KRIPKE ON MODALITY

Saul Kripke's published contributions to the theory of modality include both mathematical material (1959a, 1963a, 1963b, and more) and philosophical material (1971, henceforth N&I; 1980, henceforth N&N). Here the latter must be given primary emphasis, but the former will not be entirely neglected.

APOSTERIORI NECESSITY

Kripke's overarching philosophical point is that the necessary is not to be confused with the apriori, but preliminary explanations are needed before his contribution can be specified more precisely. To begin with, the linguistics literature (Palmer 1986) distinguishes three flavors of modality: deontic, epistemic/evidential, and dynamic. The pertinent notions of necessity are the *obligatory* or *what must be if obligations are fulfilled*, the *known* or *what must be given what is known*, and the *inevitable* in the sense of what *cannot fail and could not have failed to be, no matter what*. This last is the only notion of necessity of interest in our present context. As Kripke emphasizes, this notion of the necessary and its correlative notion of the contingent are metaphysical concepts. They are as such at least conceptually distinct from the epistemological notions of the apriori and aposteriori and the semantical notions of the analytic and synthetic. Before Kripke this was never completely forgotten, but its importance was arguably grossly underestimated. Prior to Kripke's work it was the near-unanimous opinion that the analytic is included in the apriori, which in turn is included in the necessary (Quine 1960: 59). It was the majority opinion that these inclusions reverse, making the three

classifications coextensive; but there were dissenters, conscious of being in the minority (Kneale and Kneale 1962: 637-639).

Kripke himself cites, as a putative counterexample from the previous literature to the inclusion of the necessary in the apriori, the following mathematical case. It is widely held that in mathematics the necessary coincides with the true, and the apriori coincides with the provable; but it is also widely held that the work of Kurt Gödel shows that there are unprovable truths, though there is an obvious difficulty in trying to exhibit a specific instance. Any mathematical truth not provable would be a necessity not apriori. Kripke's main philosophical contribution to the study of modality has been to give very different specific examples supposed to be necessary but aposteriori (and therefore synthetic), examples that have been very widely found convincing.

Before turning to these examples, however, two small points should be mentioned. First, Kripke tentatively suggests that there may also be examples that are apriori but contingent (and therefore synthetic). In a late work (2011) he comes close to endorsing Harry Frankfurt's proposal that Descartes' *I think* is such a case. But Kripke's claims on this head are always guarded, and he never treats the matter as much more than a curiosity. Second, many distinguish the notion of interest here, the metaphysically necessary, that which could not have failed to be *no matter what*, from the physically necessary, that which could not have failed to be *without a violation of the laws of nature*, considering the latter weaker on the grounds that the laws of nature could have been other than as they are. Kripke in the addenda to N&N indicates he is neutral on this point.

Returning then to putative examples of aposteriori necessities, Kripke's discussion of them is intertwined with discussion of issues about names and denotation or reference. Among his examples of aposteriori necessities a distinction must be made (following Salmon 1981): some emerge directly from his views on naming, while others depend on additional intuitions. Inversely, some of his views on naming directly pertain to his examples of aposteriori necessities, while others are at most indirectly relevant.

NAMING AND IDENTITY

Kripke's most basic examples are identity statements involving two proper names for the same item, as with *Hesperus is Phosphorus* or *Cicero is Tully*. In the former case the two names derive from two acts of naming, one in the evening, one in the morning (for etymologically the names mean, nearly enough, *evening star* and *morning star*); in the latter case they derive from two simplifications of the same original complex tripartite name (*Marcus Tullius Cicero*). That such identity statements are aposteriori Kripke takes to be comparatively uncontroversial. Subsequently some have argued (Soames 2005) that they are apriori, while still agreeing with Kripke that non-identities such as *Junius is not Burke* are aposteriori, on highly theoretical grounds based on a certain conception of coarse-grained propositions. That matter is a subtlety that will not be gone into here.

That the identity statements, and likewise non-identity statements, are necessary is argued by Kripke to be a consequence of proper names being *rigid designators*, meaning that they denote the same thing whether speaking of how things actually are or of how things actually aren't but potentially could have been — or in jargon, whether speaking

of the actual world or of some non-actual possible world. Kripke warns that what is at issue is what a name *is* used to denote when *we* are speaking *of* some counterfactual situation, and not what a phonetically and orthographically indistinguishable name *might be* used to denote by hypothetical speakers when *they* were speaking *in* that counterfactual situation. Bearing that in mind, let M and N be proper names, and suppose they denote the same thing with respect to, or when speaking of, the actual world @. Then, setting aside subtleties about possible non-existence in some worlds, they denote the same things with respect to, or when speaking of, any possible world *w*. For what M denotes with respect to *w* is by rigidity what M denotes with respect to @, which is by assumption what N denotes with respect to @, which is by rigidity what N denotes with respect to *w*.

In a rigorous mathematical treatise, whenever a constant is introduced, a uniquely identifying description is introduced along with it: the description serves as a definition of the constant, the constant as an abbreviation of the description. Kripke argues that names in natural language do not work this way. It is not enough to allow, as previous writers on the topic over the period 1957-1962 discussed in N&N had done, that the uniquely identifying description associated with a name may vary from speaker to speaker and occasion to occasion, or that it may be more a matter of a cluster of descriptions than of a single description, or that the description may make one speaker's reference parasitical on a previous speaker's reference, or that the description may serve to determine the reference of a name without constituting its meaning. Kripke holds

rather, in agreement with Donnellan (1970), whom he cites as having independently arrived at similar ideas, that there simply need not be any associated uniquely identifying description: that a name denotes the item it does, not because that item uniquely satisfies some associated description, but because of the history of the use of the name. This Kripke pictures as a "chain of communication" in which an "initial baptist" picks out an item by ostension or description and introduces an expression as a name for it, after which each subsequent speaker takes over the expression with the intention of using it to name whatever the speaker it was taken over from was using it to name. No uniquely identifying description need be associated with the name in order for it to continue denoting what it was introduced to denote.

According to Kripke, speakers often can associate no description with a name that is uniquely true of its bearer, and yet they do succeed in using the name to denote that bearer. In an exceptional case like *Christopher Columbus*, perhaps each of us does associate a similar uniquely identifying description with the name, some variant of *the person most responsible for large-scale contact between the eastern and western hemispheres.* In a more ordinary case like *Stephen Weinberg*, some may only be able to say *a famous physicist*, which is true of him but not uniquely so, or to say *the author of the quark hypothesis*, which is not true of him at all. And yet they are nonetheless able to say these less-than-uniquely-true things *about him* using his name. These are important and influential views, but their bearing on aposteriori necessity is less direct than that of the doctrine of rigidity.

GENEALOGY AND COMPOSITION

A second type of Kripkean example concerns pedigree. Avoiding giving royals their titles, in order to avoid issues about titles as opposed to names, consider Elizabeth Windsor, her father George Windsor, and the latter's contemporary Harry Truman. Kripke takes the following to be an aposteriori necessity: *EW is the daughter of GW and not of HT*. The example is aposteriori, it is claimed, because if a tabloid published a rumor to the contrary, the libel might not be refutable apriori by pointing out an internal contradiction, but only aposteriori by DNA evidence. The example is necessary, it is claimed, because in no counterfactual scenario however far-fetched would a daughter of HT be anything more than a substitute for EW. This is obviously so in a scenario in which EW is stillborn and for high reasons of state some by-blow of HT is secretly adopted and passed off as his daughter by GW, being given the name and place of EW; but it is plausibly claimed to be equally so in any other scenario.

This does not follow simply from names lacking associated uniquely identifying descriptions, or being rigid designators. The intuition behind the example seems to be something like this: if we imagine backing up the train of history to a time before EW's birth or conception, and then going foreword along a different track (N&N: note 57), the only way we will have of recognizing an individual on this alternative track as EW will be by her originating from the same gametes as EW. Going beyond anything explicitly said by Kripke, the general principle would seem to be:

(1) *If an individual actually has a certain ancestry, then an actual or hypothetical individual with a different ancestry does not or would not count as* that *individual*.

Kripke allows that *if* we had a clear idea of the soul or mind as an independent spiritual entity, his conclusions might be challenged (N&N: note 77), but he denies that we do have any such clear idea.

A third type of Kripkean example concerns constitution. Kripke suggests that so-called natural-kind terms behave in many ways like proper names. They come to denote what they do by an analogous process: an initial baptist picks out a specimen or sample and introduces an expression to denote the kind of thing or stuff of which it is an example, and then the word is transmitted with the intention of preserving its reference. In some cases we will all associate some uniquely identifying description with the term, but in many we may not: water being a much more familiar substance to most of us than is quicklime, *water* may be like *Columbus*, but *quicklime* more like *Weinberg*. Some examples involving natural kind terms, such as *gorse = furze* and *tungsten = wolfram*, are just like *Hesperus = Phosphorus*. Other examples appear to depend on further intuitions.

The case most often considered is *water* = H_2O. This is not at all like *Hesperus = Phosphorus*, because H_2O is not at all like a name: it is part of a systematic notation with a definite descriptive sense. It would be less misleading to spell out the meaning of the formula and state the example thus: *water is a compound of hydrogen and oxygen in a ratio of two to one.* For some purposes it might be less misleading to substitute an

example involving a less *Columbus*-like, more *Weinberg*-like term: *quicklime is a compound of calcium and oxygen in a ratio of one to one*. The example is aposteriori because the chemical formulas for substances familiar before the rise of modern chemistry were empirical discoveries by the pioneers of atomic and molecular theory. According to Kripke the example is necessary, and his intuitions here align with those of Putnam (1973), whom he cites as having independently arrived at overlapping ideas. A hypothetical substance in a counterfactual situation (the Kripke case), or an exotic substance in a remote part of the actual universe (the Putnam case), that had a different composition would not be or count as water or quicklime as the case may be, however much to outward appearances it behaved like water or quicklime. Going beyond anything explicitly said by Kripke, the general principle would seem to be:

(2) *If a substance has a definite composition, then an actual or hypothetical substance with a different composition does not or would not count as* that *substance*.

Other types of Kripkean examples concern the original material composition of artifacts (*this table was from the beginning made of wood*), the composition of atoms out of elementary particles (*gold is an element with atomic number 79*), what certain natural processes ultimate consist in (*heat is not a material caloric fluid but random molecular motion*). These can perhaps all be regarded as variations on the chemical formula examples. A yet further type concerns inclusions among biological taxa (*tigers are not reptiles but mammals*). These can perhaps be regarded as variations on the genealogical

example by considering evolutionary descent, though Kripke discusses them more as if they were case of composition, as indeed they also are, since it is from the DNA in the organism's cells that its lineage is most accurately determined. None of these further examples can be examined in detail here.

EPISTEMOLOGY OF MODALITY

Kripke in the addenda to N&N quotes Kant's well-known remark that *experience can teach us that a thing is so, but not that it cannot be otherwise*. Kant correctly observes that while experience may teach us that a necessary truth is true, experience alone does not suffice to teach us that it is necessary. Kant goes wrong, according to Kripke, in inferring that experience is not required to teach us that it is necessary, thus effectively identifying known necessity with aprioriness. This was the first step in an historical process that led to early-to-mid-twentieth-century philosophical schools such as logical positivism and ordinary-language philosophy taking necessity to reduce to a matter of semantic rules and linguistic conventions (Ayer 1936; Strawson 1952). Kripke's examples of aposteriori necessity, if accepted, as they widely have been, refute such reductionism. That means we must confront again the question of the epistemology of modality that puzzled Kant.

Kripke addresses the puzzle in a brief and guarded way in the addenda to N&N. There he suggests that in each of his basic examples, it is discoverable apriori by analysis that *if p, then necessarily p*, though it is only known aposteriori that *p*. (Note that he does not claim all examples of aposteriori necessity are like this; given independent basic

examples that satisfy *if p, then necessarily p*, it is easy to construct simple logical compounds that do not, a construction left as an exercise to the reader here.) Behind the knowledge that *if p, then necessarily p* in the basic examples would presumably lie analytic, apriori principles that here, going beyond anything explicitly said by Kripke, have been tentatively represented by (1) and (2) above.

Just as Columbus could not have discovered Atlantis, since it doesn't exist, so no Babylonian astronomer could have discovered that Hesperus and Phosphorus are distinct, since they aren't. Yet for many there remains a stubborn feeling that "it could have turned out that" Hesperus and Phosphorus were distinct. This, according to Kripke, is an illusion; but as David Papineau observes (2008), it is one that, like some famous optical illusions, tends to persist even when it is recognized as illusory. Kripke offers an analysis of what is going on here, which tends to make the illusion a result partly of confusing epistemic with metaphysical possibility, and partly of confusing speaking *of* a counterfactual situation with speaking *in* a counterfactual situation.

What really could have been the case is this: the world could have been different from how it actually is, with creatures in it who in their epistemic situation were much like us down to some point in antiquity, who some evenings saw a heavenly body they called "Hesperus" and some mornings saw a heavenly body they called "Phosphorus," where these two bodies were not merely apparently but really distinct bodies, eventually confirmed to be such by scientific astronomy. Kripke insists, however, that what is described here is not a situation in which Hesperus and Phosphorus would have been

distinct, as they actually are not, but a situation in which *Hesperus* and *Phosphorus* would have denoted something other than what they actually do denote: two distinct planets that would have existed but don't actually exist, rather than one and the same actual planet, Venus. The feeling that EW "could have turned out" to be the daughter of HT rather than GW, as the tabloid asserts, or that water "could have turned out" to have the composition HO rather than H_2O, as Dalton thought, would be explained away similarly.

Kripke's examples have convinced many of the reality and importance of the phenomenon of aposteriori necessity, but one should not take his achievement to license positing aposteriori necessities all over the place. One needs to be able to explain, in Kripke's way or some other, why there is an appearance of contingency; perhaps ultimately one needs to be able to explain as well the underlying source of the necessity in terms of appropriate analytic, apriori principles. Kripke famously argues that the illusion of contingency can*not* be explained in his way in the case of such alleged aposteriori necessities as the identity, claimed by some materialists, between pain and C-fiber firing. What is different about this case is ultimately that while there is room for a gap between looking like two different planets and really being two different planets, or looking and feeling like water and really being water, there is no room for a gap between feeling like pain and really being pain, since pain, unlike planets or water, is a feeling. But this is not the place for any extended excursion into philosophy of mind.

Considerations of philosophy of mind have motivated the largest-scale attempted

refutation of Kripke's views on necessity, represented by "two-dimensionalism" (Chalmers 1996). There can be no question of expounding this rival, anti-Kripkean view here, but it may be mentioned that Kripke's defenders (Byrne and Pryor 2004) see two-dimensionalism as relying on a notion of "primary intension" that is too much like the old notion of uniquely identifying descriptive senses supposedly associated with names, and that is discredited by considerations of ignorance and error similar to those that arise in the *Weinberg* case.

MODAL LOGIC

As Kripke reminds us, John Stuart Mill held that while in general the signification of a word consists of a "denotation" and a "connotation," roughly what were later called *reference* and *sense*, in the case of a proper name there is no connotation and the signification is simply the denotation. Mill famously also held that *all necessity is verbal necessity*, deriving from relations among connotations. It follows that while *philosophers are rational* can be necessary, because *rational* is arguably included in the connotation of *philosopher*, by contrast *Hegel is rational* cannot be necessary, because *Hegel* has no connotation for *rational* to be part of. He concluded that *there are no individual essences*.

Elaborating on this last doctrine, W. V. Quine held that "quantification into modal contexts," saying things like *there is something such that it necessarily Fs*, makes sense only if so-called *de re* modality makes sense, and a predicate can be said to be necessarily true of an object as it is in itself, independently of how or whether said object is named or described. If only *de dicto* modality, attributing necessity to whole sentences and not

subsentential parts such as predicates, makes sense, then quantified modal logic is nonsense. And if necessity is identified with analyticity, as it was by Rudolf Carnap, a pioneer of quantified modal logic, and seems to have been by C. I. Lewis, the founder of modern modal logic as such, then only *de dicto* modality makes sense. As Quine's student Dagfinn Føllesdal puts it: *Quine saw that Carnap's and Lewis's linguistic conception of necessity was untenable if one wanted to quantify into modal contexts, and that their position was therefore incoherent* (Føllesdal 2004: xxi).

One of the most important consequences of Kripke's distinguishing necessity from analyticity the way he does is that it makes room for a rehabilitation of quantified modal logic, as a logic of metaphysical necessity rather than analyticity. Kripke's earlier mathematical work showed that a system of quantified modal logic need not be formally inconsistent, but only his later philosophical work in N&N offers hope of showing it is not intuitively incoherent, which was the real issue for Quine. Closely connected with the issue of the coherence of quantified modal logic was the debate between Quine and Ruth Barcan Marcus, the main pioneer of quantified modal logic, over the status of identity statements such as *Hesperus = Phosphorus*. The debate is discussed by Kripke especially in N&I, where he concludes by saying that Marcus was right that such identities are necessary, Quine was right that such identities are not analytic, and both were wrong in failing to distinguish necessity from analyticity.

It is noteworthy that when, in the winter of 1962, Føllesdal drew Kripke into the Marcus-Quine debate, he had not yet arrived at this position, and did not insist on the

distinction between necessity and analyticity any more than any of the other participants in the debate (Marcus, Quine, Kripke, et al. 1962). But indeed, Kripke in N&N dates its main ideas to a year or two later, the academic year 1963-1964. This was well after the period of his mathematical work, the bulk of which was completed by mid-August, 1958, when an abstract (1959b) announcing it was received by the editors of the *Journal of Symbolic Logic*. Thus chronological considerations alone refute any suggestion that Kripke already had the metaphysical necessity of N&N in mind when doing his mathematical work.

That work among other things served to popularize a revival of Leibnizian talk of "possible worlds" in place of the blander terminology (such as "state descriptions") used by Kripke's predecessors. Though he never gave up possible worlds talk entirely, Kripke by the time of N&N had come to suspect it may be potentially misleading. After all, it is one thing to say that there are states the world could have been in other than the state it actually is in, and quite another to say that what we are used to thinking of as the world is only one of many, and that for every state this world could have been in but isn't, there is some other world that is in that state. This last is a manner of speaking that leads straight to Ludovician polycosmology, the theory of a pluriverse of multiple worlds found in the work of Kripke's long-time colleague David Lewis, which for Kripke is sheer fantasy.

MODEL THEORY

As to the technical content of the mathematical work, Kripke does for modal logic something like what Alfred Tarski did for classical logic. In classical logic we have a

formal syntactic *derivation procedure* — indeed, many different but equivalent ones — giving us a notion of a *provable* formula, or one that has a derivation, and of a *consistent* formula, one whose negation is not provable. We also have, thanks mainly to Tarski, a formal "semantics" or model theory, with a notion of truth in a model, giving us a notion of a *valid* formula, or one true in every model, and of a *satisfiable* formula, one whose negation is not valid, or equivalently, one true in some model. These are related by a *soundness theorem* asserting that every provable formula is valid, and a *completeness theorem*, asserting the converse, or what is equivalent, that every consistent formula is satisfiable. In modal logic there had long been many different systems, the better known among them bearing such names as T, S4, S5, and so on, each with a different class of provable formulas, and the problem was to devise a notion of model and a specification of different classes of models such that soundness and completeness would hold between T and T-models, S4 and S4-models, S5 and S5-models, and so on.

The solution to this problem presented in textbooks today incorporates the more elementary part of Kripke's mathematical work on modality. There is no need to reproduce here everything that can be found in a good textbook. Suffice it to say that a *Kripke model* for sentential model logic consists of a set X of indices, picturesquely or heuristically called "possible worlds," with one of them @ distinguished as the "actual world," and a relation R among them of "relative possibility," and a function V assigning to each world *x* and each sentence letter *p*, *q*, *r* a truth-value true T or false F. The assignment is extended to compound formulas built up using negation ~, conjunction &,

disjunction ∨, and the modal operators of necessity □ and possibility ◇, proceeding as in classical logic with ~, &, ∨, and taking □*A* (respectively ◇*A*) to be true at *x* if and only if *A* is true at every (respectively some) *y* possible relative to *x*. Truth in the model as a whole means truth at @. The classes of T-models, S4-models, or S5-models are obtained by requiring R to be reflexive, reflexive and transitive, or reflexive and transitive and symmetric. The proofs of soundness are in each case tedious but routine, while the proofs of completeness are more work.

Since the papers in which Kripke presents such material cite quite a few precursors in footnotes, it is natural to ask how much of all this is distinctively his own and how much due to his predecessors. This question can only be answered by going carefully through all the early papers, noting for each what is or isn't to be found in it. This massive task has been undertaken by Rob Goldblatt in a magisterial study, which after acknowledging that there were earlier contributions concludes that *it is only in Kripke's writings that we see such … ideas developed into an attractive model theory of sufficient power … to advance the field further* (Goldblatt 2005: 35).

Specifically due to Kripke are: (i) the notion of a model in which the elements of X are bare indices whose intrinsic nature is irrelevant, where all his predecessors had required the elements of X to be sets of formulas or something of the sort, (ii) the proofs of the more difficult completeness theorems and not just the easier soundness theorems, and (iii) the extension of the basic idea in three directions: from well-known systems like T, S4, and S5 to a range of more exotic systems; from modal logic to intuitionistic and

other non-classical logics; and from sentential logic to quantification theory. He carries out this last extension in such a way as to make the so-called *Barcan formulas*, in effect asserting that every thing that could possibly exist actually does exist, and that everything that actually does exist necessarily could not have failed to exist, into optional extras that one can assume or not as one pleases, whereas previous efforts had tended to build in these dubious assumptions. The importance of feature (i), emphasized by Goldblatt, will be apparent only to those who have actually worked in the field, but it is absolutely crucial; and it is simply an historical error or falsification to call models with this feature anything but *Kripke* models.

The keynote of Kripke's notion of model is its extreme flexibility, or adaptability to the widest range of modal systems. The other side of the coin is that the model-theoretic work is not tied to any particular conception of modality. If one has in mind some particular conception and wishes to show that this, that, or the other modal system is the one appropriate specifically for it, often a Kripke-style completeness theorem provides a starting point. But it must always be supplemented by an argument to the effect that the particular class of Kripke models involved is the appropriate one for the notion of modality in question. The latter task, which is not purely mathematical, but largely philosophical, is generally the more difficult. For as Kripke has said in another context, *there is no mathematical substitute for philosophy*. For the cognoscenti, Robert Solovay's proof that the system known as GL is appropriate for Gödel's notion of necessity as formal provability is a case in point (see Boolos 1993).

In addition to the works of Kripke and others cited above, and the further readings suggested at the end of the list of references below, the following works of the present author may be cited, as enlarging on points it here has barely been feasible to allude to in passing, if that. My notes (1999) and (2003) explain the fallacies in certain objections to Kripke's model theory on grounds of its alleged inappropriateness for "logical necessity" in the sense of *truth by virtue of logical form*, and on grounds of its failing to validate $\Diamond\exists x\exists y(x \neq y)$ as a law of logical necessity. My article (2013) explains in some detail Kripke's views on the law of necessity of identity $\forall x\forall y(x = y \rightarrow \Box x = y)$ and the history of that law in Marcus and Quine. Obviously many of the issues treated tersely above invite extended further examination. As heretofore unpublished materials (audiotapes awaiting transcription, transcripts awaiting editing, and more) in the archives of the Saul Kripke Center at the City University of New York Graduate Center gradually come forth in print in the years ahead, there will be even more to examine.

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RELATED TOPICS

[Not having seen a list of chapters, I have been unable to comply with the publisher's instructions to include at this point cross-references to the other articles in the volume most relevant to my own.]

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BIOGRAPHICAL NOTE

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