as we did. If he did so, then 'Hesperus is Phosphorus' would have been true in that situation too. He pointed maybe neither time to the planet Venus—at least one time he didn't point to the planet Venus, let's say when he pointed to the body he called 'Phosphorus'. Then in that case we can certainly say that the name 'Phosphorus' might not have referred to Phosphorus. We can even say that in the very position when viewed in the morning that we found Phosphorus, it might have been the case that Phosphorus was not there—that something else was there, and that even, under certain circumstances it would have been *called* 'Phosphorus'. But that still is not a case in which Phosphorus was not Hesperus. There might be a possible world in which, a possible counterfactual situation in which, 'Hesperus' and 'Phosphorus' weren't names of the things they in fact are names of. Someone, if he did determine their reference by identifying descriptions, might even have used the very identifying descriptions we used. But still that's not a case in which Hesperus wasn't Phosphorus. For there couldn't have been such a case, given that Hesperus is Phosphorus.

Now this seems very strange because in advance, we are inclined to say, the answer to the question whether Hesperus is Phosphorus might have turned out either way. So aren't there really two possible worlds—one in which Hesperus was Phosphorus, the other in which Hesperus wasn't Phosphorus—in advance of our discovering that these were the same? First, there's one sense in which things might turn out either way, in which it's clear that that doesn't imply that the way it finally turns out isn't necessary. For example, the four color theorem might turn out to be true and might turn out to be false. It might turn out either way. It still doesn't mean that the way it turns out is not necessary. Obviously, the 'might' here is purely 'epistemic'—it merely expresses our present state of ignorance, or uncertainty.

But it seems that in the Hesperus-Phosphorus case, something even stronger is true. The evidence I have before I know that Hesperus is Phosphorus is that I see a certain star or a certain heavenly body in the evening and call it 'Hesperus', and in the morning and call it 'Phosphorus'. I know these things. There certainly is a possible world in which a man should have seen a certain star at a certain position in the evening and called it 'Hesperus' and a certain star in the morning and called it 'Phosphorus'; and should have concluded—should have found out by empirical investigation—that he names two different stars, or two different heavenly bodies. At least one of these stars or heavenly bodies was not Phosphorus, otherwise it couldn't have come out that way. But that's true. And so it's true that given the evidence that someone has antecedent to his empirical investigation, he can be placed in a sense in exactly the same situation, that is a qualitatively identical epistemic situation, and call two heavenly bodies 'Hesperus' and 'Phosphorus', without their being identical. So in that sense we can say that it might have turned out either way. Not that it might have turned out either way as to Hesperus's being Phosphorus. Though for all we knew in advance, Hesperus wasn't Phosphorus, that couldn't have turned out any other way, in a sense. But being put in a situation where we have exactly the same evidence, qualitatively speaking, it could have turned out that Hesperus was not Phosphorus; that is, in a counterfactual world in which 'Hesperus' and 'Phosphorus' were not used in the way that we use them, as names of this planet, but as names of some other objects, one could have had qualitatively identical evidence and concluded that 'Hesperus' and 'Phosphorus' named two different objects. But we, using the names as we do right now, can say in advance, that if Hesperus and Phosphorus are one and the same, then in no other possible world can they be different. We use 'Hesperus' as the name of a certain body and 'Phosphorus' as the name of a certain body. We use them as names of those bodies in all possible worlds. If, in fact, they are the *same* body, then in any other possible world we have to use them as a name of that object. And so in any other possible world it will be true that Hesperus is Phosphorus. So two things are true: first, that we do not know *a priori* that Hesperus is Phosphorus, and are in no position to find out the answer except empirically. Second, this is so because we could have evidence qualitatively indistinguishable from the evidence we have and determine the reference of the two names by the positions of two planets in the sky, without the planets being the same.

Of course, it is only a contingent truth (not true in every other possible world) that the star seen over there in the evening is the star seen over there in the morning, because there are possible worlds in which Phosphorus was not visible in the morning. But that contingent truth shouldn't be identified with the statement that Hesperus is Phosphorus. It could only be so identified if you thought that it was a necessary truth that Hesperus is visible over there in the evening or that Phosphorus is visible over there in the morning. But neither of those are necessary truths even if that's the way we pick out the planet. These are the contingent marks by which we identify a certain planet and give it a name. ...

We have concluded that an identity statement between names, when true at all, is necessarily true, even though one may not know it *a priori*. Suppose we identify Hesperus as a certain star seen in the evening and Phosphorus as a certain star, or a certain heavenly body, seen in the morning; then there may be possible worlds in which two different planets would have been seen in just those positions in the evening and morning. However, at least one of them, and maybe both, would not have been Hesperus, and then that would not have been a situation in which Hesperus was not Phosphorus. It might have been a situation in which the planet seen in this position in the evening was not the planet seen in this position in the morning; but that is not a situation in which Hesperus was not Phosphorus. It might also, if people gave the names 'Hesperus' and 'Phosphorus' to these planets, be a situation in which some planet other than Hesperus was called 'Hesperus'. But even so, it would not be a situation in which Hesperus itself was not Phosphorus.¹

Some of the problems which bother people in these situations, as I have said, come from an identification, or as I would put it, a confusion, between what we can know *a priori* in advance and what is necessary. Certain statements—and the identity statement is a paradigm of such a statement on my view—if true at all must be necessarily true. One does know *a priori*, by philosophical analysis, that if such an identity statement is true it is necessarily true.

One qualification: when I say 'Hesperus is Phosphorus' is necessarily true, I of course do not deny that situations might have obtained in which there was no such planet as Venus at all, and therefore no Hesperus and no Phosphorus. In that case, there is a question whether the identity statement 'Hesperus is Phosphorus' would be true, false, or neither true nor false. And if we take the last option, is 'Hesperus = Phosphorus' necessary because it is never false, or should we require that a necessary truth be true in all possible worlds? I am leaving such problems outside my considerations altogether. If we wish to be somewhat more careful, we could replace the statement 'Hesperus is Phosphorus' by the conditional, 'If Hesperus exists then Hesperus is Phosphorus', cautiously taking only the latter to be necessary. Unfortunately this conditional involves us in the problem of singular attributions of existence, one I cannot discuss here. In particular, philosophers sympathetic to the description theory of naming often argue that one cannot ever say of an object that it exists. A supposed statement about the existence of an object really is, so it's argued, a statement about whether a certain description or property is satisfied. As I have already said, I disagree. Anyway, I can't really go into the problems of existence here. ...

Let's consider how this applies to the types of identity statements expressing scientific discoveries that I talked about before—say, that water is H₂O. It certainly represents a discovery that water is H₂O. We identified water originally by its

¹ Recall that we describe the situation in our language, not the language that the people in that situation would have used. Hence we must use the terms 'Hesperus' and 'Phosphorus' with the same reference as in the actual world. The fact that people in that situation might or might not have used these names for different planets is irrelevant. So is the fact that they might have done so using the very same descriptions as we did to fix their references.

characteristic feel, appearance and perhaps taste, (though the taste may usually be due to the impurities). If there were a substance, even actually, which had a completely different atomic structure from that of water, but resembled water in these respects, would we say that some water wasn't H₂O? I think not. We would say instead that just as there is a fool's gold there could be a fool's water; a substance which, though having the properties by which we originally identified water, would not in fact be water. And this, I think, applies not only to the actual world but even when we talk about counterfactual situations. If there had been a substance, which was a fool's water, it would then be fool's water and not water. On the other hand if this substance can take another form—such as the polywater allegedly discovered in the Soviet Union, with very different identifying marks from that of what we now call water—it is a form of water because it is the same substance, even though it doesn't have the appearances by which we originally identified water.

Let's consider the statement 'Light is a stream of photons' or 'Heat is the motion of molecules'. By referring to light, of course, I mean something which we have some of in this room. When I refer to heat, I refer not to an internal sensation that someone may have, but to an external phenomenon which we perceive through the sense of feeling; it produces a characteristic sensation which we call the sensation of heat. Heat *is* the motion of molecules. We have also discovered that increasing heat corresponds to increasing motion of molecules, or, strictly speaking, increasing average kinetic energy of molecules. So temperature is identified with mean molecular kinetic energy. However I won't talk about temperature because there is the question of how the actual scale is to be set. It might just be set in terms of the mean molecular kinetic energy. But what represents an interesting phenomenological discovery is that when it's hotter the molecules are moving faster. We have also discovered about light that light is a stream of photons; alternatively it is a form of electromagnetic radiation.

Originally we identified light by the characteristic internal visual impressions it can produce in us, that make us able to see. Heat, on the other hand, we originally identified by the characteristic effect on one aspect of our nerve endings or our sense of touch.

Imagine a situation in which human beings were blind or their eyes didn't work. They were unaffected by light. Would that have been a situation in which light did not exist? It seems to me that it would not. It would have been a situation in which our eyes were not sensitive to light. Some creatures may have eyes not sensitive to light. Among such creatures are unfortunately some people, of course; they are called 'blind'. Even if all people had had awful vestigial growths and just couldn't see a thing, the light might have been around; but it would not have been able to affect people's eyes in the proper way. So it seems to me that such a situation would be a situation in which there was light, but people could not see it. So, though we may identify light by the characteristic visual impressions it produces in us, this seems to be a good example of fixing a reference. We fix what light is by the fact that it is whatever, out in the world, affects our eyes in a certain way. But now,

talking about counterfactual situations in which let's say, people were blind, we would not then say that since, in such situations, nothing could affect their eyes, light would not exist; rather we would say that that would be a situation in which light—the thing we have identified as that which in fact enables us to see—existed but did not manage to help us see due to some defect in us.

Perhaps we can imagine that, by some miracle, sound waves somehow enabled some creature to see. I mean, they gave him visual impressions just as we have, maybe exactly the same color sense. We can also imagine the same creature to be completely *insensitive* to light (photons). Who knows what subtle undreamt of possibilities there may be? Would we say that in such a possible world, it was sound which was light, that these wave motions in the air were light? It seems to me that, given our concept of light, we should describe the situation differently. It would be a situation in which certain creatures, maybe even those who were called 'people' and inhabited this planet, were sensitive not to light but to sound waves, sensitive to them in exactly the same way that we are sensitive to light. If this is so, once we have found out what light is, when we talk about other possible worlds we are talking about *this* phenomenon in the world, and not using 'light' as a phrase *synonymous* with 'whatever gives us the visual impression—whatever helps us to see'; for there might have been light and it not helped us to see; and even something else might have helped us to see. The way we identified light *fixed a reference*.

And similarly for other such phrases, such as 'heat'. Here heat is something which we have identified (and fixed the reference of its name) by its giving a certain sensation, which we call 'the sensation of heat'. We don't have a special name for this sensation other than as a sensation of heat. It's interesting that the language is this way. Whereas you might suppose it, from what I am saying, to have been the other way. At any rate, we identify heat and are able to sense it by the fact that it produces in us a sensation of heat. It might here be so important to the concept that its reference is fixed in this way, that if someone else detects heat by some sort of instrument, but is unable to feel it, we might want to say, if we like, that the concept of heat is not the same even though the referent is the same.

Nevertheless, the term 'heat' doesn't *mean* 'whatever gives people these sensations'. For first, people might not have been sensitive to heat, and yet the heat still have existed in the external world. Secondly, let us suppose that somehow light rays, because of some difference in their nerve endings, *did* give them these sensations. It would not then be heat but light which gave people the sensation which we call the sensation of heat.

Can we then imagine a possible world in which heat was not molecular motion? We can imagine, of course, having discovered that it was not. It seems to me that any case which someone will think of, which he thinks at first is a case in which heat—contrary to what is actually the case—would have been something other than molecular motion, would actually be a case in which some creatures with different nerve endings from ours inhabit this planet (maybe even we, if it's a contingent fact about us that we have this particular neural structure), and in which these creatures

were sensitive to that something else, say light, in such a way that they felt the same thing that we feel when we feel heat. But this is not a situation in which, say, light would have been heat, or even in which a stream of photons would have been heat, but a situation in which a stream of photons would have produced the characteristic sensations which *we* call 'sensations of heat'.

Similarly for many other such identifications, say, that lightning is electricity. Flashes of lightning are flashes of electricity. Lightning is an electrical discharge. We can imagine, of course, I suppose, other ways in which the sky might be illuminated at night with the same sort of flash without any electrical discharge being present. Here too, I am inclined to say, when we imagine this, we imagine something with all the visual appearances of lightning but which is not, in fact, lightning. One could be told: this appeared to be lightning but it was not. I suppose this might even happen now. Someone might, by a clever sort of apparatus, produce some phenomenon in the sky which would fool people into thinking that there was lightning even though in fact no lightning was present. And you wouldn't say that that phenomenon, because it looks like lightning, was in fact lightning. It was a different phenomenon from lightning, which is the phenomenon of an electrical discharge; and this is not lightning but just something that deceives us into thinking that there is lightning.

What characteristically goes on in these cases of, let's say, 'heat is molecular motion'? There is a certain referent which we have fixed, for the real world and for all possible worlds, by a contingent property of it, namely the property that it's able to produce such and such sensations in us. Let's say it's a contingent property of heat that it produces such and such sensations in people. It's after all contingent that there should ever have been people on this planet at all. So one doesn't know *a priori* what physical phenomenon, described in other terms—in basic terms of physical theory—is the phenomenon which produces these sensations. We don't know this, and we've discovered eventually that this phenomenon is in fact molecular motion. When we have discovered this, we've discovered an identification which gives us an essential property of this phenomenon. We have discovered a phenomenon which in all possible worlds will be molecular motion—which could not have failed to be molecular motion, because that's what the phenomenon *is*. On the other hand, the property by which we identify it originally, that of producing such and such a sensation in us, is not a necessary property but a contingent one. This very phenomenon could have existed, but due to differences in our neural structures and so on, have failed to be felt as heat. Actually, when I say *our* neural structures, as those of human beings, I'm really hedging a point which I made earlier; because of course, it might be part of the very nature of human beings that they have a neural structure which is sensitive to heat. Therefore this too could turn out to be necessary if enough investigation showed it. This I'm just ignoring, for the purpose of simplifying the discussion. At any rate it's not necessary, I suppose, that this planet should have been inhabited by creatures sensitive to heat in this way.

I will conclude with some remarks about the application of the foregoing considerations to the debate over the mind-body identity thesis. Before I do so, however, I wish to recapitulate the views I have developed, and perhaps add a point or two. ...

Let us return to the question of theoretical identification. Theoretical identities, according to the conception I advocate, are generally identities involving two rigid designators and therefore are examples of the necessary *a posteriori*. Now in spite of the arguments I gave before for the distinction between necessary and *a priori* truth, the notion of *a posteriori* necessary truth may still be somewhat puzzling. Someone may well be inclined to argue as follows: 'You have admitted that heat might have turned out not to have been molecular motion, and that gold might have turned out not to have been the element with the atomic number 79. For that matter, you also have acknowledged that Elizabeth II might have turned out not to be the daughter of George VI, or even to originate in the particular sperm and egg we had thought, and this table might have turned out to be made from ice made from water from the Thames. I gather that Hesperus might have turned out not to be Phosphorus. What then can you mean when you say that such eventualities are impossible? If Hesperus might have *turned out* not to be Phosphorus, then Hesperus might not have *been* Phosphorus. And similarly for the other cases: if the world could have *turned out* otherwise, it could have *been* otherwise. To deny this fact is to deny the self-evident modal principle that what is entailed by a possibility must itself be possible. Nor can you evade the difficulty by declaring the "might have" of "might have turned out otherwise" to be merely epistemic, in the way that "Fermat's Last Theorem might turn out to be true and might turn out to be false" merely expresses our present ignorance, and "Arithmetic might have turned out to be complete" signals our former ignorance. In these mathematical cases, we may have been ignorant, but it was in fact mathematically impossible for the answer to turn out other than it did. Not so in your favorite cases of essence and of identity between two rigid designators: it really is logically possible that gold should have turned out to be a compound, and this table might really have turned out not to be made of wood, let alone of a given particular block of wood. The contrast with the mathematical case could not be greater and would not be alleviated even if, as you suggest, there may be mathematical truths which it is impossible to know *a priori*.'

Perhaps anyone who has caught the spirit of my previous remarks can give my answer himself, but there is a clarification of my previous discussion which is relevant here. The objector is correct when he argues that if I hold that this table could not have been made of ice, then I must also hold that it could not have turned out to be made of ice; *it could have turned out that P* entails that *P* could have been the case. What, then, does the intuition that the table might have turned out to have been made of ice or of anything else, that it might even have turned out not to be made of molecules, amount to? I think that it means simply that there might have been *a table* looking and feeling just like this one and placed in this very position in the room, which was in fact made of ice. In other words, I (or some conscious being) could have been *qualitatively in the same epistemic situation* that in fact obtains, I could have the same sensory evidence that I in fact have, about *a table*

which was made of ice. The situation is thus akin to the one which inspired the counterpart theorists; when I speak of the possibility of the table turning out to be made of various things, I am speaking loosely. *This* table itself could not have had an origin different from the one it in fact had, but in a situation qualitatively identical to this one with respect to all the evidence I had in advance, the room could have contained *a table made of ice* in place of this one. Something like counterpart theory is thus applicable to the situation, but it applies only because we are *not* interested in what might have been true of *this particular* table, but in what might or might not be true of *a table* given certain evidence. It is precisely because it is *not* true that this table might have been made of ice from the Thames that we must turn here to qualitative descriptions and counterparts. To apply these notions to genuine *de re* modalities is, from the present standpoint, perverse.

The general answer to the objector can be stated, then, as follows: Any necessary truth, whether *a priori* or *a posteriori*, could not have turned out otherwise. In the case of some necessary *a posteriori* truths, however, we can say that under appropriate qualitatively identical evidential situations, an appropriate corresponding qualitative statement might have been false. The loose and inaccurate statement that gold might have turned out to be a compound should be replaced (roughly) by the statement that it is logically possible that there should have been a compound with all the properties originally known to hold of gold. The inaccurate statement that Hesperus might have turned out not to be Phosphorus should be replaced by the true contingency mentioned earlier in these lectures: two distinct bodies might have occupied, in the morning and the evening, respectively, the very positions actually occupied by Hesperus-Phosphorus-Venus. The reason the example of Fermat's Last Theorem gives a different impression is that here no analogue suggests itself, except for the extremely general statement that, in the absence of proof or disproof, it is possible for a *mathematical conjecture* to be either true or false.

I have not given any general paradigm for the appropriate corresponding qualitative contingent statement. Since we are concerned with how things might have turned out otherwise, our general paradigm is to redescribe both the prior evidence and the statement qualitatively and claim that they are only contingently related. In the case of identities, using two rigid designators, such as the Hesperus-Phosphorus case above, there is a simpler paradigm which is often usable to at least approximately the same effect. Let ' R_1 ' and ' R_2 ' be the two rigid designators which flank the identity sign. Then ' $R_1 = R_2$ ' is necessary if true. The references of ' R_1 ' and ' R_2 ', respectively, may well be fixed by nonrigid designators ' D_1 ' and ' D_2 ', in the Hesperus and Phosphorus cases these have the form 'the heavenly body in such-and-such position in the sky in the, evening (morning)'. Then although ' $R_1 = R_2$ ' is necessary, ' $D_1 = D_2$ ' may well be contingent, and this is often what leads to the erroneous view that ' $R_1 = R_2$ ' might have turned out otherwise.