Naming, Necessity, and More

Explorations in the Philosophical Work of Saul Kripke

Edited by
Jonathan Berg

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1 Introduction

Albert, the table at which I work, was originally made from some particular wood, nails, and glue. It could have been originally made from slightly different matter: if the carpenter who originally made Albert had picked up and used a few nails that were different from the ones she actually picked up and used in the construction of Albert, the resulting table might still have been Albert. But origin essentialism claims that although the difference in original material constitution that I just described *is* a possibility for Albert, *not all* differences in original material constitution are: if the carpenter received a shipment of entirely different pieces of wood, boxes of nails, and bottles of glue on the day of Albert's manufacture and went on to construct with these items a table just like Albert in shape and size and so on, the resulting table would not have been Albert.

We have here a pair of intuitions:

[P] Slight variation in the original constitution of a material object is possible.
[E] Total variation in the original constitution of a material object is not possible.

Origin essentialism, the claim that an object's (material) origin is essential to it, has in recent years enjoyed a fairly widespread acceptance (due in part of course to Kripke's having a very strong intuition in favor of it). When I first heard the claim that origin was essential, I took it to mean that a table, for example, couldn't have had any different material origin, no matter how slight the difference. But, it turns out that most advocates of origin essentialism have been careful to formulate their claims in such a way that [P] is not obviously violated. In *Naming and Necessity*, Kripke suggests only that the table in the lecture hall could not have been made from a '*completely* different block of wood' and that Queen Elizabeth could not have originated from a '*totally* different sperm and egg' (Kripke 1972/1980, p. 113, my change of emphasis). These claims, which are in keeping with [E], do not obviously conflict with [P].

But, do [P] and [E] nonetheless conflict in some less than obvious way? Although I (1998) have argued that the *arguments* that have been used to support (claims like) [E] sit ill with (claims like) [P], I have not said that (claims like) [P] and (claims like) [E] themselves conflict. However, one can construct a paradox that suggests that the intuitions do, after all, conflict with one another. The paradox arises because [P] – and [E] for that matter – if true, does not *just happen* to be true as a matter of contingent fact; rather it *has* to be true. [P], if it holds at all, holds not only for material objects that actually have been or will be made, but for any material object that could be made. [P] is necessary. Actually something more – perhaps stronger, depending on your views – should be said about [P]: it is not only necessary, but it is necessarily necessary and necessarily necessarily necessary, and so on.[1]

Let's call the hunk of matter from which Albert was originally made 'h'. Let n be the number of molecules in h. Let h, h_1, h_2, . . ., h_n be a sequence of different hunks of matter, each hunk differing from its immediate predecessor only in the replacement of one molecule by a distinct molecule of the same kind, so that that h_1 'overlaps' h by all but one molecule, h_2 'overlaps' h by all but two molecules, and so on through h_n which does not 'overlap' h at all.

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[1] That whatever is necessary is necessarily necessary (or what amounts to the same thing, on the assumption that every proposition has a denial opposite to it in truth value, that whatever is possibly possible is possible) is the cornerstone of S4 modal logic, whose characteristic axiom schema is $\ulcorner \Box\phi \rightarrow \Box\Box\phi \urcorner$ (or, in an alternate axiomatization, $\ulcorner \Diamond\Diamond\phi \rightarrow \Diamond\phi \urcorner$). The theorems of S4 are a subset of the theorems of S5, which is the standardly accepted system of logic for metaphysical modality. Hence, *according to S5* (and S4), if [P] is necessary, it is necessarily necessary and necessarily necessarily necessary, and so on. But what if one does not accept S5 (or S4)? One might still think that *[P] and [E]*, if true, are necessary, necessarily necessary, and so on without thinking that this is (logically) the way it is for *all* necessary truths. Suffice it to say that everyone whose views I will be discussing here does in fact think that [P] and [E], if true, are necessary, necessarily necessary, and so on.

Here then is the paradox, which for ease of exposition, I present in the familiar language of possible worlds.[2] Since Albert was originally made from h, we can infer via [P] that Albert could have been manufactured from h_1. In other words, there is a possible world in which Albert was originally made from h_1. Eliminating the abbreviation, there is a world, which is *possible relative to* (or, in alternative terminology, *accessible from*) the actual world in which Albert was originally made from h_1. Call this possible world 'w_1'. Now consider [P] again. It doesn't *just happen* to be true. Not only does it hold in the actual world, it holds in w_1 as well: if Albert had been originally made from h_1 – as in fact it could have been – then Albert could have been originally made from h_2. In other words, there is a world, possible relative to w_1, in which Albert was originally made from h_2. In still other words, there is a world, which is possible relative to a world that is itself possible relative to the actual world, in which Albert was originally made from h_2. For short, there is a *possibly possible* world, w_2, in which Albert was originally made from h_2. Now consider [P] again. Not only does it hold in the actual world and in w_1, it holds in w_2 as well: if Albert *had been* originally made from h_2 – as it *possibly could* have been – then Albert could have been originally made from h_3. In other words, there is a world, possible relative to w_2, in which Albert was originally made from h_3. In still other words ... We can continue on in this way until we reach a world, w_n, which is possible relative to w_{n-1}, in which Albert was originally made from h_n. If the relation of being possible relative to is transitive, that is, if whatever is possibly possible is also possible, then w_n is possible relative to the actual world, which is just to say that Albert could have been originally made from h_n. But h_n has no matter at all in common with the hunk of matter from which Albert actually was originally made. Thus [E] has been violated.[3] Obviously this presents a puzzle for anyone who holds

[2] I do this at the risk of presenting the paradox in a way that would be objectionable to David Lewis. If we simply stipulate that 'possible world' is synonymous with 'maximal ways things could have been', then Lewis should not object to this way of setting out the paradox. (For more on this issue, see Section 5.) Consider it so stipulated.

[3] This paradox is sometimes called 'Chisholm's Paradox'. I am not sure whether the name is appropriate. The paradox with which I am concerned may loosely be described (borrowing words from David Lewis) as one in which a chain of little differences in the original constitution of a given artifact add up to a big difference in the original constitution of the artifact. Chisholm (1967) presents a puzzle in which, by gradual changes over a number of possible worlds, two individuals in the actual world, Adam and Noah, are supposed to swap all their

that whatever is possibly possible is possible and that both [P] and [E] are conceptual truths that are not only true but necessarily true (and necessarily necessarily true and so on).

It will be useful to write this paradox in the language of quantified modal logic.[4]

[MP] (a modal paradox)

(The superscripted numerals indicate the number of times a given operator is repeated. 'Mah_1' is read 'Albert is originally made from h_1' or 'h_1 originally materially constitutes Albert'.)

(1) $\Diamond Mah_1$
(2) $\Box(Mah_1 \rightarrow \Diamond Mah_2)$
(3) $\Box\Box(Mah_2 \rightarrow \Diamond Mah_3)$[5]
.
.
.
(n) $\Box^{n-1}(Mah_{n-1} \rightarrow \Diamond Mah_n)$
(C1) $\Diamond^n Mah_n$
(C2) $\Diamond Mah_n$
(n+1) $\sim\Diamond Mah_n$

Obviously, one can solve this paradox by rejecting [P] (and so rejecting (1) through (n)). And equally obviously one can solve this paradox by rejecting [E] (and so rejecting (n+1)). My concern here though is to examine some (purported) solutions to the paradox that (at least appear

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properties (well, as many as they can), so that the end result is a world that is indistinguishable from the actual world, 'except for the fact that the Adam of [the last world] may be traced back to the Noah of [the actual world]' and vice versa. In later work, Chisholm (1976) offers a problem more like the paradox presented here. Lewis says that he does not 'distinguish [the] paradox about origins from Chisholm's original paradox' (Lewis 1986, p. 244). Salmon (1986, note 1) though expresses some reservation about calling the paradox about origins 'Chisholm's Paradox'. It seems to me safest simply to drop the name and note (as I am here doing) that the paradox I discuss is akin to the one(s) given by Chisholm.

[4] There is at least one difference between the paradox I gave in 'the language of possible worlds' and [MP]. The original presentation had as a premise that whatever is possibly possible is possible. [MP] in effect deems that premise a *logical truth* that is reflected in the *inference* from (C1) to (C2).

[5] '$\Box\Box(Mah_2 \rightarrow \Diamond Mah_3)$' states of the proposition expressed by '$(Mah_2 \rightarrow \Diamond Mah_3)$' that it is necessarily necessary, that is, that it holds on all worlds possible relative to worlds that are themselves possible relative to the actual world. And similarly for other 'stacked box' statements.

to) honor [P] and [E] – solutions that don't blame the paradox simply on a conflict between [P] and [E]. (When I speak of rejecting/honoring these principles, I mean rejecting/honoring them as conceptual truths that are true, necessarily true, necessarily necessarily true, and so on.) Broadly speaking there are in the literature two general approaches meeting this constraint. One approach simply denies that (it is a logical truth that) whatever is possibly possible is possible and hence rejects the inference from (C1) to (C2). According to the other approach, it is a logical truth that whatever is possibly possible is indeed possible, and this (alleged) fact allows [MP] to be recast as an argument that is formally similar to (standard formalizations of) classical sorites paradoxes; the thought then is that the modal paradox would be amenable to one's favored solution to sorites paradoxes in general. In Section 2 I present the solution offered by Graeme Forbes (notably 1983, 1984, 1985, and 1992), who takes the second approach. In Sections 3 and 4, I present the solutions offered by Nathan Salmon (notably 1981, 1986, and 1989) and by David Lewis (1986), who both take the first approach. In Section 5, I address some mistaken criticisms that Salmon and Lewis have made of each other's solutions. In Section 6, I offer criticisms of Ferbes's solution. Section 7 contains my concluding remarks.[6]

2 Presentation of Forbes's solution

[MP] has the feel of a sorites paradox. Forbes's (1983, 1984, 1985, 1992) solution takes this quite seriously: what I call 'step 1' assimilates formally our modal paradox to standard sorites paradoxes; what I call 'step 2' offers a solution to the latter; and what I call 'step 3' thereby offers a solution to the former as well. I will explain each step of Forbes's solution in turn.

Step 1: the assimilation

In spite of the undeniable fact that our modal paradox feels something like a sorites paradox, in fact [MP] bears very little formal resemblance to (standard formalizations of) sorites paradoxes, one of which is exhibited below.

[SP] (a sorites paradox)
('g_1' through 'g_n' are names for the individuals in a succession of shorter and shorter people. 'Tg_1' says that g_1 is tall.)

[6] The postscript to this chapter was written 13 years after my original talk at the June 1999 conference in Haifa. I have made some changes to the paper as originally given, but I have tried not to change its general thrust, even though I would now approach the material somewhat differently.

(1) Tg_1
(2) $Tg_1 \rightarrow Tg_2$
(3) $Tg_2 \rightarrow Tg_3$
.
.
.
(n) $Tg_{n-1} \rightarrow Tg_n$
(C) Tg_n
(n+1) $\sim Tg_n$

Clearly there is nothing in [SP] that corresponds to the stacking of necessity operators in [MP]; thus the two are formally quite different. Forbes points out though that in the standardly accepted system of logic for metaphysical modality, S5, [MP] can be recast as [MSP] below.

[MSP] (a modal sorties paradox)
(1) $\Diamond Mah_1$
(2) $\Diamond Mah_1 \rightarrow \Diamond Mah_2$
(3) $\Diamond Mah_2 \rightarrow \Diamond Mah_3$
.
.
.
(n) $\Diamond Mah_{n-1} \rightarrow \Diamond Mah_n$
(C) $\Diamond Mah_n$
(n+1) $\sim\Diamond Mah_n$

When I say that [MP] can be recast in S5 as [MSP] I mean that the like-numbered premises of each argument are S5-equivalent to one another. [MSP] has only one conclusion, (C), whereas [MP] has two, (C1) and (C2), because (C1) and (C2) are S5-equivalent.[7]

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[7] There are four systems of (propositional) modal logic that are relevant to the current discussion: T, B, S4, and S5. (Propositional modal logic is adequate for our current purposes. The 'conversion' of [MP] to [MSP] does not turn on quantification or the subject-predicate structure of the relevant sentences.) All may be given axiomatically as systems whose inference rules include modus ponens and necessitation and whose axioms include every instance of the K(ripke) axiom schema $\ulcorner\Box(\phi \rightarrow \psi) \rightarrow (\Box\phi \rightarrow \Box\psi)\urcorner$. An axiomatization of the system T results from adding to this that every instance of the axiom schema $\ulcorner\Box\phi \rightarrow \phi\urcorner$ is an axiom. This characteristic axiom schema for T corresponds to models in which the accessibility relation between worlds is reflexive. An axiomatization of the system B results from adding to the axiomatization of T that every instance of the axiom schema $\ulcorner\phi \rightarrow \Box\Diamond\phi\urcorner$ is an axiom. This characteristic axiom schema for

[MSP] does have the same form as [SP]: where [MSP] has the 'predicate' '◊*Ma*' (or 'possibly originally constitutes Albert'), [SP] has the predicate 'T' (or 'is tall'); and where [MSP] has the names of individual hunks of matter (h_1 through h_n), [SP] has names of the individuals (g_1 through g_n).

Step 2: the solution to standard sorites paradoxes

Sorites paradoxes are often called paradoxes of vagueness, since they are thought to arise from the sort of vagueness that gives rise to the prospect of borderline cases. In the case of [SP], the vague predicate is 'is tall'.[8] Vague predicates may usefully be contrasted with a predicate like 'is even' as predicated of an integer. Satisfying this predicate is plausibly seen as an all or nothing affair: any integer either satisfies it (completely) or does not satisfy it (at all), that is, any integer is either even or not. There is no prospect of an integer's being a borderline case for evenness. No integer is 'sort of' (or indeterminately) even.

Forbes thinks that vague predicates can be satisfied to a full range of degrees. For our purposes, we can think of these degrees as real numbers between and including 0 and 1. Forbes thinks that since Kareem Abdul Jabbar is taller than Michael Jordan, Jabbar satisfies 'is tall' to a higher degree than does Jordan.[9] Nonetheless both satisfy 'is tall' to a fairly high degree, and to a higher degree than does Bill Clinton, for example.

B corresponds to models in which the accessibility relation between worlds is symmetric. (So in any B-model, the accessibility relation is both reflexive and symmetric.) An axiomatization of the system S4 results from adding to the axiomatization of T that every instance of the axiom schema ⌜$\Box\phi \rightarrow \Box\Box\phi$⌝ is an axiom (or equivalently by adding to the axiomatization of T that every instance of the axiom schema ⌜$\Diamond\Diamond\phi \rightarrow \Diamond\phi$⌝ is an axiom.) This characteristic axiom schema for S4 corresponds to models in which the accessibility relation between worlds is transitive. (So in any S4-model, the accessibility relation is both reflexive and transitive.) Finally, an axiomatization of the system S5 results from adding to the axiomatization of T that every instance of the characteristic B axiom schema is an axiom and that every instance of the characteristic S4 axiom schema is an axiom. (So in any S5-model, the accessibility relation is an equivalence relation. Typically, a defender of S5 has in mind that every world is accessible to every world. A formula is true in all S5-models of this restricted type if and only if it is true in all S5-models.) Equivalently, one can add to the axiomatization of T that every instance of the characteristic axiom schema for S5, ⌜$\Diamond\phi \rightarrow \Box\Diamond\phi$⌝, is an axiom.

[8] I do not intend to suggest by the words 'vague predicate' that I think that vagueness resides in language rather than in the world. A predicate may be 'vague' because the property or concept associated with it is vague.

[9] To give a more specific reference than just the four works cited at the beginning of this section, I refer the reader to Forbes (1985, p. 170). It may be worth noting that apparently none but perhaps the tallest person (or people) is tall to degree 1.0.

Now, if the idea of degrees of predicate satisfaction makes sense, then so should a corresponding idea of degrees of truth, according to which the sentence ‘Kareem Abdul Jabbar is tall’ is true to a higher degree than the sentence ‘Michael Jordan is tall’. Sentences involving vague predicates can be wholly true or wholly false or somewhere in between, just as individuals can satisfy vague predicates completely or not at all or to some degree in between.

Traditionally we work with a two-valued logic, in which sentences are either wholly true or wholly false. Forbes thinks that this is appropriate whenever our predicates are sharply defined, as they are in mathematics. But, he thinks, if we keep to tradition when the sentences with which we are concerned admit of many values besides absolute truth and absolute falsity (because the predicates involved admit of various degrees of satisfaction), we are bound to get into trouble. And that trouble comes, for example, in the form of sorites paradoxes. The paradox arises because we treat sentences with ‘in between’ truth values as if they were sentences with values 0 and 1 only. So, Forbes turns to a logic that he thinks is appropriate for sentences whose truth values are between 0 and 1. The ‘truth tables’ Forbes (1985, pp. 170–1) adopts are given below.

$$
\begin{aligned}
\text{val}[{\sim}p] &= 1 - \text{val}[p] \\
\text{val}\ [p\ \&\ q] &= \min\ \{\text{val}[p], \text{val}[q]\} \\
\text{val}\ [p \vee q] &= \max\ \{\text{val}[p], \text{val}[q]\} \\
\text{val}\ [p \to q] &= 1 - (\text{val}[p] - \text{val}[q]), \text{ if val}[p] > \text{val}\ [q] \\
&\ 1 \text{ otherwise}
\end{aligned}
$$

It is easy for the reader to verify that these ‘truth tables’ yield the familiar results in cases where the sentences involved have values 0 and 1. The crucial clause, for present purposes, is the one for the material conditional. To get a feel for the idea behind it, consider two conditionals in which the antecedent is ‘more true’ than the consequent: (i) if Kareem Abdul Jabbar is tall, then so is Michael Jordan; and (ii) if Kareem Abdul Jabbar is tall, then so is Bill Clinton. It makes some intuitive sense to say that the first conditional is more true than the second, which to some degree explains why the clause for the arrow is written as it is.

According to Forbes, validity in this many-valued logic is not a matter of preservation of absolute truth, as it is in two-valued logic; rather it is a matter of preservation of degree of truth. An argument is valid just in case ‘there is no assignment of degrees of truth to its sentence letters such that the value of the conclusion falls below that of the lowest-valued premises' (ibid., p. 171). Again, it is easy for the reader to verify that this yields the usual results in cases where the sentences of the argument all have values of either 0 or 1.

Forbes thinks that once we make the move to a many-valued logic, we will see that sorites arguments are in fact *invalid*.[10] This claim seems implausible at first, since the only inference pattern that sorites arguments ultimately involve is modus ponens, which surely is a paradigm of a valid inference pattern. But, Forbes points out, modus ponens is *not*, according to his definition of validity, a valid inference pattern, since it does not preserve degree of truth. To see this, consider a case where the antecedent of the conditional premise has value 0.6 and the consequent has value 0.4. In this case the premises of a modus ponens argument will have values 0.6 (for the premise which consists of the antecedent of the conditional alone) and 0.8 (for the conditional premise, since 1 minus the difference between the antecedent and the consequent is 0.8), while the conclusion will have value 0.4 (which is the value of the consequent of the conditional alone), which is lower than the value of the lowest valued premise. Here the premises are 'mostly' true and the conclusion 'mostly' false.

Our initial intuitions about any sorites paradox are that the reasoning involved is legitimate, since modus ponens is above reproach; that all of the premises are true; but that the conclusion is false. In a way, Forbes's solution respects these intuitions: modus ponens *is* above reproach in cases in which the sentences involved are wholly true or wholly false; all of the premises in a sorites argument are (at least) very nearly true; and the conclusion of a sorites argument is very false (perhaps even wholly false). Because modus ponens is, in the cases we are most familiar with, a valid inference pattern, we are lulled into thinking, wrongly, that it is always valid. In this way, Forbes proposes to explain the seductiveness of sorites paradoxes while yet depriving them of their power.

Step 3: the extension of this solution to [MSP]

To my mind, the extension of the solution is quite straightforward, and here is what I take it to be. [MSP] and [SP] both have the same general form, which is displayed below.

(1) $\varphi\gamma_1$
(2) $\varphi\gamma_1 \rightarrow \varphi\gamma_2$
(3) $\varphi\gamma_2 \rightarrow \varphi\gamma_3$

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[10] For a criticism of Forbes's characterization of validity and of his characterization of his own solution, see Salmon (1986, pp. 105–6).

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(n) $\varphi\gamma_{n-1} \rightarrow \varphi\gamma_n$
(C) $\varphi\gamma_n$
$(n+1)$ $\sim \varphi\gamma_n$

It is clear then that the 'predicate' '$\Diamond Ma$' (or 'possibly originally constitutes Albert') should play the same role in the modal paradox as the predicate 'T' (or 'is tall') plays in the sorites paradox, since each is the appropriate substituend for φ. Just as different people satisfy 'is tall' to varying degrees, so should different hunks of matter satisfy 'possibly originally constitutes Albert' to varying degrees. Carrying out these parallels, Forbes should say that '$\Diamond Mah_1$' is more true than '$\Diamond Mah_2$', which in turn is more true than '$\Diamond Mah_3$', and so on. Thus the conditional premises are less than wholly true (since 1 minus the difference in the values of the antecedent and the consequent is less than 1).[11] Thus the argument involves sentences that have more than just the two traditionally recognized truth values and hence the modus ponens inferences it makes are in fact invalid. End of story. End of philosophical story, at any rate.

Now I turn from philosophy proper to the history of recent philosophy. In the paragraph on the extension of the solution (that is, on step 3), I said what I thought Forbes *should* say. What he actually does say is different. Forbes thinks that in [SP] the 'predicate whose application conditions are tolerant' is 'is tall', but he thinks that in [MSP] 'the predicate whose application conditions are tolerant is a predicate expressing the thisness or haecceity of α, for which we may simply use the predicate $\xi = \alpha$' (Forbes 1983, p. 239). As we have seen, straightforward substitution into the general form of a sorites paradox should lead Forbes to say that the tolerant predicate is 'possibly originally constitutes Albert', and not, as he has it, 'is identical to Albert'. Forbes's 'substitution error' – whether it really is an error depends on what can be said against making the straightforward substitution – led him to the following concern.

> We turn now to the task of extending the degree-theoretic solution of the sorites paradoxes to the modal [paradox]. There are two obstacles in

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[11] I assume that if we started [MSP] with '$\Diamond Mah$' instead of with '$\Diamond Mah_1$' (and made corresponding adjustments) Forbes would allow that the first premise was wholly true. In any case, Forbes's focus is on the conditional premises.

> the way of such an extension, one technical and one philosophical ... The philosophical difficulty concerns the coherence of the notion of the degree to which an object satisfies such a predicate as $\xi = a$ at a world. In the standard semantics for S5, transworld heirlines of objects are given by transworld identities: the only object which satisfies $\xi = a$ at a world is a. So if there can be degrees of satisfaction of $\xi = a$ at a world w then it looks as if there must be degrees of being identical to a at w. Yet the notion of degrees of identity is incoherent ... Instead, we need to replace standard S5 semantics with some other sort ... The prescient reader will have anticipated that counterpart theory is about to appear on the stage ... The extension of the [counterpart] relation is fixed by considerations of similarity across worlds. Since there is no problem at all about degrees of similarity, degrees of counterparthood are equally straightforward. (Ibid., pp. 247–8)[12]

I will not (here) critically evaluate these remarks of Forbes. Instead I will continue my recounting of history. Forbes's turn to counterpart theory led Salmon to make a number of objections to Forbes's solution to the modal paradox. Salmon's criticisms center on problems he sees with counterpart theory. That is, his criticisms center on what I will call Forbes's *implementation* of his solution rather than on the solution itself. (As will, I hope, become clear soon enough, Forbes need not have taken a stand on the merits of standard versus counterpart theoretic semantics in order to have offered a degree-theoretic solution to the modal paradox; furthermore, it is not the case that, unless vague identity is countenanced, the standard semantics do not have the wherewithal to implement his solution.) Forbes's solution has come to be called the 'counterpart-theoretic solution' (and Salmon's has come to be called the 'intransitive-accessibility solution').[13] This nomenclature has unfortunately led to the obscuring of important philosophical issues that differentiate the solutions of Forbes, Salmon, and Lewis. There is a tendency to see Forbes and Lewis as significantly united (since both advocate versions of counterpart theory), and Salmon as the opponent of both. This, as you will see, I think is a mistake.

Let's pick up the philosophical story again and let it mingle with our historical story. Forbes would be right to say that if he accepts the

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12 For anyone curious about it, the technical difficulty concerns the fact that linearly ordered degrees of truth may not be good enough for representing similarity in *multiple* respects. This need not worry us, since we have been concerned with only differences along one dimension, namely original material constitution.

13 Forbes (1984, p. 176) and Salmon (1986, p. 82) both use this kind of terminology.

standard possible worlds semantics, then in order to be able to say, for example, that the sentence 'It is possible that Albert is originally made from h_2' is less than wholly true, he would have to say that it is less than wholly true that there is a possible world in which Albert is originally made from h_2. Forbes seems to think that saying this will put him in the hopeless position of having to say that identity is vague. And so he is motivated to accept a version of counterpart theory:

> [There is] a vagueness or fuzziness in the limits of the range of sums of wood which possibly constitute [Albert]: there is no sharp distinction between those sums which could, and those which could not, constitute [Albert]. [i] Given that there is no fuzziness in the boundaries of particular sums of wood or in the constitution relation, *it seems that this vagueness must arise from an underlying vagueness in the concept of possibly being identical to [Albert]; [ii] however in standard modal semantics, such vagueness could only be represented by vagueness in [Albert]'s transworld identity condition*, and a solution of the paradox in which we think of identity as vague would be rather unappealing. But it does make sense to think of *similarity* as being vague, in the sense of admitting *degrees* ... Since the counterpart relation is fixed by similarity considerations ... and similarity admits of degrees, the degree-theoretic resolution of non-modal paradoxes ... can be transcribed into the modal logical context. (Forbes 1984, pp. 173–4, my emphasis)

Forbes's thoughts here take some care to work through. What [i] shows us is that he here locates the vagueness in the concept of *possibly* being identical to [Albert] whereas earlier (1983, p. 239) he located the vagueness in the predicate expressing the thisness or haecceity of Albert. But still it seems to me that he has misidentified the predicate that is the analog of 'is tall', which (I remind you) I claimed is 'possibly originally constitutes Albert'. It should be noted that the identity predicate '=' makes no (explicit) appearance in [MP]. What's more [ii] may be false: arguably, vagueness in the predicate 'possibly is identical to Albert' can be represented in the standard semantics by means of a vague accessibility relation. More importantly, vagueness in the predicate that is actually relevant (namely, 'possibly originally constitutes Albert') can be represented in the standard semantics by means of a vague accessibility relation. And, in a more historical note, in the very same article from which the (most recent) block quotation was taken, Forbes recognizes that the standard semantics *can* accommodate his degree-theoretic solution to the modal paradox by 'allowing the accessibility relation to be a relation of degree' (Forbes 1984, p. 179). The idea is simple. If one wants to say, as Forbes does, that it is less than wholly true that it is possible that Albert is originally made from h_2, then the standard semantics makes it a breeze to accommodate the less than absolute truth of that proposition: there's a world, that is less than wholly possible, in which Albert is originally made from h_2. This paraphrase 'locates' the vagueness in the accessibility relation between worlds. And that, after all, is the natural home for the feeling that it is *less than wholly possible* that Albert is originally made from h_2. I say it is the 'natural home' because if one thinks of a possible world as a way things could have been, then to the extent that one thinks that there are ways things *almost* could have been, one should think that there are *almost possible worlds*, that is worlds that are *less than wholly possible* relative to the actual world. But once it is recognized that the standard semantics can accommodate the view that, for example, 'It is possible that Albert is originally made from h_2' is less than wholly true but not wholly false, it should, I think, also be recognized that the motivation that Forbes has given for turning to counterpart theory has been undercut.

The truth, as we have seen, is that Forbes's solution to the modal paradox can be 'implemented' in either standard or counterpart theoretic semantics. To my mind the choice between which of these is the best way to implement the solution is tangential to the issue of what the solution to the paradox is. Forbes's solution to the modal paradox is complete with just these elements: [MP] can legitimately be recast as [MSP]; sorites paradoxes or paradoxes of vagueness arise from the fact that (at least) the conditional premises involved are less than wholly true and from the fact that modus ponens is invalid (in the sense that Forbes defines); and finally [MSP] involves a vague predicate that is relevantly analogous to the predicates in standard sorites paradoxes. End of story. There is no need for Forbes to commit himself to any particular semantics for modal statements. Indeed such a commitment is odd in light of the fact that his official view about modal semantics (even in the 1984 article quoted previously) is the 'reverse translation' view. According to this view, neither the possible worlds translations nor the counterpart theoretic translations of sentences of modal logic mean what they appear to mean (that is, they do not really assert the existence of possible worlds as such); indeed *they have no meaning other than that of the sentences they translate* (Forbes 1985, p. 80). If that were so, there should, it seems, be no relevant difference in the choice of one over the other.

To conclude this presentation of Forbes's views, I want only to stress that I take the issue of the apparatus that he employs to be tangential to the issue of the solution to the paradox. Accordingly, my criticisms below will address only what I consider to be essential to his solution.

3 Presentation of Salmon's solution

Salmon's solution to [MP] is admirably simple: deny that everything that is possibly possible is possible. This allows Salmon to affirm the truth of each of the premises in [MP], to affirm its first conclusion, (C1), but to deny that (C2) follows from (C1).[14]

It is wrong to assume that anything that is possibly possible is possible, Salmon thinks, since that assumption goes against intuition. He offers the following type of example in support of his claim. Let's assume that there is a sharp division between what matter Albert could and what matter Albert could not have originated from.[15] Then, whatever that

[14] Salmon credits Chandler (1976) with first suggesting this type of solution. Denying that everything that is possibly possible is possible of course commits one to denying that it is a truth of logic that everything that is possibly possible is possible, and hence commits one to denying the inference from (C1) to (C2). Salmon (1989) argues that even if it turns out as a matter of metaphysics that everything that is possibly possible is possible, it would still not be a truth of logic that everything that is possibly possible is possible, so (C2) would still not follow from (C1). However, (C2) would be obtainable from (C1) together with the additional premise that everything that is possibly possible is possible. See note 4.

[15] The example can be reworked to the same effect if instead of assuming a sharp division, one instead assumes, for example, an interval of vagueness and indeterminacy (see Salmon 1989, p. 5). It is nonetheless an interesting question whether in fact there is a sharp division. Salmon (1986, Appendix) sketched an argument designed to show that there is a sharp cutoff point in the amount of different original matter possible in the construction of an artifact. First, consider the question of whether or not there is a sharp cutoff point in the amount of different matter it is possible to *reconstruct* the same table from. Let $a_1 - a_n$ be a series of different tables, each of which is originally constructed from n molecules. Suppose that, at a later time (say, immediately after original construction), each of these tables is completely dismantled. Suppose that later (say, immediately later) a series of n tables, $a_1' - a_n'$, are built in such a way that a_1' is made from all but one of the molecules from which a_1 was originally made (and is made according to the same plan and so on as a_1 was made); a_2' is made from all but two of the molecules from which a_2 was originally made (and was made from the same plan and so on as a_2 was originally made); and so on through a_n', which is made from all but n of the molecules from which a_n was originally made (that is a_n' is made from matter that is completely different from the matter from which a_n was originally made). Now, since identity does not admit of borderline cases (as Salmon 1981 and elsewhere argues), each statement of the form '$a_i = a_i'$' is either (wholly) true or (wholly) false. Surely a_1 is identical to a_1' and surely a_n

cutoff point may be, it would seem that there is some hunk of matter h_m which is such that it is actually impossible that Albert was originally constructed from it, but which is close enough to being a possible material origin for Albert, that had Albert originated from a certain hunk of matter h_k, which in fact Albert could have originated from, then *it would have been possible* for Albert to have originated from h_m, even though it is not actually possible. In standard Kripke semantics this denial that whatever is possibly possible is possible amounts to denying that the accessibility relation between worlds is transitive.

4 Presentation of Lewis's solution

Like Salmon, Lewis (1986, pp. 243–8) denies that everything that is possibly possible is possible. Thus he can similarly affirm the truth of each of the premises in [MP], affirm its first conclusion, (C1), but reject 'the fatal move' (1986, p. 245) from (C1) to (C2).

But Lewis does all this while maintaining the usual assumption that all worlds are possible relative to each other (and hence that the accessibility relation between worlds is transitive).[16] How can he do this? He rejects the analysis of modality suggested by Kripke semantics (and by commonsense) in favor of his own – the original – version of counterpart theory. According to Lewis, the claim that *it is possibly possible that*

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is not identical to a_n'. Assuming that for any i, if a_i is identical to a_i' then $a_{(i-1)}$ is identical to $a_{(i-1)}$ and assuming that for any i, if a_i is not identical to a_i' then $a_{(i+1)}$ is not identical to $a_{(i+1)}'$, there must be a sharp cutoff point in what matter a table could be reconstructed from. It seems reasonable that if a table x, which is originally constructed from hunk of matter y, could (not) be *reconstructed* in the specified way from hunk of matter y', then x could (not) have been *originally constructed* from y'. (And here I'm assuming this (or something like it) captures the 'natural assumptions' to which Salmon alludes.) From this it would follow that there is a sharp cutoff point in the matter from which a table could be originally constructed.

16 Lewis (1968) does not provide formal semantics in the usual sense but instead provides a translation scheme. Standardly, a general model for (quantified) modal logic includes (among other things) a set of worlds, a binary relation on that set (the accessibility relation), and a function from worlds to sets of individuals (the individuals that exist at the world). It is natural to think of a Lewis model as adding to this a binary relation on individuals (the counterpart relation). Lewis models would require the accessibility relation to be such that every world is accessible to each world (and hence explicit mention of the relation could be dropped). It is also natural to think of Lewis as doing away with the accessibility relation between worlds altogether.

Albert was originally made from h_m amounts to the claim that there is a (possible) world in which a *counterpart of a counterpart of Albert* is originally made from h_m, whereas the claim that *it is possible that Albert* was originally made from h_m amounts to the claim that there is a (possible) world in which a *counterpart of Albert* is originally made from h_m.

According to Lewis, a counterpart of a counterpart of an individual is not always a counterpart of that individual. In this way, Lewis's theory denies (that it is a logical truth) that whatever is possibly possible is possible.

5 The Salmon–Lewis solution

We've just seen that Lewis and Salmon are in agreement that it is not the case that whatever is possibly possible is possible. Both agree that the inference from (C1) to (C2) in [MP] is illegitimate. Both reject the S5 axiom schema according to which whatever is possibly possible is possible. However, Salmon, it seems, would disagree with my characterization: he calls Lewis 'a friend of S5' and takes him to be a principal objector to his view that S5 is to be rejected as the proper logic for metaphysical modality.[17]

The source of Salmon's surprising epithet is to be found, I suspect, in the differences in the way Salmon and Lewis 'implement' their solution. To repeat, Salmon analyzes '$\Diamond\Diamond Mah_m \rightarrow \Diamond Mah_m$' as the claim that if there is a world that is possible relative to (that is, accessible from) a world that is possible relative to the actual world in which Albert was originally made from h_m then there is a world possible relative to the actual world in which Albert is originally made from h_m. Salmon can coherently deny this conditional since he does not think that all worlds are possible relative to each other. Again, Lewis offers a different analysis: if there is a world in which a counterpart of a counterpart of Albert is

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[17] See Salmon (1989, p. 24). Salmon (1986, n. 10 and elsewhere) does point out that Lewis is committed to denying that all instances of $\ulcorner\Diamond\Diamond\phi \rightarrow \Diamond\phi\urcorner$ are true. So it is somewhat mysterious as to why Salmon calls Lewis a friend of S5. To avoid confusion, let me stress that the current issue concerns *propositional* S5: in particular, the issue is whether a particular proposition (that Albert is originally made from h_m) is possibly possible but not possible. It is well known (and Salmon would certainly agree) that Lewis is no friend of *quantified* S5 with identity. (For example, the necessity of identity is a theorem of quantified S5, but it fails in Lewis's counterpart theory.) The sentences we are concerned with do not involve quantifiers over individuals or the identity predicate, though they do contain names for individuals and predicates that apply to those individuals.

originally made from h_m then there is a world in which a counterpart of Albert is originally made from h_m. Lewis can coherently deny this conditional since he does not think that all counterparts of counterparts of an individual are themselves counterparts of the given individual. *If* Lewis accepted the standard analysis of modal talk that is suggested by Kripke semantics, then Salmon's epithet would be appropriate. But since Lewis favors his own analysis in terms of counterpart theory, the epithet is inappropriate. Lewis and Salmon both solve the modal puzzle by rejecting the same axiom schema of S5 (namely, the characteristic axiom schema of S4). In Salmon's 'implementation' this involves saying that the accessibility relation is not transitive; in Lewis's 'implementation' this involves saying that, although the accessibility relation is transitive, the counterpart relation is not. Lewis is no friend of S5.

Lewis offers the following criticism of Salmon:

> There is supposed to be a different defence available. Instead of relying on intransitivity of the counterpart relation to block the fatal move – indeed without assuming counterpart theory at all – we could instead rely on inaccessibility of worlds ... [But] by what right do we ignore worlds that are deemed inaccessible? Accessible or not, they're still worlds. We still believe in them. Why don't they count? (Lewis 1986, p. 246)

Lewis's question is easy enough to answer. Inaccessible worlds don't count, for Salmon, for the very same reason that, for Lewis, counterparts of counterparts don't count: they don't correspond to *possibilities*, but merely possible possibilities. The right by which Salmon ignores the merely possibly possible worlds is the very same right by which Lewis ignores the mere counterparts of counterparts (of the relevant individual).

For all their rhetorical flourish, both Salmon's objection to Lewis and Lewis's objection to Salmon confuse two issues: how to analyze modality and how to solve the paradox. The disagreement that they have about the proper analysis of modality is tangential to the issue that immediately concerns me. I will thus, in this context, for now, speak of the 'Salmon–Lewis Solution' to the modal paradox.

It may be helpful to develop some neutral terminology in which to discuss the Salmon–Lewis Solution. I believe, and so do you, that things could have been different in countless ways. But what does this mean? Ordinary language permits the paraphrase: there are many ways things could have been besides the way they actually are. I believe that things could have been different in countless ways; I believe what is expressed by permissible paraphrases of expressions of what I believe; taking the paraphrase at its face value, I therefore believe in the existence of entities that might be called 'ways things could have been'. I prefer to call them 'possible maximal ways'.[18]

There are other maximal ways (for things to be). There are maximal ways things could not metaphysically have been. That is, there are impossible maximal ways. There are maximal ways things could logically have been. That is, there are logically possible maximal ways. There are maximal ways things could not logically have been. That is, there are logically impossible maximal ways. You get the idea.[19]

One maximal way (hereafter 'm-way') things could be is the m-way things actually are. I prefer to call that possible m-way 'w*'. (I return to the usual practice of leaving implicit that the possibility here is metaphysical. Also, no harm will result in the current context if we ignore all but the logically possible maximal ways, so we can take those to be the m-ways. I take the metaphysically possible maximal ways and the metaphysically possibly possible maximal ways and so on to be a subset of the logically possible maximal ways.) According to w*, Albert is originally made from h. It follows from [P] (even though a nominalist about ways would demur) that, according to some possible m-way, Albert is originally made from h_1. (Perhaps the nominalist about ways will not be too upset if I hereafter deny his or her existence. Well, more accurately, if I hereafter stop mentioning that he or she demurs from certain inferences.) It follows from [E] that according to no possible m-way is Albert originally made from h_n. It follows from the fact that [P] is a conceptual truth that there is a possible^n m-way (where 'possible^3 m-way', for example, is short for 'possibly possibly possible m-way') according to which Albert is originally made from h_n. If it follows from the claim that there is a possible^n m-way according to which Albert is originally made from h_n that there is a possible m-way according to which Albert is originally made from h_n, then we have a contradiction. This is our paradox.

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18 Obviously, this paragraph mimics the famous paragraph of Lewis (1973, p. 84). Where I have 'maximal way', Lewis has 'world'. No doubt 'world' is a more elegant way to convey that the ways that concern us are maximal (roughly in the sense of evaluating every single proposition as true or false), but it invites confusing worlds (in the sense of maximal ways) with worlds (in the sense of universes). Besides, my aim was to provide a neutral terminology, and the phrase 'possible world' is problematic for this purpose.

19 This paragraph expresses ideas that are stated more fully in Salmon (1989).

Salmon and Lewis are united in solving this paradox by holding that the relation of one m-way's being possible relative to another (that is, the accessibility relation between m-ways) is not transitive. Lewis should have no trouble at all understanding why inaccessible m-ways don't count as possible m-ways – in spite of his (at least professed) inability to understand why inaccessible worlds don't count as possible worlds.[20]

6 Discussion of Forbes's solution

In this section I criticize the first and third steps of Forbes's solution, taking them in reverse order. (Criticism of step 2 – his solution to standard sorites paradoxes – is beyond the proper scope of this chapter.[21]) Because I take Forbes's counterpart theoretic 'implementation' of his solution to be inessential to his solution itself, my criticisms do not address problems with counterpart theory. Problems with counterpart theory have been the focus of Salmon's objections to Forbes's solution.

Step 3: the extension of [SP]'s solution to [MSP]

In order for any solution to [SP] that hinges on the claim that the predicate 'is tall' is vague properly to extend to [MSP], it must make sense to think of the allegedly analogous predicate 'possibly originally constitutes Albert' as vague (in the same way). In particular, in the case of Forbes's solution, it must make sense to think of that predicate as being satisfiable to varying degrees. Furthermore, Forbes (1984, p. 176) claims that it is a strength of his solution to [MSP] that each of the conditional premises is treated uniformly in the sense that they are all taken to have the same degree of truth. Forbes maintains that each of the conditional premises of [MSP] is very, very close to being wholly true, but that each falls short of being wholly true, since in each case the antecedent is more true than the consequent.

Taking premise (2) of [MSP] as an example, Forbes maintains that 'it is possible that Albert is originally made from h_1' is more true than 'it is possible that Albert is originally made from h_2'. But this conflicts with intuition, since 'it is possible that Albert is originally made from h_2'

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[20] Assuming that Lewis stands by his (1973, p. 84) stipulation to use 'possible worlds' for 'ways things could have been', he apparently has a bit of a problem. (Well, more than a bit.)

[21] Williamson (1994) offers a discussion of the problems with degree theoretic solutions to sorites paradoxes.

seems just as true as 'it is possible that Albert is originally made from h_1'. Surely it is wholly true that Albert could have been originally made from a hunk of matter that is only one molecule different from the hunk of matter from which Albert was actually originally made. And surely it is wholly true that Albert could have been originally made from a hunk of matter that is only two molecules different from the hunk of matter from which Albert was actually originally made.

Although Forbes thinks that it would weaken the dialectical strength of his position, he could respond by abandoning his commitment to saying that *each* conditional premise has the same, very high, truth value: perhaps, he might say, some of them are wholly true, while others are very nearly true.[22] Still, on this view, Forbes is committed to thinking that predicates like 'possibly originally constitutes Albert' are satisfiable to varying degrees. He suggests a test for the appropriateness of degree-theoretic talk about a particular predicate:

> The basic concepts of degree-theoretic semantics are straightforwardly legitimized by the use of vague predicates in the comparative form, for if of two red color patches, one can be redder than another, then the first is red to a greater degree than the other, and so satisfies the predicate 'is red' to a greater degree than the other. (Forbes 1983, p. 242)

Does it make sense to use the comparative form in the case at hand? That is, does it make sense to say that it is more possible for h_1 to constitute Albert originally than it is for, say, $h_{1zillion}$ to constitute Albert originally? To my mind, it does not, unless that is simply a misleading way of saying that h_1 *could* and $h_{1zillion}$ *could not* originally constitute Albert (just as saying 'the integer two is more even than the integer three is' would be an extremely misleading way of saying that two is even and three is not). But, to other minds, the comparative may seem to make sense.

Other kinds of possibility admit of degrees, why not metaphysical possibility? We find it natural enough, for example, to say that one

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22 To my mind this would strengthen Forbes's position, since the position would allow that it is wholly true that Albert could have been originally made from a hunk of matter that was only two molecules different from the hunk of matter from which Albert was actually originally made. Similarly, it would, to my mind, strengthen his solution to the sorites paradox for him to allow that it is wholly true that Kareem Abdul Jabbar is tall (even though some people are taller).

action or set of actions is more permissible (that is, ‘morally possible’) than another: killing one’s father is more morally possible than killing one’s father *and* marrying one’s mother. Similarly we might say that it is more physically possible for me to jump over my apartment building than to jump over the Empire State Building. Can’t we understand degrees of metaphysical possibility along these lines?

My reply has two parts: first, on closer examination, it doesn’t seem at all clear that other kinds of possibility do admit of degrees; and second, even if they do, there is good reason to think that metaphysical possibility does not.

It seems to me that, although it may be worse to kill one’s father and marry one’s mother than it is simply to kill one’s father, both sets of actions are wholly morally impermissible (under most circumstances). It is true that, all other things being equal, the latter situation is more like a situation which is wholly permissible than the former is. Nonetheless, both are wholly impermissible. It is also true that, all other things being equal, the latter situation involves the breaking of fewer of the moral laws than does the former. Still, both involve breaking the moral laws and thus both are wholly impermissible. (Analogously, someone who is only one-week pregnant is more like someone who is not pregnant than is someone who is eight-months pregnant, but still both are wholly pregnant.) Moreover, if moral possibility admits of degrees, then we should be able to make sense of some action’s being ‘kind of (morally) permissible’ just as we can make sense of something’s being ‘kind of red’. Suppose someone asks me if she can (morally speaking) do *x* and I reply, ‘You kind of can.’ My response seems odd, but we might make sense of it by saying that I mean that she can do *x* and get away with it. But that of course is *not* to say that it is partially morally permissible to do *x*. Or perhaps I mean that it is morally permissible for her to do something similar to *x* – something that would, for example, achieve the goal the person had in mind in doing *x*. But again, this is *not* to say that doing *x* is partially morally permissible. So, I am not convinced that moral possibility does admit of degrees, although I am convinced that some things are morally worse than others. Similar things can be said about physical possibility. So I am dubious of my imagined critic’s claim that non-metaphysical forms of possibility admit of degrees.

But, for sake of argument, let me grant that degrees of moral or physical possibility can be cashed out in some way – perhaps in terms of number of violations of laws (assuming these can be individuated in some acceptable way) and degree to which laws are broken. But what could the analog be in the case of metaphysical possibility? Number and degree of 'laws of existence' or 'laws of logic, broadly construed' that are broken? I'm not sure what such laws would be, but whatever they would be, I would think that something could not break them to varying degrees or that something could break one at all. Surely then the default position is that metaphysical possibility does not admit of degrees. And Forbes has offered us no account to make sense of degrees of possibility.[23]

Step 1: the claim that [MSP] and [MP] are equivalent puzzles

Suppose that Forbes is right that 'possibly originally constitutes Albert' is a predicate of degree, and suppose too that he is right about his solution to classical sorites paradoxes. All this helps to solve [MP] *only if* it is correct to regard [MP] and [MSP] as the same puzzle (that is, as logically equivalent puzzles). Intuitively they seem like different puzzles[24] and so far we have seen no reason to question this intuition. Forbes does note, as I mentioned on page 59, that the standardly accepted system of logic for metaphysical modality, S5, allows [MP] to be recast as [MSP]. (S4 also allows the recasting.) That is true, but only because according to S5 (and S4) it is a matter of logic that whatever is possibly possible is possible. But Salmon has provided a counterexample to this. And all that matters (in this context) is that Salmon's counterexample is logically possible. So the dialectical situation is this: the advocate of Forbes's solution must give a reason to think that accessibility (being possible relative to) must be transitive and in so doing provide a reply to Salmon's counterexample.

Forbes does indeed offer an argument for the transitivity of possibility: the argument takes the form of a reductio on the claim that there are contingently impossible worlds (like the world in Salmon's example in which Albert is originally made from h_m). (Just to make sure it is

[23] See note 15 for a very different argument against the claim that it is vague as to what matter a given table could be originally constructed from.

[24] I say they intuitively seem like different puzzles because once the premises of [MP] are cashed out in terms of ways for things to be, there is a strong intuition that they are true. Intuitions about the truth value of the premises in [MSP] are not so clear. Of course this difference in intuitions about truth values does not show that the premises in the puzzles are not at bottom equivalent: one could hardly argue that '$(P \& \sim P)$' and '$(\exists x)(\forall y)(Sxy \leftrightarrow \sim Syy)$' are not logically equivalent on the ground that one has firm intuitions that the first is a contradiction, but that one lacks firm intuitions about the second. Nonetheless, these intuitions about the truth values of the premises of [MP] and [MSP] place the burden of proof on the person who would equate the two puzzles.

clear why this reductio is an argument for the transitivity of possibility: a world is contingently impossible iff it is impossible but is not necessarily impossible; that is, a world is contingently impossible iff it is impossible but is possibly possible. So if there are no contingently impossible worlds, then *if a world is impossible then it is not possibly possible*. Contraposing the conditional gives the following conditional: if a world is possibly possible then it is possible.) But, I will show, Forbes's argument is flawed.

Before I give Forbes's argument, it is good to highlight a couple of familiar points. Some necessary truths are conceptual and that fact seems to guarantee their necessity. [P] and [E] are good examples of this. Other necessary truths are not conceptual and in fact require empirical justification. Perhaps the most famous example of this kind of truth is the claim that water is H_2O. One has to discover this truth empirically. One can infer that it is *necessary* that water is H_2O by appealing to the empirical discovery together with the conceptual truth that chemical kinds have their chemical structures necessarily. It is a fairly common view that all empirical necessities are like this in that their justifications appeal to empirical truths together with conceptual necessities.[25]

To make Forbes's argument easy to follow and hence easy to evaluate, I pictorially represent the worlds of Salmon's example below. For each world, I list the salient truths of the world together with the modal statuses of those truths at the world. [E′] is the essentialist claim that is operative in the example. It says that a lot of variation in the original constitution of a material object is not possible.[26]

w^* (the actual world)
[E′] (which is necessary at w^*)
Mah (which is contingent at w^*)
$\sim Mah_m$ (which is necessary at w^*)

w_k (an actually possible world)
[E′] (which is necessary at w_k)

[25] For discussions relevant to this view, see Kripke (1971), Salmon (1981), Bealer (1987), and Sidelle (1989).

[26] The difference between h and h_m is a lot; the differences between h and h_k and between h_k and h_m are not a lot. For present purposes this is all the precision we need.

Mah_k (which is contingent at w_k)
$\sim Mah_m$ (which is contingent at w_k)

w_m (an actually contingently impossible world that is possible relative to w_k)
[E′] (which is necessary at w_m)
Mah_m (which is contingent at w_m)

Now for Forbes's alleged reductio.[27] He asks us to consider a contingently impossible world, like w_m. Then he asks, 'in what could such an impossibility consist? No a priori conceptual truth can fail at it, since it is then not a *possible* [sic] world'. I assume that Forbes meant to say 'possibly possible world' here: *of course* it is not a *possible* world, since it is, *ex hypothesi*, an *impossible* world, albeit only contingently so. So far, so good.

Forbes goes on to ask, 'could some a posteriori necessary truth, necessary at w^* fail at [w_m]?'. Before looking at his reason for the answer he gives to this question, which must be 'no', it is useful to think about what Salmon's example would have us answer. Clearly that answer would be 'yes', since, to take the salient example, '$\sim Mah_m$' is necessary at w^* (and hence true at w_k) and false at w_m (where its negation is true).

Forbes's answer to his question is this: 'evidently not: the same a priori conceptual truths hold at every world, and any a posteriori truth T necessary at the actual world is so by being true at the actual world and by some conceptual truth's entailing that T's truth makes it necessary'. This is wrong as I explain in detail below. Forbes concludes, 'thus T holds at any world accessible to the actual world, so the same conceptual truth will make it necessary at such a world over again; hence we never reach a world where some actual impossibility is true'.

It is easy to see what is wrong with Forbes's claim (and with the conclusion that he draws from it) if one takes as one's sample necessary a posteriori truth (that is, as the 'T' in Forbes's answer) that Albert is not originally made from h_m. This claim is true and its necessitation is true. Its necessitation appears to be justified on the basis of empirical truths (that Albert was originally made from h and that h and h_m do not have a lot of matter in common) and a conceptual truth ([E′]). *However*, its necessitation does not follow, as Forbes claims it must, from *its* truth and some conceptual truth *that entails that if it is true then its*

[27] All the quotations in this paragraph are taken from Forbes (1985, p. 237, n. 26).

necessitation is true. Indeed there does not seem to be such a conceptual truth: if it were a conceptual truth that if Albert is not originally made from h_m then necessarily Albert is not originally made from h_m, then surely it would also be a conceptual truth that if Albert is not originally made from h_1 then necessarily Albert is not originally made from h_1; and the latter conditional is false (or at least very nearly so).

And so, although Forbes is right to say that our sample T (namely '~Mah_m') holds at any world accessible from the actual world, this *does not* mean that T is *necessary* at any world accessible from the actual world. He mistakenly thinks that it does because he mistakenly thinks that *T itself* together with some a priori conceptual truth guarantees the necessity of T. What in fact is the case is that *truths other than T* together with the conceptual a priori truth [E′] guarantee the necessity of T: the necessity of T depends crucially on a fact about what Albert *was* (instead of a fact about what Albert *was not*) originally made of together with [E′]. The fact that Albert was originally made from *h* does not hold at w_k (though the fact that Albert was not originally made from h_m does hold there): there Albert was originally made from h_k and that hunk of matter *does* (unlike *h* itself) sufficiently overlap h_m. So Forbes fails to establish that there are no merely contingently impossible worlds. And this means that he fails to show that his recasting of [MP] to [MSP] is legitimate.

7 Conclusion

I conclude simply with an observation. The notion of a possible world (that is, of a maximal way things could have been) that is involved in the Salmon–Lewis solution seems to conflict with the Leibnizian picture of a possible world. According to the Salmon–Lewis solution what is possible depends at least in part on what is actual: had Albert actually been originally made from h_1 instead of *h*, then different worlds would have been possible worlds. Now think of Leibniz's God. He is supposed to find himself presented with a plethora of possible worlds and he is supposed to pick one – the best – to make actual. But what exactly is Leibniz's God supposed to be presented with? It seems peculiar to say that God is presented with only the possible worlds, if which ones are possible depends at least in part on what is actual: when God makes his choice, there is no actual world yet; that is precisely what God is supposed to be deciding. So whatever exactly Leibniz's God is supposed to be presented with, they cannot simply be the metaphysically possible worlds of the Salmon–Lewis solution; that is, they cannot simply be ways things could have been.

8 Postscript: friends and enemies

The issue over which I disagreed with Salmon concerned whether Lewis was a friend of S5. (Bear in mind that it is propositional S5 that is our concern. See note 17.) Salmon claimed that Lewis was a friend of S5. I claimed that Lewis was not a friend of S5. It turns out that Salmon's claim was based in part on the fact that Lewis defended S5 in a seminar co-taught by Lewis and Kripke at Princeton (around 1980) that Salmon attended. Salmon reports (personal communication) that Lewis himself gave a version of the 'oft-used defense of S5 modal logic' that Salmon presents as follows:

> In the metaphysical, unrestricted senses of 'necessary' and 'possible', the characteristic S5 principle that any possible truth is necessarily possible may be easily proved. Suppose *p* is a possible truth, that is, a proposition true in at least one possible world *w*. Then relative to any possible world *w′*, without exception, there is at least one possible world in which *p* is true – namely, *w*. It follows (given our assumption that *p* is possible) that it is necessary that *p* is possible. For in the unrestricted sense of 'possible', one possible world in which *p* is true is all that is required for *p* to be 'possible' relative to any given world *w′*, with no further restriction as to what sort of world *p* is true in or how that world is related to *w′*. (Salmon 1989, p. 10)

So, Lewis in effect defended the claim that any proposition, such that it is possible that it is possible, is possible. (See note 7 on the relationship between the characteristic axiom schemata for S5 and S4.) Yet, as we have seen, he is committed to the claim that the proposition expressed by 'Albert was originally made from h_m' is such that it is possible that it is possible even though it is not possible. On the face of it then, Lewis is committed to a blatant contradiction. This matter is a large topic that cannot be adequately addressed in this postscript. For now, let me retract my claim that Lewis is not a friend of S5: just what constitutes friendship is a delicate issue. However, let me nonetheless affirm the spirit of what I claimed by saying that, with defenders like Lewis, S5 needs no critics.[28]

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