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The Problem of Material Origins

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Saul Kripke has convinced many of us that material things have their material origins essentially. Plutarch, through his Ship of Theseus story, has convinced many of us that material things can sometimes survive gradual replacements of their material parts, that they are *materially non-rigid*. By way of a series of counterexamples, I will argue that any attempt to specify what in particular is essential about material origins will founder on the phenomenon of material non-rigidity.

To get a feel for the sort of counterexamples I have in mind, consider my skateboard, *Skate*. Originally, Skate was constituted by a certain collection of molecules. As a result of wear, tear, and repair, Skate has since come to be constituted by a partly different collection of molecules. And, theoretically, with enough time and upkeep, Skate could some day come to be constituted by an entirely different collection of molecules. The question arises whether Skate could *originally* have been constituted by entirely different molecules. One is tempted to say *no*: any skateboard originally made of entirely different molecules would not have been *this very skateboard*. It seems essential to Skate that it originated in at least some of the molecules in which it actually originated. Kripke first teased intuitions of this sort from us in his influential *Naming and Necessity*, where he offered a number of persuasive examples, as well as a proof-like argument, in support of his thesis that "If a material object has its origin from a certain hunk of matter, it could not have had its origin in any other matter."[1] At least in the present case, however, our essentialist intuition fails to respect certain possibilities. In particular, it fails to respect the range of possibilities engendered by the material non-rigidity of Skate's more immediate parts. Skate was originally constructed from a wooden deck, two metal trucks, eight metal screws, and four plastic wheels. These immediate parts of Skate are

capable of surviving various gradual replacements of *their* respective parts. The deck is for instance capable of surviving a procedure whereby all of its constitutive molecules are very gradually replaced with qualitative duplicates. Had it and the other immediate parts of Skate undergone such procedures before having been assembled into Skate, Skate would not have originated in any of its actual original molecules. And yet, intuitively, Skate might still have existed. So it seems, contrary to initial appearances, that it is not essential to Skate that it originate in some of the molecules in which it actually did.

A tension between Kripke's thesis and the phenomenon of material non-rigidity will surface as we examine a series of hypothetical scenarios similar to this one. On the one hand, in its weakest form, Kripke's thesis will throughout our investigation seem powerfully compelling: never will it seem possible for a given material thing to have had an entirely different material origin. On the other hand, all attempts to say anything more specific about the necessity of material origins will be thwarted by counter-examples in which actual original parts of some object x undergo gradual replacements of *their* respective parts prior to x's origin. In some cases, the parts will be ordinary material objects, like the wheels on my skateboard; in others, they will be portions of material stuff, like the plastic constitutive of these wheels. Our intuitions about the various counterfactual scenarios will run counter to several widely held theses about material origins. I predict, for instance, that we will not find it counterintuitive that a wooden table might have originated from a portion of wood having no wood in common with that originally constitutive of the table.[2]

To prepare for some forthcoming examples, I need to discuss the material non-rigidity of ordinary objects and also of portions of stuff (§1). Readers familiar with the phenomenon of material non-rigidity are encouraged to move directly to my discussion of the tension between it and the necessity of origins thesis (§2).

1.

Plutarch's story has it that over a long stretch of time, very gradually, all original matter of the Ship of Theseus was replaced, plank by plank, with new matter. Some philosophers maintain that the story is mostly false, due to an innocent mistake in describing the historical events.[3] According to them, an accurate story would have it that the original ship ceased to exist as soon there was any loss of original matter. They maintain that attempts to repair a ship almost inevitably result in the destruction of at least one ship and the creation of at least one new ship. For present purposes, I will not be concerned with this revisionary position.[4] My aim is not to defend the thesis that material objects are materially non-rigid, but only to show a tension between it and Kripke's thesis. Assuming, then, that there is such a

phenomenon as material non-rigidity, let me characterize some as its central features.

Generally speaking, most ordinary material objects seem capable of surviving a **G**radual **R**eplacement **O**f **P**arts, or a *GROP*. Mountains, cells, tables, skateboards, bladders, trees, trousers, and skyscrapers all seem capable of surviving a GROP. Though impractical, by replacing lost or damaged parts with new ones, we could gradually repair mountains as they deteriorate from natural forces. To some degree, most biological entities engage in such processes constantly as they fight against the forces of entropy to maintain their integrity. We can envisage these processes taken to their extreme, resulting in *complete* replacements of constitutive matter over large spans of time.

A GROP can occur at any of various mereological levels. For illustration, suppose that before us is a large brick apartment building. We can imagine replacing this building's thousand apartment units with qualitatively identical ones: each year, say, we could lift out an entire apartment and replace it with a duplicate. Alternatively, we could gradually replace its million bricks with duplicates; or its many billion brick-pebbles with duplicates; or its very many trillion molecules with duplicates; and so on.

Objects capable of surviving one sort of GROP might not be capable of surviving others. Consider for example the hydrogen atom, which is composed of one tiny electron and one relatively enormous proton. Chemists speak of hydrogen atoms losing their electrons and gaining new ones. But, for good reason, there is no talk of their losing protons and gaining new ones: a proton is too significant a part of a hydrogen atom to be replaceable. To survive a given sort of GROP, an object must be sufficiently *complex*, and must not have any parts that are *too significant*, at the considered mereological level of GROP. A given duplex house might for instance be capable of surviving a gradual replacement of its bricks, pebbles, or molecules, but not of its two unit-homes. Some forthcoming examples will take advantage of the fact that a sufficiently complex molecule is capable of surviving a GROP. There are enough protons, electrons, and neutrons in a complex molecule to allow it to maintain its integrity throughout their gradual replacement. Perhaps even neutrons and protons could survive gradual replacements of their quarks with duplicates.

Ordinary material objects, such as my skateboard and its wheels, can survive a GROP. But so can mere *portions* (or quantities[5]) of *stuff*, as well as the primitive pieces, lumps, heaps, pools, puddles, and droplets they sometimes form. Water, sand, gold, chalk, plastic, wood, clay, blood, and quartz are types of *stuff*. The wood constitutive of my skateboard deck is a *portion* of stuff. And the flat oval lump that it forms is a *piece* of stuff. There are intuitive differences between portions of stuff, on the one hand, and the primitive pieces, lumps, pools, and so on they sometimes form, on the other. For instance, portions seem capable of existing in scattered states, whereas

pieces, lumps, pools, and so on, do not. Were we to break a piece of wood in half, intuitively, we would destroy it, but not necessarily the portion of wood constitutive of it. That very wood might still exist, just no longer in the form of the original piece. Or suppose that we have before us a soft clay bowl. Intuitively, we could destroy the bowl by reforming the clay into a solid ball; we could destroy the bowl *and* the piece of clay out of which it is made by tearing the bowl in half; and we could destroy the bowl, the piece of clay, and the *portion* of clay constitutive of the piece by scattering the clay's atoms evenly throughout the universe, so that they no longer form any clay at all.

Generally speaking, portions of stuff, as well as the pieces, lumps, pools, and so on that they sometimes form, are materially non-rigid.

Intuitively, any ordinary piece of wood could survive the destruction of some of its constitutive molecules. Indeed, it could plausibly survive the very gradual replacement and subsequent destruction of *all* of its original constitutive molecules. But no *portion* of wood could survive such a procedure. Wood is constituted mostly by H_2O and complex carbon-based molecules. Intuitively, a given portion of it persists only if each and every one of its constitutive molecules continues to stand to some of the others in a relation sufficient for the formation of some wood. If just one of its molecules were to be destroyed, so would it: *that very portion of wood* would exist no longer, even though many of its subportions would. So, at the mereological level at which the portion of wood is individuated—that of the molecule—material replacements result in the destruction of the *portion* but not necessarily of the *piece* that it constitutes.

Suppose, then, that we look at a lower level, one below the level of resolution at which the portion of wood is individuated. Suppose that, very gradually, the many *fundamental* particles that ultimately compose a given portion of wood were to be destroyed and replaced with qualitative duplicates. At the end of the process the resultant wood would contain none of the fundamental matter now constitutive of it. For this reason, it is tempting to conclude that the original wood would no longer exist. This temptation fails, however, to respect certain possibilities engendered by the non-rigidity of the molecular components of the wood. Suppose that we were to operate on the molecules by exchanging the quarks of their many neutrons and protons with qualitative duplicates. Intuitively, any ordinary molecule could—nomological barriers aside—survive such a procedure. Given that these molecules would survive, there is no reason to doubt that the wood they compose would survive too. After all, wood is individuated partly in terms of various sorts of molecules. So long as each of these molecules survives and bears to some of the others a relation sufficient for the formation of wood, the wood should survive too. Generalizing, it is plausible that a given portion of wood could survive the gradual exchange of *all* the fundamental particles constitutive of it at a given time.

Further generalizing, it is plausible that, at some mereological level or other, most ordinary portions of stuff, as well as the primitive pieces, lumps, heaps, pools, puddles, and droplets they sometimes form, are materially non-rigid.

2.

What impact does the phenomenon of material non-rigidity have on Kripke's necessity of origins thesis? Corresponding to various mereological levels of resolution at which one might attempt to pinpoint the essential features of a material object's origin are various formulations of Kripke's thesis. Perhaps what is essential about the origin of a given table, for instance, is that it involve a certain tree; or that it involve certain tree cells, molecules, atoms, or subatomic particles; or that it involve a certain hunk of wood; and so on. After considering a hypothetical example concerning a table and its origin, we will consider several initially plausible formulations of the necessity of origins thesis, each catered to a unique level of mereological resolution. Subsequent to each, an appropriate counter-example, based on the phenomenon of material non-rigidity, will be given.

For the remainder of our discussion, let us pretend that the following scenario is true. Alice has two trees on her property: Tree-A and Tree-B. The trees are genetic twins and develop in perfect harmony with each other: Tree-A is at all times of its existence qualitatively identical to Tree-B. At time t, Alice randomly chooses Tree-A over Tree-B, cuts it down, and builds Table-A from it according to her plan, Plan-A, which calls for the use of an entire tree.

As an aid to specifying subsequent scenarios, let me introduce some nomenclature: 'Cells-A' refers collectively to all cells actually constitutive of Tree-A at time t; 'Molecules-A' refers collectively to all molecules actually constitutive of Tree-A at time t; 'Atoms-A' refers collectively to all atoms actually constitutive of Tree-A at time t; and 'Sub-atoms-A' refers collectively to all electrons and quarks actually constitutive of Tree-A at time t. Likewise, 'Cells-B' refers collectively to all cells actually constitutive of Tree-B at time t; and so on.

In the first subsection we examine three formulations of Kripke's thesis: one in terms of the *tree*, one in terms of the *fundamental particles*, and one in terms of the *molecules*, from which a table originates. In the second subsection we examine two formulations arising out of alternative interpretations of Kripke's expression 'hunk of wood': one in terms of the *piece of wood*, and one in terms of the *portion of wood*, from which a table originates. In the final subsection, we abandon our efforts to specify what in particular is essential about material origins and settle on a relatively weak formulation of Kripke's thesis.

2.1. Trees, quarks, and molecules

Given that Table-A originated from Tree-A, might it have originated from Tree-B instead? One is initially inclined to say *no*, for how could *this very table* have originated from a numerically distinct tree? Of course, Alice might have chosen to build a table out of a different tree, but then, it seems, she would have built a different table. The following formulation of the necessity of origins thesis is initially plausible:

(1) If a wooden table T is originally made from a tree x, and y is any tree numerically distinct from x, then T is such that it could not have been originally made from y instead of from x.

But consider World One, which is just like the actual world except for two differences. First, prior to time t, when Alice actually cut down Tree-A, all cells composing Tree-B are very gradually replaced with their respective, qualitatively identical, counterparts from Tree-A. Second, Alice randomly chooses *Tree-B* instead of Tree-A. And so even though Alice chooses a different tree, she ends up using the very same tree cells, molecules, atoms, and fundamental matter that she actually used.

In World One, then, Alice builds a table, according to Plan-A, from Tree-B, Cells-A, Molecules-A, Atoms-A, and Sub-atoms-A. Intuitively, Alice builds the very same table she built in the actual world, namely, Table-A. This intuition is to be expected. For, except for the factor of the trees, everything speaks to Alice building the same table in both scenarios: both "higher factors" like the implementation of the same plan, and "lower factors" like the employment of the very same sub-atomic particles, atoms, molecules, and tree-cells. This scenario serves as a counterexample to (1): Table-A originated from Tree-A, but might not have.

In light of this counterexample, let us reformulate our necessity of origins principle. Perhaps we should focus on a more fine-grained level of mereological resolution. Maybe what is essential about the origin of a material object is that it involve (in the right sort of way) all, most, or even some, of the fundamental physical matter actually involved in its origin.

Let us assume that electrons and quarks are basic particles and that they are the only basic constituents of atoms. Given that Table-A was originally constituted by a certain collection of electrons and quarks, might it originally have been constituted by an entirely different collection? One is initially inclined to think not. For how could *this very table* have originated from fundamental particles entirely distinct from those actually originally constitutive of it? The following principle is initially plausible:

(2) If a wooden table T is originally constituted by fundamental particles x_1–x_n, and fundamental particles y_1–y_n are all numerically distinct from

> each of x_1–x_n, then T is such that it could not have been originally constituted by y_1–y_n instead of by x_1–x_n.

But consider World Two, which is just like the actual world, with the following exception. Prior to time t, all electrons and quarks constitutive of Tree-A's atoms are gradually replaced with their respective counterparts from Tree-B, so that as Tree-A falls to the ground it is constituted by Cells-A, Molecules-A, Atoms-A, and *Sub-atoms-B*. The end result is as follows: Alice builds a table according to Plan-A from Tree-A, Cells-A, Molecules-A, Atoms-A, and *Sub-atoms-B*.

Alice would seem to build the very same table she built in the actual world, namely, Table-A. At the very least, it is not counterintuitive that she would build Table-A. This is enough to undermine the intuitive justification of (2): Table-A was originally constituted by one collection of fundamental particles but, consistent with our intuitions, might have been originally constituted by an entirely different collection.

Although it seems unlikely, perhaps we have missed our target first by shooting too high, at the level of trees, and then by shooting too low, at the level of sub-atomic particles. Maybe what is essential about the origin of a material object is that it involve (in the right sort of way) something in the "middle ground," like all, or most, of the molecules actually originally constitutive of the object. Nathan Salmon (1986, p. 76) states that a wooden table "might have been originally constructed with some different molecules, but not all." The following principle has a certain initial appeal:

> **(3)** If a wooden table T is originally constituted by molecules x_1–x_n, and molecules y_1–y_n are all numerically distinct from each of x_1–x_n, then T is such that it could not have been originally constituted by y_1–y_n instead of by x_1–x_n.

But consider World Three, which is just like the actual world, with the following two exceptions.

First, all molecules constitutive of Tree-A are gradually exchanged with their counterparts from Tree-B. Second, an attempt is made to localize the difference of material origin to the level of molecules. Wherever possible, parts of molecules are returned to their original tree. If for instance x is an electron that is part of an H_2O molecule, then x is swapped with its counterpart from the other tree. If, however, x is an oxygen atom that is part of an H_2O molecule, then x is not swapped with its counterpart because it is too significant a part of the molecule to be replaced. The two procedures are coordinated so that the final exchanges of molecules, atoms, electrons, and quarks happens just a moment before Tree-A falls to the ground. The result is that Alice builds a table according to Plan-A from Tree-A, Cells-A, Molecules-B, a *minority* of Atoms-B, a *majority* of Atoms-A, and all of

Sub-atoms-A. With the exception of the molecular level, material sameness has mostly been preserved.

It is at least somewhat intuitive that Alice builds Table-A. More importantly, it is not *counter*intuitive that she builds Table-A. This is enough to undermine our intuitive justification for (3)—a formulation of the necessity of origins principle at the molecular level of resolution.

Our first three attempts to specify what is essential about material origins have failed. Intuitive justification is lacking for the claims (i) that Table-A essentially originated from a particular tree; (ii) that Table-A essentially originated in some of the fundamental matter in which it actually originated; and (iii) that Table-A essentially originated in some of the molecules in which it actually originated.

Two further formulations of the necessity of origins thesis are suggested by Kripke's original formulation.

2.2. Pieces and portions

Kripke (1980, fn. 56) employs the notion of a *hunk of matter* in his original formulation:

> **(K)** If a material object has its origin from a certain hunk of matter, it could not have had its origin in any other matter.

There are two ways to construe *hunks*: either as *portions* or as *pieces*. Kripke seems to have in mind pieces, for he substitutes talk of pieces for talk of hunks in his argument for (K).[6] It is, however, worth examining both interpretations of (K).

Here is a formulation in terms of *pieces*:

> **(4)** If a wooden table T is originally formed from a *piece* of wood x, and y is any piece of wood numerically distinct from x, then T is such that it could not have been originally formed from y instead of from x.

Suppose that in the actual world Alice builds Table-A from a single piece of wood, Piece-A (what is left of Tree-A as it falls to the ground), which is constituted by a certain portion of wood, Portion-A. Now consider World Four, which is just like the actual world, with the following two exceptions.

First, unbeknownst to Alice, at time t, Tree-B is cut down and Piece-B (what is left of Tree-B as it falls to the ground) is surreptitiously swapped with Piece-A moments before Alice commences construction of her table, so that Alice unknowingly builds a table from Piece-B instead of from Piece-A. Second, prior the swap, tiny bits of wood are gradually exchanged with their qualitatively identical counterparts until Piece-B comes to be constituted entirely of Portion-A.

In World Four Alice builds a table according to Plan-A from Piece-B, Portion-A, Molecules-A, Atoms-A, and Sub-atoms-A. Intuitively, in World Four Alice builds Table-A. World Four serves, then, as a counter-example to (4).

Here is a variant of Kripke's thesis formulated explicitly in terms of *portions* of wood:

(5) If a wooden table T is originally formed from a *portion* of wood x, and y is any portion of wood that does not share any wood with x, then T is such that it could not have been originally formed from y instead of from x.

World Three serves already to undermine the intuitive justification for (5). In World Three, Alice builds a table according to Plan-A, from Tree-A, Cells-A, Molecules-B, a minority of Atoms-B, a majority of Atoms-A, and Sub-atoms-A. Because a given portion of wood exists whenever, and wherever, each and every one of its constituent molecules stands in a wood-sufficient relation to some of the others, Alice builds a table out of Portion-B—a portion of wood numerically distinct from, and not overlapping with, Portion-A. Because we did not find it counterintuitive that Alice builds Table-A in World Three, intuitive justification for (5) is lacking.

2.3. Some of everything

Perhaps we should abandon our efforts to isolate a mereological level that is particularly important to the origin of a table and settle for a weaker thesis on which a table must have had at least some of its original material parts, regardless of their level of mereological resolution. Consider for instance (6):

(6) If a wooden table T is originally constituted by x_1–x_n (all and only those original material parts of T at the time of T's origin) and y_1–y_n are all numerically distinct from each of x_1–x_n, then T is such that it could not have been originally constituted by y_1–y_n instead of by x_1–x_n.

Before turning to World Six, our final hypothetical scenario, I need to fill in some details about the actual world. Alice actually built Table-A from Piece-A as follows. First, she cut Piece-A into 100 smaller pieces, Piece-A1–Piece-A100. Then she worked on these 100 pieces individually, preparing them, like pieces of a puzzle, for their eventual union into a table. After finishing work on the pieces, but before fusing them together, she put them in storage. After a very long time she retrieved them from storage and, with the aid of a revolutionary technology, fused them *seamlessly* together (as if she were fusing two pieces of hot wax into one) to form Table-A.

World Six is just like the actual world except for one difference. While Piece-A1–Piece-A100 are in storage, all of their constitutive bits of wood are gradually replaced with their counterparts from Tree-B. As in the actual world, Alice eventually fuses Piece-A1–Piece-A100 seamlessly together to form a table. The end result is that she builds a table *from* the very same 100 pieces of wood, even though the table originates *in* none of the material things that it actually originated in. That is to say, at the time of its origin the table has none of the material parts that it actually originally had. Note that in the actual scenario, Table-A never had as *parts* any of pieces A1–A100, for they ceased to exist the moment they were fused together to form Table-A (just as smaller pieces of hot wax cease to exist when they are fused into one larger piece).

It is intuitive to me that in World Six the table formed from pieces A1– A100 is the same table that was actually originally formed from these pieces, namely, Table-A. At the very least, I think others will not find it counterintuitive that it is Table-A. This undermines the intuitive justification of (6). For, at the time of its origin, Table-A is constituted by material parts entirely distinct from those that actually originally constituted it.

A problem with (6) is that it focuses only on things which are parts of T at the time of T's origin. It might, however, be essential to T that it originate *from* certain things which are not parts of T at the time of T's origin. Table-A might, for instance, essentially originate *from* Piece-A1–Piece-A100. Similarly, a particular human might essentially originate from things—an egg and a sperm, for example—which are never parts of her.[7,8]

Here, then, is the appropriate reformulation of (6):

> **(7)** If a wooden table T is the only table that originates from all and only material things x_1–x_n, and material things y_1–y_n are all numerically distinct from each of x_1–x_n, then T is such that it could not have been the only table originating from y_1–y_n instead of from x_1–x_n.

I believe that (7) is immune to counterexamples. In addition to its strong initial appeal, (7) is resistant to our usual method for constructing counterexamples. By including *all* material things involved in a table's origin, (7) does not allow us to play one part of a table's material origin against the others, as we did in the preceding examples. Our only hope for finding a counterexample is to play non-material aspects of a given table's origin against the relevant material aspects, in the hope that enough non-material constancy in origin might compensate for a radical difference in material origin. We could, for instance, claim that if Alice had built a table from entirely different material things, but at the very same time as actual, in the very same location as actual, and according to the very same plan as actual, she would have built the very same table as actual. We *could* make this

claim, but it would be counterintuitive. For it seems that just prior to building the table envisaged in this scenario Alice might have built a table from Plan-A, Tree-A, Cells-A, Molecules-A, Atoms-A, Sub-atoms-A, Piece-A, and Portion-A and that *this* table might have been Table-A.

We have found that a number of initially plausible necessity of origins theses fall victim to counterexamples based on the material non-rigidity of various material objects and portions of stuff. Our attempts to specify a particular mereological level at which to formulate a necessity of origins thesis were frustrated by various possibilities of part replacements. We settled finally on a weak, but general, formulation of the thesis that appears to be immune from counterexamples. This formulation does not attempt to specify what in particular is essential about material origins. It basically states that no material object could have had an entirely different material origin. Perhaps nothing more specific can be said about the necessity of material origins.[9]

Notes

[1] Kripke (1980, fn. 56).

[2] Throughout my paper I rely on an intuitive understanding of 'constitute' and its cognates. I avoid explicit definitions in part because I know of none that are satisfactory, and in part because I do not want to risk biasing the definitions against Kripke's thesis. Kripke himself offers no explicit definitions of his mereological vocabulary. Where I use 'constitute' and its cognates, Kripke uses 'make' and its cognates. My talk converts to his as follows: 'The so-and-so's constitute (or are constitutive of) x' converts to 'The so-and-so's make up x'. 'Such-and-such portion of stuff constitutes (or is constitutive of) x' converts to 'Such-and-such portion of stuff makes up x'. And 'x is constituted by the so-and-so's (or such-and-such portion of stuff)' converts to 'x is made up of the so-and-so's (or such-and-such portion of stuff)'.

[3] See, for example, Chisholm (1976).

[4] The revisionary position is somewhat more plausible in light of Hobbes's twist on Plutarch's story. Suppose that the original planks of the ship were, upon replacement, placed in storage by a historian who eventually built a ship from them on shore according to the blueprints of the Ship of Theseus. Has the historian swiped the Ship of Theseus from beneath the sailors' feet? Or has she merely built another ship using the first ship's original building blocks and blueprints? Perhaps we feel a tug in the revisionary direction because the twist reminds us of two sorts of alternative histories the Ship of Theseus might have had. First, the ship might have been disassembled, stored for a period of time, and reassembled. Second, it might have ended up in the historian's basement in the following way: Theseus's cousin, Disaeus, might have sent it disassembled to the historian who reassembled it in his basement—but there is a twist: Disaeus disassembled the Ship of Theseus by replacing its planks one-by-one with qualitatively identical ones, thereby leaving himself with a duplicate of the original ship; he sent off the disassembled ship with a mischievous grin, *believing* that what remained in his possession was the genuine Ship of Theseus.

[5] I prefer 'portion'; Helen Cartwright (1975) and Tyler Burge (1977) prefer 'quantity'; Dean Zimmerman (1995) prefers 'mass'.

[6] Here is Kripke's argument:

> Let '*Table A*' be a name (rigid designator) of a table, let '*Piece A*' name the piece of wood from which it actually came. Let '*Piece B*' name another piece of wood. Then suppose *Table A* were made from *Piece A*, as in the actual world, but also another table *Table B* were simultaneously made from *Piece B*. [. . .] Now in this situation *Table A* ≠ *Table B*;

> hence, even if *Table B* were made by itself, and no table were made from *Piece A*, *Table B* would not be *Table A*. (1980, p. 114, fn. 56; for clarity I have substituted '*Table A*', '*Piece A*', and so on for Kripke's bare capital letters.)

Kripke concludes that *Table B* would not be *Table A*. But we are not interested in the fact that *Table B*—a table that by stipulation is in at least some possible world distinct from *Table A*—would not be identical to *Table A*. This follows trivially from Kripke's stipulations that the terms '*Table A*' and '*Table B*' are rigid designators and that *Table A* is in some world not identical to *Table B*.

We are interested in the substantial issue of whether *Table A* could have originated from *Piece B*. What Kripke is tacitly assuming is a sufficiency of origins principle, something like: if a table *T* has its origin in a certain hunk of matter, then, necessarily, any table having its origin in that matter is identical to *T*. Of course, *given* this principle and that in *some* possible world *Piece B* originally constitutes a table distinct from *Table A*, it follows that in *no* possible world does *Piece B* originally constitute *Table A*.

As noted by Salmon (1979) and Noonan (1983), however, the sufficiency principle is highly dubious. To see that it is, simply imagine that after *Table A* is made, its wood is gradually replaced, bit by bit, with similar wood. And imagine that the original wood is then formed into a table. Clearly, this second table is not identical to *Table A*, and yet it originates in the very same wood.

[7] Kripke (1980, p. 113) asks rhetorically, "How could a person originating from different parents, from a totally different sperm and egg, be *this very woman*?"

[8] It is often assumed that only for a biological entity must a necessity of origins principle be formulated in terms of things that are causally continuous with, but which are never parts of, the given entity. McGinn (1976, p. 133), for instance, says, " . . . so you must have come from the gametes you came from because you are [. . .] continuous with them. I shall call this relation *d-continuity*. [. . .] There can be d-continuity between entities without the relation of *being made out of* holding between them. This seems to be a peculiarity of biological entities. It contrasts with the relation between a table and the piece of wood it 'came from'."

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