Williamson's earrings

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In this paper I show how an old puzzle of Timothy Williamson's supports a novel argument against physicalism. I will begin by presenting the puzzle along with Williamson's solution to it. I will then argue that his solution is inconsistent with a natural understanding of physicalism. I will then argue that Williamson is incorrect when he claims that there is no principled way to defuse his puzzle by rejecting the 4 axiom of modal logic, according to which that what is necessary is necessarily necessary. I will do this by providing a model that does just that. I will then argue that the accessibility relation in this model is more naturally interpreted as a constraint on a closeness ordering for counterfactuals. On this picture, physicalism fails in a different respect than it does on Williamson's view – with respect not to qualitative facts but to haecceitistic facts instead. The essentiality of material origins also fails to hold with metaphysical necessity, although it does hold with a certain sort of counterfactual necessity.

1 The puzzle

Since Williamson is his own best expositor, I quote his statement of the puzzle at length:

> [T]he paradox involves a fantasy about the manufacture of a certain kind of ear-ring. The craftsman turns a patterned metal disc with rotational symmetry on a lathe, and then cuts it along a diameter into matching halves, the two ear-rings, with a device that simultaneously punches an attachment for the ear out of each half. Once the disc is lying ready to be cut, the only remaining uncertainty in the manufacture concerns the diameter along which the cut will be made; the story can fix the craftsman, the time, the place and other such details. In the actual world of the story, the craftsman is struck dead before he can cut the disc; had he not been, he would have chosen a diameter at random.
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> For any diameter d, the craftsman might have cut along d; he would thereby have made one and only one pair of ear-rings. Something more is true: there is one and only one possible pair of ear-rings which in the circumstances he would have made by cutting along d. [...] Thus we can talk about the possible pair of ear-rings the craftsman would have made had he cut along d. [...]

> Intuitively, the differences between [...] two processes of manufacture [which differ only as regards the angle at which the disc is cut, and by only one degree] are too slight to amount to the distinctness of their products. The very same ear-rings would be made in both cases, but out of marginally different material. An imperceptible tremor of the craftsman's hand would not cause an ear-ring to appear in the workshop that would otherwise never have been there. [...]
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> The last [three] paragraphs constitute a paradox [...since they] incoherently identified ear-ring identity with [a] non-transitive relation. Williamson (2013 [1990], §8.1)

The problem is this. Say that two semi-circular halves of the disc are *earring equivalent* just in case the possible earring that would have been made from the one (had the disc been cut so as to separate it from its complement half) is the same as the possible earring that would have been made from the other. The transitivity of earring equivalence follows from the transitivity of identity. If differing only slightly in material sufficed for earring equivalence, that would make all halves of the disc earring equivalent to one another, since they are all related by the transitive closure of the relation of differing only slightly in their matter. But this is absurd, since had the disc been cut the same earring would not have been made twice over, from both halves of the disc! So we have a reductio of our hypothesis that sufficient material similarity suffices for earring equivalence. As Williamson puts it, 'almost exact similarity of processes of manufacture is insufficient for the identity of their products'.

Williamson then proposes the following striking solution to the puzzle: there are exactly four possible earrings (i.e., two pairs of possible earrings) that could have been made from the disc under the relevant circumstances. More specifically, there are two orthogonal diameters d and d' of the disc such that any pair of possible cuts that go through the same quadrants of the disc (as demarcated by d and d') would have produced the same pair of earrings. (Williamson adds that it is indeterminate which pair of diameters are distinguished in this way, although he would now put the point in terms of vagueness-induced unknowability.) The motivation for this surprising view is that four is the minimal number of possible earrings consistent with the commonsense idea that, for any semicircular half of the disc, any possible earring that could be made from that matter could not have been made from less than half of that matter. In this respect Williamson's proposal respects the maxim: Do not multiply possible earrings beyond necessity.

Assume for the moment that Williamson's solution is correct. Then physicalism is false, for the following reason. Say that a semicircular half of the disc is *penumbral* just in case the diameter of the disc to which it corresponds is within one degree of either of the two distinguished diameters d and d'. Williamson's solution entails that some but not all of the halves of the disc are penumbral. Since we may idealize the case so that the disc is physically symmetric (in the sense that any two semicircular halves of the disc have exactly the same physical properties) penumbralness is a counterexample to physicalism: it is a property that fails to supervene on physical properties, since there are halves of the disc that are alike in all physical respects but differ with respect to penumbralness. Indeed, it is a counterexample to even very

weak forms of physicalism, since the case doesn't violate the actual laws of nature or involve the instantiation of alien fundamental properties or anything like that.

One might object to the claim that distinct halves of the disc are alike in all physical respects by pointing out that for any two such halves there will be some matter that is part of one of them but not part of the other. Let's not argue about whether such *de re* material differences count as 'physical' differences: that is not a productive question. The important point is that any view worthy of the name 'physicalism' ought not to allow the concrete realm to have qualitative asymmetries without having corresponding qualitative physical asymmetries.[1] For example, suppose concrete reality were symmetric in all qualitative physical respects but not in all qualitative respects because there were two qualitative physical duplicates C and Z made of different matter such that C was conscious and Z was an unconscious zombie. Had such a scenario obtained, physicalism would clearly have been false, however the details of that doctrine are best understood. The fact that C and Z would have been composed of distinct portions of matter is irrelevant. The moral is that any physicalism worthy of the name should be concerned at least with such claims of qualitative supervenience. Since we can idealize our puzzle so that the disc is symmetric in all qualitative physical respects (i.e., in all respects with which physics is concerned), and since being penumbral is a qualitative property, the argument from Williamson's solution to the falsity of physicalism stands.

One might object that physicalism should be understood in such a way that it only concerns how objects are *determinately*. Since according to Williamson it is indeterminate which halves of the disc are penumbral, such an understanding of physicalism would block the argument from Williamson's solution to the falsity of that doctrine. But such an understanding is unmotivated. In describing C and Z we did not need to stipulate that C was *determinately* conscious and Z *determinately* an unconscious zombie. Were we to suppose that it was somehow indeterminate which of C and Z was conscious, although determinately the case that exactly one of them was conscious and the other not, that supposition would still be inconsistent with physicalism. If anything, the indeterminacy Williamson postulates makes his solution to the puzzle all the more striking. It means that his solution is inconsistent not only with physicalism, but also with the popular thesis that the indeterminate supervenes on the determinate (or, as Williamson would now put it, that the vague supervenes on the precise).

One might object that physicalism should be understood not as entailing the object-by-object supervenience of qualitative properties on qualitative physical properties, but only the supervenience of the global pattern of how things are in qualitative respects on the global pattern of how things are in qualitative physical respects. In response, the example of C and Z above again suggests that such a weakening is unmotivated. More importantly, even this weaker understanding of physicalism is inconsistent with Williamson's solution. For according Williamson, all and only the penumbral halves of the disc would have resulted in *modally fragile* earrings:

[1]Compare Field (1992). I use 'qualitative' in the sense that contrasts with 'haecceitistic'. F is a qualitative property just in case there is no individual x and relation R such that to be F is to bear R to x. Being qualitative, in this sense, is compatible with being highly extrinsic and gerrymandered.

earrings that could have easily failed to be made had the disc been cut only slightly differently. With sufficient idealization (e.g., supposing that how the disc is cut is determined by a physically symmetric indeterministic process), we can then consider two worlds w_1 and w_2 alike in all qualitative physical respects such that in w_1 the disc is cut so that fragilely made earrings are produced and in w_2 the disc is cut along a different diameter so that non-fragilely-made earrings are produced – w_1 will correspond to a penumbral cut and w_2 to a non-penumbral one. w_1 and w_2 are then a counterexample to physicalism understood in terms of global supervenience, since they are alike in all qualitative physical respects but differ in the qualitative respect that the former but not the latter contains fragilely made earrings.

It is worth noting that the present argument against physicalism does not essentially rely on Williamson's claim that there are exactly four possible earrings that could be made from the disc. It is enough to assume that some possible earring is such that, were it made, it could have been made by a slightly different cut.

The challenge to physicalism posed by Williamson's solution runs deeper than other more familiar challenges to physicalism that appeal to facts about the modal profiles of material objects. For example, it is sometimes claimed that distinct yet coinciding objects, such as a statue and the clay composing it, pose a challenge for physicalism, since they seem to differ in qualitative modal and sortal respects without differing physically. In response, self-proclaimed physicalists might reasonably protest that such differences are not the sort of thing that they took themselves to be denying. What they took themselves to be denying were such things as the possibility of unconscious zombies physically indiscernible from us. Accordingly, they might restrict the scope of physicalism so that it concerns only properties that never distinguish mereologically coincident objects, or so that it only concerns the distribution of properties among objects that instantiate fundamental properties (unlike statues, let us suppose). The statue and the clay are arguably no counterexample to physicalism restricted in either of these two ways. And the imagined scenario involving the conscious C and its zombie twin Z would still be a counterexample to physicalism so construed: C and Z would be distinguished by the property *coinciding with something conscious* (which by construction never distinguishes between coinciding objects), and pairs of elementary particles playing symmetric physical roles (and in so doing instantiating fundamental properties) that were parts of C and Z respectively would be distinguished by the property *being part of something conscious*. But weakening physicalism in either of these two ways does nothing to make the doctrine compatible with Williamson's solution to his puzzle. This is because we can run the same style of argument concerning the properties *coinciding with something penumbral* and *being an electron at the center of something penumbral*. There seems to be no natural and independently motivated understanding of physicalism to which Williamson's solution is not a counterexample.

Of course, Williamson's solution is not the only possible response to his puzzle. One could hold on to physicalism if one claimed that no matter how the disc were cut modally fragile earrings would be made. This reply comes in two versions. According to the first version, *all* possible earrings that could be made from the disc would be fragilely made: every bit of their matter would be essential to them. But what holds for earrings holds for artifacts more generally, and a general hyper-

essentialism about artifacts' material origins seems obviously false. This very table would still have been made had its timber been hewn very slightly differently, say by a single molecule. Such judgments are not the sort of thing we ought to reject without powerful arguments, and sufficiently powerful arguments for physicalism have not been forthcoming. (One might worry about how we can be confident of such judgments on Williamson's view, given the possibility of fragilely made earrings. Williamson makes the following meta-semantic conjecture, elaborating a suggestion he attributes to Eli Hirsch: no *actually* made earrings are fragilely made, and we would still have spoken truly with this sentence had we manufactured fragilely made earrings, since we would have meant something correspondingly different by the word 'earring' in such circumstances. Here is not the place to explore this intriguing proposal, although see Hawthorne (2006, footnote 8) and, more generally, Dorr and Hawthorne (2014).)

The second version of the view that all halves of the disc are modally fragile denies Williamson's assumption that the craftsman would have made only one pair of earrings had he cut the disc. Instead, he would have made a *continuum* of coinciding pairs of earrings, each with a different modal profile. Some of these pairs of earrings would be fragilely made. In fact, a continuum of them would be. (Perhaps it is some consolation that 'most' of the earrings would not be fragilely made, at least relative to the measure corresponding to the natural angular metric on the disc.) This proposal does not immediately reconcile Williamson's puzzle with physicalism, since had any earrings been made there would have been coinciding earrings alike in all physical respects but differing as regards whether they were fragilely made. But the proposal does reduce the problem to that of reconciling physicalism with mereological coincidence, which, as discussed above, does not seem hopeless.

The problem with the proposal is that it is beyond belief. *Pace* Leslie (2011), it is incredible to suppose that there are as many earrings as dreamt of by such views.[2] It is important to distinguish such views from the more common supervaluationist idea that, although there are a continuum of material objects each of which is a perfectly good 'candidate' for being an earring, there is definitely only one pair of *earrings* resulting from any ordinary episode of earring-manufacture. Supervaluationism does require a plenitude of material objects, but it at least respects our ordinary judgments about how many tables, chairs, and other familiar artifacts there are.

A different response to the puzzle modifies the second version of the fragility gambit by proliferating possible artifacts but not actual ones, thereby respecting our pretheoretical judgments of how many earrings there are. The idea is to reject Williamson's premise that there is only one pair of possible earrings that could be made from the craftsman cutting the disc along a given diameter d, but agree with him that such a cut would produce only two earrings. For every set of possible material origins that the earring-plenitude view considered above says *would* be the modal profile of some earring were the disc cut along d, we instead claim that it merely *could* be the modal profile of an earring made by cutting the disc along d.

[2]See Lewis (1976) and Hawthorne and McGonigal (2008) for similar views concerning people. Williamson (1986) describes such proposals as "buy[ing] metatheoretical light at the price of theoretical darkness."

Whether or not this solution to the puzzle is plausible, it is no more friendly to physicalism than Williamson's solution is.[3] This is because the response entails that physically identical cuts along d could produce fragilely made earrings and could produce non-fragilely-made earrings but could not produce both. It thereby contradicts all of the aforementioned supervenience theses. We have simply shifted the bump in the carpet. We have avoided a counterexample to physicalism in the actual world of the thought experiment only at the expense of generating counterexamples to physicalism in worlds where earrings are manufactured.

2 Denying the 4 axiom

For a long time I thought these were the only possible solutions to the puzzle, and so physicalism was false.[4] That was a mistake.

One of Williamson's primary motivations in presenting his puzzle was to argue that puzzles about artifacts' potential originating matter do not, as Chandler (1976) and Salmon (1989) have argued, give us reason to doubt the principle that what is possibly possible is possible (or, equivalently, that what is necessary is necessarily necessary). Unlike earlier arguments, Williamson's appeals only to what is *actually* possible for the various halves of disc and the possible earrings that could be made from it, not to what *would* have been possible had various possible pairs of earrings been manufactured. In particular, none of the above claims would loses any of their plausibility were every modal operator to be prefixed by an 'actually' operator. Williamson writes:

> [T]he series of worlds is viewed not from one end but from the standpoint of a world outside the series, from which all its members are equally possible. The idea of diminishing possibility does little to alleviate the latter kind of paradox. (Williamson, 2013 [1990], p. 127)

[3] Against this solution, Williamson writes:

> [I]f there were two possible pairs of ear-rings either of which in the circumstances he might equally well have made by cutting along d, a curious kind of indeterminism would follows: the same process in the same circumstances could lead to the creation of either pair of ear-rings, and nothing in the period up to the moment of creation would determine which pair was created. Indeterminism does not come so cheap. Even if each of several pairs is a *logically possible* outcome of cutting along d in the circumstances, surely there is only one possible pair which *would have been* the outcome; uniqueness holds for nearby worlds if not for all.

In response, Hawthorne (2006) presents a number of cases in which the identity of a possible material object does not seem to supervene on its conditions of manufacture. He does not, however, directly challenge Williamson's verdict about the present case.

[4] In Goodman (unpublished) I give a different argument that ordinary modal reasoning commits us to the nomological possibility of physically identical material objects differing in their qualitative modal properties.

I want to begin by arguing that, whether or not there is a way of defusing the earrings puzzle by denying the 4 axiom for metaphysical possibility, Williamson's explanation of why there could be no such way is incorrect.

Let's think about a simpler case. Imagine that, instead of making a pair of earrings by cutting the disc in half, the craftsman makes single earrings by annihilating one half of the disc, chosen at random. In the actual world w_0 he dies without 'cutting' the disc. By denying the 4 axiom one could adopt the following view. In w_0, there is a unique possible earring e_0 such that, no matter how the craftsman were to cut the disc, e_0 would have been made. Had e_0 been made from matter m, then it could (and would) have been made from any cut that annihilated no more than half of m. But had e_0 been made from matter m, then had an earring been made from less than half of m, a different possible earring, e_1, would have been made. To keep the model symmetric, let there be another world w_1, like w_0, in which the disc is never cut. In w_1, e_1 would have been made no matter how the disc were cut. Here, in outline, is a Kripke model of the proposal. Imagine two copies of the unit circle c_0 and c_1. Let w_0 be the center of c_0 and w_1 be the center of c_1. w_0 sees every point on c_0, and w_1 sees every point on c_1. Every point on c_0 sees all the points on c_0 not more than 90 degrees from it, and sees every point on c_1 more than 90 degrees from it; vice versa for the points on c_1. We let our accessibility relation be the smallest reflexive symmetric relation satisfying these constraints. Note that there's nothing special about 90 degrees – we could have chosen any angle. The 4 axiom fails in the model because the accessibility relation is not transitive.

This simplification of the puzzle is still one in which 'the series of worlds is viewed not from one end but from the standpoint of a world outside the series'. And we have just seen how it can be resolved by denying the 4 axiom. So Williamson's diagnosis of the situation is incorrect: if there is a barrier to solving his paradox by denying the 4 axiom, he has not properly identified it.

Say that it is super-necessary that p just in case it is necessary that p, necessarily necessary that p, etc. The solution sketched above to the simplified puzzle is consistent with physicalism understood as the claim that all existence entailing qualitative properties and relations strongly individually supervene with super-necessity on all qualitative physical properties and relations. But one might still think that the model is inconsistent with the spirit of physicalism, since it is inconsistent with the conjunction of the following two claims:

> PHYSICALITY
> The only perfectly natural properties and relations instantiated in worlds like ours are fundamental physical properties and relations.

FUNDAMENTALISM
For all worlds w and v, if w and v agree as regards which individuals instantiate which perfectly natural properties and relations, then $w = v$.

w_0 and w_1 are a counterexample: they are distinct, yet fundamental physical properties and relations are instantiated in exactly the same pattern by exactly the same individuals in both worlds. There is no point in arguing about whether the supervenience-theoretic principle or the conjunction of PHYSICALITY and FUNDAMENTALISM is more deserving of the honorific 'physicalism' – both are interesting theses. But it is interesting to see how the two versions of physicalism come apart in the model just described. Moreover, consider the following modification of FUNDAMENTALISM

FUNDAMENTALISM$^-$
For all *possible* worlds w and v, if w and v agree as regards which individuals instantiate which perfectly natural properties and relations, then $w = v$.

If we reject the 4 axiom, then FUNDAMENTALISM$^-$ is strictly weaker than FUNDAMENTALISM, and its conjunction of PHYSICALITY is in fact consistent with the above solution to the simplified paradox.

Let us now consider whether the above model might provide a resolution to Williamson's earring paradox. Suppose that, in place of e_0, there were a single pair of possible earrings x and y that would have been made no matter how the disc were cut. If we only had to specify which two possible earrings would have been made had the disc been cut in a particular way, then the above model would provide a solution. But we have to say more than that – we also have to say which possible earrings would be made of which matter. Now there is a rather fantastic although qualitatively symmetric way of interpreting the above model that validates the claim that, for all semicircular halves of the disc m and m' that differ only by one degree, had x been made from m, it could have been made from m': we could say that, no matter how we were to cut the disc, each half of the disc would both constitute x and constitute y. In other words, x and y would be multiply located. That there would have been multiply located earrings is even more bizarre than the Leslie-style view that accepts a continuum of co-located but singly located earrings. And the Leslie-style solution does not require weakening our theory of metaphysical necessity.

Notice that Williamson does not explicitly appeal any principles about metaphysical necessity in deriving a contradiction from intuitive principles about his case. And since his argument is sound, one of those principles must be false. Assuming we reject solutions involving co-located or multiply located earrings, we must reject the following principle:

(A) In the world of the thought experiment w_0, for any distinct diameters d and d' differing by only one degree, the possible earrings that would have been made from a cut along d are the same as the possible earrings that would have been made from a cut along d'.

But now consider the following principle:

(B) In the world of the thought experiment w_0, for any distinct diameters d and d' differing by only one degree, if earrings had been made from a cut along d, then those earrings would still have been made from a cut along d'.

Pre-theoretically, (B) would seem to be the more natural way of expressing the idea that possible earrings are modally tolerant with respect to their originating matter. For one thing, unlike (A), (B) does not require quantification over non-existent possible earrings. In fact, Williamson uses (B) to justify (A) when he writes: '[(A)] The very same ear-rings would be made in both cases, but out of marginally different material. [Because, (B)] An imperceptible tremor of the craftsman's hand would not cause an ear-ring to appear in the workshop that would otherwise never have been there.' But this inference is not justified, because (B) does not entail (A). In fact, (B) is consistent with the intuitive claims about the case that Williamson shows to be inconsistent with (A).

To get an intuitive feel for why (B) fails to entail (A), observe that (thinking in terms of the Lewis-Stalnaker semantics for counterfactuals) the d'-world closest to w_0 need not be the d'-world closest to the d-world closest to w_0. (A consistency proof(-sketch) will be given later.) Williamson does not consider this sort of solution, perhaps because, assuming S5, it requires accepting that the possible earring that would have been made from matter m could have been made from none of m (although the worlds in which that happens are not ones that would have resulted in the circumstances from any possible cut) – and this conclusion is inconsistent with the orthodox principle of the essentiality of the material origins of artifacts. Yet one of the ingenious features of Williamson's paradox (which he never points out) is that it nowhere relies on any such essentialist premise – the distinctness of the earring that would have been made from matter m and the earring that would have been made from the complement of m is established instead by the premise (noted above) that, had they been made, they would have been constituted by different portions of matter. Indeed, in conversation Williamson is at least now perfectly willing to consider rejecting Kripkean essentialist dicta on general theoretical grounds (for example, in order to reconcile the reduction of metaphysical possibility to counterfactual consistency with the apparent counterfactual consistency of counter-essentialist hypotheses).

Of course, even if Williamson is open to rejecting the essentialist orthodoxy, many philosophers aren't. In particular, those like Chandler and Salmon who reject the 4 axiom do so in order rescue just such essentialist principles. This raises the question of whether, by so weakening our theory of modality, we can have a solution to Williamson's paradox that, though it rejects (A), accepts the related and arguably more compelling principle (B) and is moreover consistent with Kripkean essentialism about the possible originating matter of earrings.

It turns out that a solution is possible. We adopt Williamson's notation for semicircular halves of the disc and for the possible earrings that, from the perspective of w_0, they would have composed: we harmlessly identify semi-circular halves of the disc with real numbers $x \in [0, 360)$ in the obvious way, and let $o(x)$ be the possible earring that, in the actual world of the thought experiment w_0, would have been made from x had an earring been made from x. We maximally violate (A): $o(x) \neq o(y)$ whenever $x \neq y$. For every $0 < x < 360$, we add new world w_x like w_0

in that the disc is never cut. We associate each w_x with a function o_x specifying, in w_x, which possible earrings would be made from which cuts of the disc. We require that $o_x(y) = o(y - x)$, with subtraction understood modulo 360. We also add a continuum of "balancing worlds" v_x for $x \in [0, 360)$: v_x stands to w_x just as w_0 stood to w_1 in the 4-denying model of the simpler annihilation paradox. We introduce a corresponding function o' such that, for all $x, y \in [0, 360) : o(x) \neq o'(y)$, and $o'(x) = o'(y)$ iff $x = y$. We add a corresponding family of functions o'_x specifying, in v_x, which possible earrings would be made from which cuts of the disc, again requiring that $o'_x(y) = o'(y - x)$, with subtraction modulo 360. We represent worlds in which the disc is cut by triples $\langle i, x, y\rangle$, where i (= w or = v) indicates whether the world is accessible from a w-world or accessible from a v-world, $x \in [0, 360)$ tells us which w-world or v-world that is, and $y \in [180)$ tells us how the disc is cut. Let $z \in [0, 90)$ be the angle corresponding to the degree to which possible earrings can tolerate having different originating matter. We take our accessibility relation R be the smallest reflexive symmetric relation satisfying the following conditions:

1. $w_x R\langle w, x, y\rangle$
2. $v_x R\langle v, x, y\rangle$
3. $\langle i, x, y\rangle R\langle i', x', y'\rangle$ iff either
   (a) $z \geq y - y' (\text{mod } 90), i = i'$, and $o_x(y) = o_{x'}(y')$, or
   (b) $z < y - y' (\text{mod } 90)$, $i \neq i'$, and $o_x(y) = o_{x'}(y')$

Although every half of the disc is associated with a different possible earring in the worlds where the disc is not cut, in every world where the disc is cut the earrings therein are tolerant of counterfactual perturbations in their originating matter in just the way you would expect on a Chandler-Salmon style view. There is one small wrinkle. In order to get from a world where an earring is made of matter x to a world where it is made from matter $x + 180$ (mod 360) you might have to go through a lot of worlds, if the tolerance threshold z is small *and you only want to go through worlds in which the same earrings are made*. But if you are willing to see new possible earrings along the way, you can take shortcuts by visiting worlds in which the disc is cut radically differently from how it is in the starting world, or not cut at all. In fact, as is also true in the simpler annihilation model described earlier, every world sees every other in at most three steps. So although the 4 axiom is invalid, the model does validate $\Box\Box\Box\varphi \rightarrow \Box\Box\Box\Box\varphi$.

The model also validates supervenience-theoretic physicalism. To see this, notice that, for every 'physical profile' (parametrized by whether and where the disc is cut) each world sees exactly one world with that physical profile, and so everything supervenes on the world's physical profile, with the supervenience claim understood as restricted to accessible worlds in the appropriate way.

3 A counterfactual twist

Suppose we want to keep an S5 logic of metaphysical necessity. Then we can interpret the relation R in the above model not as an accessibility relation for metaphysical

possibility, but rather as a constraint on a closeness ordering for counterfactuals: x is closer to w than y is whenever x can be reached from w in fewer R-steps than y can. I think this is the most attractive of the views considered so far. It rejects (A) and accepts (B) for the same reason as the 4-denying view. Unlike the 4-denying view, it does not accept the essentiality of origins understood as a claim about the metaphysically possible originating matter of artifacts. But it does accept a version of the essentiality of origins understood as a claim about the arrangements of matter that *would* give rise to the artifact in question. Although an earring e could have been made from the opposite matter from which it is in fact made, this is a far out possibility: had an earring been made from that matter, it would not have been e. On reflection, the more familiar and stronger Kripkean essentiality principle formulated in terms of metaphysical possibility starts to feel, at least to me, like an overenthusiastic generalization from the more secure counterfactual data.

This view also allows that qualitative properties supervene on qualitative physical ones (although as mentioned earlier I think that this principle fails for other reasons). But it does not allow that facts about which earrings there are supervene on the underlying physical facts. This haecceitistic failure of physicalism is perhaps easier to swallow than the zombie-like failure of qualitative supervenience. But it is still quite a surprise.

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