A new route to the necessity of origin

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1 Introduction

Saul Kripke (1980, 112–4) has claimed that there are necessary connections between material things and their material origins. His presentation of such necessity of origin theses included two paradigmatic examples: that it is impossible for a particular table to have been constructed from any hunk of matter other than that from which it was actually constructed, or for a particular human being to have originated in gametes other than those in which he or she actually did. Necessity of origin theses (henceforth, simply 'origin theses') are now standard examples of so-called metaphysical necessities, though unlike many other examples, they posit necessary connections between distinct individuals. Despite their familiarity, the conceptual grounds of origin theses are less clear than is usually supposed. Kripke's influential discussion provides only the briefest sketch of an argument. More explicit treatments have since been offered, but all of these turn out to be variations of just two strategies. J. L. Mackie and Penelope Mackie suggest that origin theses are grounded in a branching times model of necessity. Nathan Salmon, Colin McGinn, Graeme Forbes, and others suggest that such theses are grounded in a further principle, the sufficiency of origin.[1] Both approaches depend on stronger assumptions than Kripke's original presentation appeared to call for, assumptions strong enough to engender a measure of skepticism in the philosophical community.

In this paper, we identify a third, overlooked approach to such theses, an argument from what we call *independence principles*. On this approach, origin theses are by-products of a more fundamental feature of the processes by which material objects are produced, their mutual independence. Independence principles are motivated, in turn, as a consequence of a plausible metaphysical

[1] For the claim that origin theses are an upshot of the branching framework, see J. L. Mackie (1974) and P. Mackie (1998). Accounts that ground origin theses in the sufficiency of origin include McGinn (1976); Johnston (1977); Salmon (1979); Noonan (1983); and Forbes (1981, 1985, ch. 6). Forbes also makes use of a branching-worlds framework, but it plays no direct role in his argument for the origin thesis. Rather, it serves to support Forbes' sufficiency of origin thesis by restricting the range of worlds to which it applies. Both approaches develop suggestions found in footnotes 56 and 57 to Kripke's original discussion. The independence approach offered in this paper may constitute an interpretation of Kripke's argument in footnote 56, but the textual evidence is unclear.

principle governing such processes: their invulnerability to non-local prevention. We explain this approach and argue that it yields valid arguments for origin theses, is distinct from the two orthodox approaches, and proceeds from more plausible assumptions.

2 The Locality of Prevention

Origin theses express restrictions on possible processes of creation. They claim that certain logically possible productions, e.g., that of Elizabeth Windsor from the Trumans, are not in fact possible. But why shouldn't this be possible? Finding a principled answer to this question requires consideration of a broader one: What does it take to prevent the production of a particular material object from a particular hunk of raw material? Consider Kripke's example of a table, T_1, and the hunk of wood, H_1, from which it was actually produced. It is a contingent fact that H_1 gives rise to T_1. There are many ways it might not have come to pass. We might have made H_1 into a chair; we might have burned H_1 for warmth; we might have seized the means of table production; we might just have decided to leave H_1 alone. In all of these cases, some factor prevents the production of T_1 from H_1. The factors that prevent T_1's production in each case are those divergences from the actual circumstances responsible for T_1's not coming from H_1 in that case.[2]

We should notice an important feature of these examples. Each factor which prevents T_1 from eventuating makes a difference to H_1 or the people and tools involved in the productive effort. In this sense, the preventions are *local*. What makes no difference to the existence of H_1 or the process by which T_1 actually came from H_1 is irrelevant to T_1's production and cannot interfere. These reflections suggest that processes of table-creation are governed by a principle of *locality of prevention*: any case in which some factor prevents the production of T_1 from H_1 must differ from actual circumstances with respect to properties of either H_1 or other elements of the process by which T_1 actually emerged.[3]

The locality of prevention is a thesis about dependencies.[4] It limits the factors on which the success of a productive effort may depend to those which make for local differences. No restriction on how those local differences may be

[2]Although causing an effect is a sufficient condition for a factor to be responsible for that effect, it is not a necessary condition. Many cases of prevention cannot be thought of as strictly causal, as we are often contemplating the absence of a certain event being responsible for the absence of another. Consider the following case. T_1 fails to eventuate because life failed to evolve and there are no trees and, thus, no H_1. Here there is no identifiable causal process involving H_1 or the production process, but 'because' expresses a relation of responsibility nontheless.

[3]This claim states only a necessary condition for preventing the production of T_1 from H_1. No implication of the converse, a sufficient condition for preventing that production, is intended. A productive effort using H_1 as raw material may result in T_1 even though there are significant differences from the actual circumstances in the locale of the production. The locality of prevention allows that there is more than one way to produce a table.

[4]Thanks are due to an anonymous referee for bringing the necessity of this clarification to our attention.

made is involved. For instance, it is consistent with the locality of prevention that there be action at a distance, whereby a distant event is directly causally responsible for some effect, e.g., on H_1, precipitating the failure of T_1 to emerge. The question of the truth of the locality of prevention is orthogonal to questions about the possibility of action at a distance, and more generally about the nature of causal connections.

The locality of prevention lies at the heart of the present approach. It expresses what looks like a general truth about processes of table-creation: they are essentially local phenomena. The causal-historical path leading to this desk runs through quite specific materials and processes of assembly which are distinct from those leading to your desk, or, indeed, to anything constructed from completely different materials, at other times, or in other places. Because the actual production of this desk from its source hunk is solely a matter of what happens along the causal-historical path, any factor which prevents that production must make a difference along this path. Factors that fail to influence it do not prevent the desk from coming into existence just as it actually does. Running the process which actually leads from H_1 to T_1 in the presence of factors which do not locally infringe can still lead to T_1.

It is important to distinguish two claims at this point.[5] The claim we defend is that, in the absence of any factor which affects H_1 or some other element of the production of T_1, that production *may* result in the production of T_1. Nothing prevents T_1 from being produced, and its emergence is possible. A stronger claim, with which it might easily be confused, is that in the absence of such factors the process *must* result in the production of T_1. Nothing prevents T_1 from being produced, so its emergence is inevitable. The stronger claim, unlike the weaker, articulates a sufficient condition for being T_1: any table which is produced from H_1 under precisely the actual conditions is, as a matter of necessity, T_1. The present approach eschews such sufficient conditions for being T_1. All that is promised by the locality of prevention is that T_1 might still be the product in such a case. But, for all that the principle tells us, it also might not.[6]

The difference between the two claims can be illustrated by appeal to a metaphysical view which accepts the weaker, but denies the stronger. Consider a view according to which there are no non-trivial sufficient conditions for being T_1. T_1's identity is 'bare' in the sense that it depends on no further facts about either T_1 or anything else. A proponent of this view holds that H_1's

[5] We are again indebted to that same anonymous referee for pointing out the need to highlight this distinction.

[6] There is a delicate question here about the force of the 'might' in 'T_1 *might* still be the product.' Although we find the ordinary English locution expresses our thought tolerably well, those who are overly used to hearing 'could' as 'there exists a possible world in which' may be left puzzled. In the locution of possible worlds, our claim amounts to this: any condition or factor F not affecting the locale of the H_1-T_1 production, but otherwise compossible with it, is such that there is a possible world in which F obtains, and T_1 is a table produced from H_1. In that sense the production *can* still succeed, even though F takes place. Of course this is consistent with there being another possible world in which F obtains and T_1 is not produced from H_1.

being in the place that it actually was, being manipulated and shaped as it actually was, with the tools, by the workers, and under the circumstances it actually was, provides no guarantee that T_1, rather than some other table, is the product. The product of their labors might simply have been a different table. The proponent of bare identities, then, denies the stronger claim that T_1 must emerge in those circumstances. But she will find nothing to quarrel with in the locality of prevention: it is the inevitability of T_1's emergence she finds repugnant. Its possibility is no problem for her.[7]

This distinction will also help to contrast our claim with another, more familiar thought for which it may be taken. It is sometimes claimed that identity is an 'intrinsic' relation. Expressions of this view vary widely, but the basic thought is that relations of identity hold only in virtue of the (other) intrinsic properties of the relata and cannot be determined by the existence or non-existence of some other thing or the obtaining of some extrinsic fact.[8] One version of this thought, the 'only x and y principle,' claims that the identity of a thing with itself over time cannot depend on whether some other individual is or is not present and rules out, for instance, 'best candidate' theories of identity over time.[9] Although we have formulated our idea in terms of a factor's locality — its making a difference to those objects, events, and agents in the locale of a production process — and not the intrinsic properties of a certain object or region, there are clear affinities between the two ideas. One who accepts the intrinsicness of identity should also accept the locality of prevention, as a world with no local differences in the production process may also be one with no intrinsic differences, and an intrinsic duplicate of that production process will have a product which is intrinsically just like T_1.

Even so, it should be clear that the claim of intrinsicness goes beyond ours in a number of ways. First, the intrinsicness claim, especially in its 'only x

[7]We are not endorsing the position according to which there are no non-trivial sufficient conditions for being T_1. We broach the position only for the purposes of illustration. It does serve to underscore, however, the broad appeal that the locality of prevention has. Some of the literature on the necessity of origin rests the case for origin theses on the rejection of this position, e.g. (Forbes, 1985, ch. 6). Noonan (1983) thinks the case for origin theses rests on the rejection of 'bare' identities (see esp. p. 3), but argues against the ultimate coherence of such a position. Obviously, the route we are sketching here does not rest on its rejection.

[8]We should distinguish three claims that may march under the banner 'the intrinsicness of identity': (1) If $x = y$, then the identity of x and y is an intrinsic feature of x (i.e. y). (2) Whether $x = y$ is not determined by any merely extrinsic feature of x or y. (3) Not only is (2) true, but whether $x = y$ is determined by other intrinsic features of x and y. (2) implies (1), for if the identity of x and y were an extrinsic feature of x, then an extrinsic feature of x, namely its identity with y, would determine whether x is identical to y. If the existence of a 'best candidate' z for identity with x is held to be an extrinsic feature of x or y, then (2) will also yield the 'only x and y principle' mentioned below. A proponent of the 'bare identities' view will find nothing to quarrel with in either claim. Since, according to this view, nothing other than the fact that $x = y$ settles the question of whether $x = y$, its proponent can embrace both (1) and (2). But the third claim is simply inconsistent with the 'bare identities' view. Since proponents of the intrinsicness of identity are so often motivated by a distaste for bare identities, we shall assume throughout that the strongest claim (3) is intended.

[9]For the intrinsicness thesis and the only x and y principle, see, e.g., Wiggins (1980, 94–99) and Noonan (1985b). For the closest continuer theory, see Nozick (1981, 29–70) and Noonan (1985a).

and y' guise, is usually applied to questions of identity over time. We make no claims about what form a correct account of identity over time must take. Our concern is only with what it takes to prevent a given object from coming to be and not with its continued survival after that point. The locality of prevention is compatible with a variety of accounts of identity over time, including 'best candidate' or even a counterpart-theoretic accounts, whether or not such theories are advisable.

This leaves 'cross-world' applications of the intrinsicness claim, which bring us to a second, more important difference. The intrinsicness claim is typically taken to imply a sufficiency principle for cross-world identity: given that T_1 eventuates from H_1 in a region R in w, any world which is an intrinsic duplicate of w in R (and contains H_1 in R) will be a world in which T_1 eventuates from H_1 in R. (Noonan, 1985b, 82) This is precisely the sort of consequence to which we deny that the locality of prevention need be committed. As should be clear from the example of bare identities, the locality of prevention only requires that T_1 may eventuate in such a similar situation, not that it must. We emphasize the distinction between 'may' and 'must' here both because weaker premises make stronger arguments and because keeping the distinction firmly in mind will help distinguish the present approach from those based on sufficiency principles when we come to them.

The applicability of the locality of prevention is no less general than its appeal. Nothing about the locality of prevention is really specific to tables. Analogous restrictions on prevention seem to govern the production of most kinds of material objects, many kinds of events, and perhaps even some kinds of nonmaterial objects.[10] Despite their generality, the restrictions imposed by the locality of prevention are not trivial. There are kinds for which these restrictions do not hold. Call something a *prototypical table* if it is the first table ever made in the universe. We may prevent the production of a prototypical table from a source hunk simply by constructing another prototypical table at some earlier point in time. Such prevention need not be local.[11] It is also easy to find examples of kinds for which interference might occur 'after the fact.' Call something a *super-prototypical-table* if it is the only table ever to exist in the universe. What produces a super-prototypical-table in one circumstance may fail to do so in another. The construction of a second table, even after the first is

[10] Although the independence approach to origin theses offered here applies most obviously to material objects, considerations of constitution play no essential role in the reasoning. What matters is rather creatibility and the invulnerability of such creation processes to non-local prevention. Where events and nonmaterial things fit this profile, as, for example, symphonies and species of animal arguably do, similar reasoning will apply. This would appear to vindicate J. L. Mackie's suggestion, (1974, 360), that 'the contrast between the necessity of origin and the contingency of development is not essentially connected with constitution,' while offering a rather different explanation of the contrast.

[11] The interference is not just with the existence of, say, PT_1, nor with its creation from some hunk or other, but with the *production* of PT_1 from, say, H_1. We are thinking of productions as individuated in part by the kind of thing the product is. So, supposing PT_1 to be a prototypical table constructed from H_1, the production of that very table from H_1 may fail in some other world, even though the right table is produced from H_1 in that world. The prototypical table production fails because the product is not a *prototypical* table.

completed, spoils it. Productions of prototypical- and super-prototypical-tables are vulnerable to forms of competitive interference. What prevents their production is our running the very same sort of process on another hunk somewhere else.

3 Independence Principles

The contrast with ordinary tables is instructive, for ordinary tables do not seem vulnerable to the same sort of non-local, competitive interference. As far as making T_1 from H_1 goes, it just doesn't matter what you do with some other hunk of wood somewhere else in the universe. Make it into a table or don't. As long as the second process doesn't infringe on the process which actually makes H_1 into T_1, this process may well run as it actually did, resulting in T_1. The reasoning is symmetric. Suppose we do make that second hunk into a table. Whether we make H_1 into T_1 or not is irrelevant to the success of our new endeavor, unless the two processes locally interfere with one another.

The locality of prevention has the following consequence: if one table production need not have effects in the locale of another and *vice versa*, then it is possible for both productions to succeed. Table productions can be isolated from the effects of other table productions in most cases. The upshot is that processes that turn hunks into tables seem to enjoy a form of *independence* from one another. A process that turns one hunk into a table *need not* interfere with any other, though there are cases in which they do, in fact, interfere. Suppose we burn one of the hunks in order to power the machine which makes the other hunk into a table. In this situation, we can no longer make any of the tables we might otherwise have made from the burned hunk. But this connection between the processes is contingent. Had we found another source of power, the second hunk would have remained available for table-manufacture. The relevant form of independence is one which rules out only necessary interference between table-making processes.

If this reasoning is correct, we seem to have the following situation. Given any two distinct hunks, a table constructed from the first hunk can, in principle, also be constructed in the presence of the production of any of the tables which can be constructed from the second hunk. This is what we call an *independence principle*.[12] It expresses the compossibility of table-productions from distinct hunks. Independence is the ineluctable result of the locality of prevention. Because making a table is just a matter of what happens locally along the casual-historical path, the paths are compossible when nothing requires one to affect the other as a matter of necessity. Whenever processes of production

[12]Independence principles, and the availability of valid arguments from them to origin theses, appear to have been first noticed by Kit Fine and Robert Stalnaker. In footnote 11 of (Salmon, 1979), Salmon attributes a similar idea to Fine and Stalnaker, but does not there recognize that it represents an approach to origin theses fully distinct from his own. Later writers appear either to have overlooked the suggestion or to have accepted Salmon's assimilation of the suggestion to the sufficiency approach. If the interpretive suggestion of note 1 is correct, the idea is originally Kripke's.

are invulnerable to non-local prevention, there will be an analogous principle of independence. So, independence principles seem to hold no less generally than does the locality of prevention.[13]

In fact, there is reason to think that independence principles can hold even in the presence of certain failures of the locality of prevention. The only failures of locality which undermine independence principles are those in which non-local *competitive* prevention is possible, as in the case of the prototypical-tables. While we believe that the case for independence is clearest for the broad array of processes which are plausibly thought immune to all forms of non-local prevention, it is logically possible for a pair of production processes to be independent in the required sense even though each is vulnerable to some forms of non-local prevention. This means that the independence approach to origin theses may remain available in some difficult cases, though at the cost of additional philosophical work. Although it is our purpose here to illustrate the core of the approach, a brief discussion of an example may indicate the direction one might take here.

Our example is inspired by the literature on personal identity. Our focus, however, will be on the production of human beings rather than persons. Suppose a human being, H_1, actually develops from gametes G. Suppose also that it is possible for the process which actually led to H_1 to have led to a human being H_2, who later 'split,' resulting in identical twins. Consider a view which maintains, "It is essential to H_1 that she not split. Because of the split, H_2 and H_1 are distinct; in general it is impossible for a human being to split like this if she does not actually do so. In effect, H_2's split prevents the productive process involving G from yielding H_1." If we accept this view, we seem to have a case of non-local prevention *par excellence*. An event in the subsequent history of the product H_2 prevents the production from yielding H_1, but not by any effect on G or other elements of the process.[14]

Even granting this view, it remains clear that the production processes display the relevant form of independence from production processes involving other gametes. The splitting of an individual coming from a set of gametes is not required by the coming of an individual from distinct origins. H_2's production from G is as compossible with the production of individuals from other origins as H_1's is.[15]

Independence principles imply that, even if one thinks that a given origin

[13]The 'seem to' should be taken seriously. We will meet examples where independence principles fail even though locality holds when we discuss productions whose source-hunks overlap below. Such cases are very much the exception rather than the norm.

[14]This view is broached for purposes of illustration only. We do not endorse the view, and will make no attempt to motivate or defend it. The philosophical literature on personal identity is replete with views regarding the metaphysics of the fission of persons. Perhaps a good place to start is (Parfit, 1986).

[15]We bypass for now issues involving the entanglement of productive processes that lurk in the wings here. Consider, for instance, cases of productions from overlapping source-hunks, a possibility for gametes. It is doubtful that the production of H_1 from G is compossible with the production of another human being from overlapping origins. These issues do not affect the paradigm cases for origin theses, where there is no such entanglement, and will be discussed in detail later.

could have given rise to a variety of different individuals — distinct solo alternatives, twins, or what have you — all the processes starting with that material origin are independent of those starting with distinct material origins; any of the individuals obtainable from one are compossible with any of the individuals obtainable from another. Perhaps H_1 can only appear when there is no splitting, but it may appear alongside any individual from another origin. Independence principles govern relations between productions from distinct source hunks. Since the splitting cases do not involve other source hunks, they do not touch independence principles, even if they threaten the locality of prevention.[16]

4 The Argument from Independence

We are now in a position to understand origin theses, not as bottom level metaphysical principles or mere intuitions, but instead as byproducts of independence principles. Let us start with an explicit characterization of independence for tables. Here and throughout the paper, we use 'made from' as short for the relation *made entirely and exclusively from*, i.e. that relation which holds between tables and hunks of material that contain all and only the material from which the table is made.[17]

(T-IND) Necessarily, given a table, T_1, made from a hunk, H_1, for any table, T_2 which might be made from a hunk, H_2, distinct from H_1, it is also possible that both T_1 is a table made from H_1 and T_2 is a table made from H_2.

In line with our reasoning, this expresses a compossibility claim about processes of table production. As promised, it is no logical truth, for the inference

[16] Another issue on which independence does not pronounce is whether the twins resulting from the split of H_2 are separately producible. Independence only maintains that individuals having distinct material origins are compossible, but the twins share a material origin. Furthermore, independence principles only license inferences from claims about what is separately producible to what is jointly producible, never the reverse.

[17] It is natural in English to speak of tables being made from hunks containing only a portion of their original material, as in 'this table was originally made from that leg.' If we allowed such a colloquial understanding of the expression 'made from', then the resulting origin theses would have actual counter-examples. For instance, this table was not only "made from" that leg, but also from other, distinct legs. It is not only possible for this table to have been "made from" a hunk distinct from this leg, it actually was "made from" a distinct hunk, e.g. that other leg. We adopt the stipulation of the main text as a way of avoiding such uninteresting counter-examples. One could, alternatively, avoid the irrelevancies by taking the relation indicated colloquially by "made from" as one's starting point in formulating our principles. One could then specify the more artificial relation we intend as one that holds between a table and a hunk iff all and only parts of the hunk are things the table is "made from", in the colloquial sense. (Really, an even more complicated specification is required, given that it is also natural in English to speak of a table's being made from a hunk which is only partially used up in the manufacture, as in 'this table was originally made from a certain block of wood, half of which was left over'.) Because substituting this specification for 'made from' would overcomplicate the formulation of our principles, we reserve the expression 'made from' for the relation *made entirely and exclusively from*, as we explain in the main text.

from 'Actually P' and 'Possibly Q' to 'Possibly P and Q' is invalid. Furthermore, we believe that (T-IND), as it stands, is susceptible to counter-example. Because our purpose here is to demonstrate a valid argument schema from independence-style principles to origin theses and not a full investigation of the truth of such principles, it is simplest to consider an unrestricted version of independence. Later, we will suggest how the principle might be restricted in order to restore its plausibility.

The argument requires two other premises. The first is a familiar logical principle, the (necessary) necessity of distinctness.

(ND) Necessarily, if $x \neq y$, then necessarily $x \neq y$.

The second is another metaphysical principle. Call it origin uniqueness.

(OU) Necessarily, if T_1 is a table made from H_1 and T_2 is a table made from H_2 and $H_1 \neq H_2$, then $T_1 \neq T_2$.

Keeping in mind our stipulative use of 'made from,' this principle says that a single table cannot *entirely and exclusively* originate from each of two distinct hunks within a *single* possible world. Suppose that there is a world in which T_1 is made from both H_1 and H_2. Our stipulation regarding the use of 'made from' requires that H_1 and H_2 contain exactly the same material. Barring the possibility of distinct but exactly coincident hunks, H_1 and H_2 are identical, as (OU) says. The principle is no logical truth, since the impossibility of distinct but exactly coincident hunks is no logical truth. Nevertheless, (OU) is still a trivial truth about material objects like tables: tables with distinct origins (in a world) are also distinct. The conclusion is a necessity of origin thesis for tables.

(T-NO) Necessarily, given a table, T_1, made from a hunk, H_1, any table, T_2, which might be made from a hunk, H_2, distinct from H_1, is distinct from T_1.

Now the argument. Start with a table, T_1, made from a hunk, H_1. Let T_2 be some arbitrary table it is possible to make from a hunk, H_2, distinct from H_1. Since T_1 actually comes from H_1 and it is possible that T_2 come from H_2, the independence principle says that both are jointly possible in some world w. Since H_1 and H_2 are distinct, they are distinct in w as well by the necessity of distinctness. By origin uniqueness, the distinctness of the hunks in w shows that T_1 is distinct from T_2 in w. An application of the necessity of identity shows that T_1 and T_2 are actually distinct as well. Since the choice of H_2 and T_2 was arbitrary, we conclude that any table it is possible to make from such an H_2 is distinct from T_1. Since the choice of starting world was arbitrary, the conclusion holds for all possible worlds. Q.E.D.[18]

[18]The proof is straightforward and requires only the K and T axioms along with the rule of necessitation. One could, for elegance, use B and the necessity of identity in lieu of (ND). The relevant QML symbolizations are:

T-IND $\Box\forall t_1\forall h_1(O(h_1,t_1) \Rightarrow \Box\forall t_2\forall h_2(h_1 \neq h_2 \wedge O(h_2,t_2) \Rightarrow \Diamond(O(h_2,t_1) \wedge O(h_1,t_1))))$

ND $\Box\forall x\Box\forall y\Box(x \neq y \Rightarrow \Box(x \neq y))$

5 Circularity Worries

One natural reaction to the argument is to think that, while valid, it simply begs the question because the independence principle just is the necessity of origin in disguise. What difference is there, one might ask, between being told that a table could have come from no other hunk and being told that the production of any table from another hunk is compossible with the first table? Strictly speaking, the charge is false. Independence and the necessity of origin do not imply one another. First, independence, by itself, does not imply any origin thesis in the absence of the necessity of distinctness and origin uniqueness. For instance, if distinctness were contingent, then T_1 could be made from H_2 in a world in which that hunk is identical to H_1. While neither the necessity of distinctness nor origin uniqueness is open to much doubt, our reasons for accepting them come from quarters far removed from those which support the origin thesis. Second, the necessity of origin does not imply independence. Even if no table could ever come from other matter, it might still be the case that independence fails because some distinct table-productions are not compossible. The necessity of origin only denies the existence of certain possibilities, while independence principles make a positive claim that a certain situation, that containing both table-productions, is possible.

Such logical niceties aside, one might still think there is something to the spirit of the charge. After all, if independence is true, it rules out any form of necessary interference between the making of T_1 from H_1 and the making of any table at all from H_2. Haven't we just stipulated away the apparent counter-example to the origin thesis, that in which the interference comes from our making H_2 into T_1? To see why the answer is 'no,' we need to go back to the justification of independence. Where H_1 and H_2 are distinct hunks and we have a way making H_1 into a particular table, if we also have a way of making H_2 into a particular table, then it seems that we could, in principle, run both of these processes together. The distinctness of the hunks seems to guarantee that there is no necessary interference between the processes; in at least one world, we can run them both and get the very tables we produced separately. Someone who wants to claim that we can make H_2 into T_1 needs to explain either why we could not also run the process which in fact turned H_1 into T_1 or why that process could not result in T_1. Either sort of explanation would appear to violate the locality of prevention. It won't do simply to say, 'We've already made T_1, so T_1 can no longer be made,' without also telling us what factor necessarily affects H_1 or some other element needed to produce T_1 from it. Without some explanation of why the two processes *must* interfere with each other, the objector is left baldly claiming some unspecified form of interference. One may object to independence, but the assertion of independence is not just the bald assertion of the origin thesis. Independence has its own grounds of

OU $\Box\forall t_1\forall h_1\Box\forall t_2\forall h_2\Box[(h_1 \neq h_2 \wedge O(h_1,t_1) \wedge O(h_2,t_2)) \Rightarrow t_2 \neq t_1]$

T-NO $\Box\forall t_1\forall h_1(O(h_1,t_1) \Rightarrow \Box\forall t_2\forall h_2(h_1 \neq h_2 \wedge O(h_2,t_2) \Rightarrow t_2 \neq t_1))$

support, and one who objects to the origin thesis must find some flaw in these independent grounds.

6 Independence and Branching Times

It will be worthwhile at this point to distinguish the independence approach to the origin theses from the two other dominant approaches, the branching account and the sufficiency account. The former grounds origin theses in the so-called branching times model of necessity. Questions about possibility are settled according to this model by asking whether the history of the universe could have gone as it actually has, up to a point, and then diverged in a way that brought about the possibility in question. On one simple version of this framework, the *de re* possibilities for T_1 are given in all the ways the universe could have gone on after the advent of T_1. None of these histories, however, include T_1's coming from another hunk. By the time of the divergence, it is too late for T_1 to have had a different origin. There are possibilities for tables included in earlier divergences, but none of these, according to the framework, are possibilities for T_1; these divergences are too early to represent possibilities for it.

The branching times and independence approaches differ, most obviously, in the scope of the claim in which they ground their arguments. While the independence approach relies on a specific insight about what it takes to prevent the production of a material object, the branching times approach relies on an overarching claim about what, in general, determines the possibilities for things, in short, a full-fledged interpretation of necessity. The independence approach, in contrast, requires no particular interpretation. The two approaches may also conflict directly, for it is not obvious that independence principles will come out true under a branching times interpretation of necessity. Consider, for instance, the simple version of the branching times interpretation broached in the last paragraph. Let T_2 be a merely possible table which might have been created from H_2 long before T_1 was actually created from H_1 and thus resides on a branch which diverges from actuality prior to the advent of T_1. Compresence with the production of T_2 from H_2 is not a possibility for T_1 as independence claims, since only branches which diverge from actuality after T_1's advent represent possibilities for it. Perhaps some subtler, more complicated version of the branching times model is consistent with independence principles. Even so, the subtlety and complexity required underscores the differences between the two approaches.

7 Independence and the Sufficiency of Origin

The difference between the independence approach and the sufficiency approach is more subtle because the forms of argument are superficially similar. Both use the necessity of distinctness, origin uniqueness, and some compossibility claim

about table productions to reach the origin thesis. The sufficiency account starts with an independence-like principle, though one that is weaker and more obviously true. Call it weak-independence for tables.

(T-WIN) For any two distinct hunks of matter, H_1 and H_2, and any table, T_1, made from H_1, it is possible both that T_1 is a table made from H_1 and that T_2 is a table made from H_2.

Of our usual H_1-H_2-T_1 situation, this says that it is possible to construct some table or other from H_2 alongside T_1; call it T_2. T_2 is, by the necessary distinctness of the hunks and origin uniqueness, distinct from T_1 and necessarily so. But this leaves open the possibility of another, special table, T_3, which is constructible from H_2 but is not compossible with T_1's production from H_1. Thus, the logic of the situation so far allows that T_3 might be T_1, and thus a counter-example to the origin thesis. This gap is bridged by appealing to another principle, the sufficiency of origin for tables.

(T-SO) If it is possible for a table, T, to originate from a hunk, H, then necessarily any table originating from H is T.

This claims that each hunk has lurking in it at most one possible table, or, more generally, that having a particular origin is a sufficient condition for being a particular table. With the sufficiency principle in hand, one may infer that T_3 is identical to T_2 because both share the very same origin, *viz.*, H_2. Since it was shown that T_2 is necessarily distinct from T_1, we can conclude the same for T_3 and for any table coming from a distinct hunk.

We, along with many others, are skeptical about the truth of such sufficiency principles,[19] but what is relevant here is that the argument from independence does not presuppose, and is compatible with the falsity of, the sufficiency of origin. The independence principle says that the making of T_1 from H_1 does not foreclose the possibility of making any table that might otherwise be made from H_2, for both may be constructed in the same world. The truth of this claim is entirely compatible with our being able to make a number of alternative tables from a single hunk of matter, and this is the denial of the sufficiency principle. Essentially, the sufficiency principle functions in the argument by ensuring an unusually strong form of independence between table-makings: no table from H_2 need interfere with T_1's coming from H_1 because any table from H_2 is T_2, which we already know from (T-WIN) does not interfere. But once one sees how the argument from independence proceeds, it becomes clear that sufficiency principles are an unnecessarily strong way of guaranteeing the independence required to derive the origin thesis.

While it should be clear that the argument from independence does not rely on any sufficiency of origin principle, one might think that sufficiency reasoning is still at work in the justification of independence itself.[20] This impression may

[19] For some doubts, see, e.g., Salmon (1979); Robertson (1998); Hawthorne and Gendler (2000); MacKay (1986); Chihara (1998); Della Rocca (1996); Sarkar (1982); Noonan (1983); and Kripke (1980, 43, 46).

[20] Teresa Roberston emphasized the need for this point.

be dispelled. We suggested that independence principles have their source in the principle of locality of prevention: a production process can be prevented only by factors which affect the raw materials, workers, tools, and facilities involved. Where there are two such processes which need not affect one another, they are compossible because nothing prevents both from occurring together in some world. One way of understanding this reasoning would invoke a sufficiency principle for processes. If one thought that the process which actually leads from H_1 to T_1 would inevitably lead to T_1's emergence, then any world containing this unaltered process alongside some other such process is a world containing T_1 and some other table.

We have emphasized that, while one may reason in this fashion, one need not. Securing the truth of independence for a pair of non-interfering processes, say those which take H_1 into T_1 and H_2 into T_2, requires only that there be some world in which we can run them both with these results. It is a matter of indifference whether there are some other worlds in which running these processes leads to tables other than T_1 and T_2. It is for this reason that we say that running the process which actually leads from H_1 to T_1 in the presence of another process which doesn't locally infringe *can* lead to T_1, not that it *must*. Once again, sufficiency reasoning turns out to be stronger than is required for the argument. We might also note that questions about the necessary features of processes are bypassed on our approach, for it is again a matter of indifference whether, say, the process which actually led from H_1 to T_1 could have run differently with the same result or, if so, how differently it could have run. Given a pair of hunk-to-table processes, all that matters is the possibility of running them unaltered and getting those same tables in at least one world.

8 Overlapping Origins

(T-IND), as stated, is not problem-free. It turns out to be counter-intuitive when H_1 and H_2 have much of their material in common. If H_1 is made into a table in such a case, then there may not be enough of H_2 left to craft some table we might have otherwise obtained; the two tables compete for raw materials. Such cases are also ones in which a necessity of origin thesis is implausible. Couldn't T_1 have been made from slightly different matter? Couldn't it therefore have been made from a hunk distinct from H_1, but sharing much material in common? If our claim that independence principles ground origin theses is correct, then it is no coincidence that origin theses seem implausible in cases where independence fails. Such cases also suggest that we may restore (T-IND)'s plausibility by restricting it, from distinct hunks, to non-overlapping hunks.

RT-IND Necessarily, given any two *non-overlapping* hunks, H_1 and H_2, and a table, T_1, made from H_1, for any table, T_2, that might be made from H_2, it is also possible that both T_1 is a table made from H_1 and T_2 is a table made from H_2.

Such a restricted (T-IND) would support a similarly restricted and more plausible origin thesis, like that defended by Kripke, Salmon, and others, that no table could have been constructed from a hunk entirely disjoint from that table's actual originating hunk.

A second sort of case appears to be a counter-example to even this restricted form of independence and complicates our defense of origin theses. Suppose that H_1 is a block of petrified wood which comes from H_2 by petrification, a process in which all the organic matter of H_2 is replaced by minerals.[21] Once again, making a table from H_2 will preclude our making any tables from H_1, despite the fact that the two hunks share no matter. Making some T_2 from H_2 and allowing H_2 to petrify into H_1 compete for raw materials. H_2 cannot both be made into the table T_2 and remain available for petrification into the hunk H_1. So (RT-IND) is evidently false in this situation.

There are two issues here. The first is the general truth of independence-style principles. Even though H_1 and H_2 do not overlap in the sense of sharing matter, it is clear from the perspective of the locality of prevention principle what is going on. The processes which lead from H_2 to T_2 and from H_2 through H_1 to T_1 overlap in their causal histories and necessarily interfere with one another. This suggests that (RT-IND) does not exhaust the content of the locality of prevention principle and that one could develop a notion of 'non-overlap' other than 'disjointness of matter' which would validate independence principles. Since it is not our primary aim to arrive at the truth about independence principles, we will not pursue this suggestion here. The second issue, more important in this context, is the impact of such examples on the plausibility of origin theses. Even if there is such a sense of 'non-overlap' which validates independence, it looks as if there is no origin result in the offing with respect to some items in a object's causal past, those whose role in the causal chain wholly consumes them as a matter of necessity (so not, for instance, one's grandmother). Even if such a version of independence remains true, it will support only a weaker origin thesis, one which does not foreclose the possibility that T_1 originate from a hunk whose causal history is suitably entangled with H_1's. In these cases, a skeptic might claim that the independence approach must allow that T_1 could have come from H_2 instead of H_1.

It is important to be clear on what sort of skepticism these cases might be thought to encourage. Such cases cannot support a broad skepticism about origin theses for two reasons. First, there remain many source-product pairs for which instances of the independence principle are obviously true, and so corresponding instances of origin theses will be true of them. This delivers the paradigmatic cases of origin theses, where there is no entanglement between productive efforts: this table could not have been made of some other hunk of wood grown in Australia, no matter how similar; nor could Elizabeth Windsor have come out of Harry and Bess Truman's gametes. Second, the coherence of examples like the petrified wood case turns out to presuppose the acceptance of some origin theses. Consider how it is plausible to claim that the petrification

[21] This case is due to James Forrester.

of H_2 into H_1 necessarily competes for raw materials with the production of T_2 from H_2. There will be *necessary* competition only if H_1 could not have come from any hunk other than H_2. That is, the skeptic uses an origin thesis about hunk-productions to arrive at a counter-example to independence principles for table-productions. If our skeptic's aim is to undermine the plausibility of origin theses in general, then her position is not coherent.

There remains a rather different sort of 'skeptic,' one who endorses the origin thesis in a wide range of cases, including, here, the impossibility of T_1's coming from H_2. Such a skeptic does not deny that independence arguments give rise to origin theses, but challenges our claim that independence is the full story of the conceptual grounds of origin theses. It is, however, unclear to us that this is genuinely impossible or that the independence approach gives the wrong answer in this case. Suppose, for instance, that the craftsmen who actually made T_2 from H_2 were rather more indolent and allowed the wood from H_2 to petrify in the course of their activity. Might not the product of their admittedly languid efforts have been T_1? This would seem to be a case in which the stone table T_1 might be produced from the wooden hunk H_2. There is thus some temptation to treat this case as analogous to the earlier case of overlap: because the origins are entangled, independence fails and so does the necessity of origin. It is true that the 'overlap' is more generally spatio-temporal-causal in nature than the mere sharing of matter, but there was already need for this generalization.

We believe that it is difficult to pronounce on purported cases of the origin thesis in a vacuum. Indeed, the point of any of the approaches to origin theses is to ground them in more than fleeting intuitions. Our imagined opponent thinks T_1 could not have originated from H_2. Could she appeal to either of the other two approaches to support her case? The sufficiency approach will not help. The petrification case is one in which even weak-independence fails. Not even one table can be made from H_1 in the presence of a T_2 made from H_2, contra (T-WIN). So the sufficiency approach does not show that T_1 could not have been made from H_2. The simple branching account appears to support the case, as T_1 and T_2 lie, as it were, on different temporal branches. The simple version, however, has problems precisely with avoiding making the time and circumstances of creation a necessary feature of objects.[22] Presumably one might avoid these difficulties by providing a more sophisticated account which achieves plausibility by allowing branches before the time of creation. Once we are permitted to take liberties with the circumstances that predate T_1's advent, however, it is more difficult to resist our little story about the indolent craftsmen. It would seem at first blush that a more liberal version of the branching times approach faces the same difficulties in handling the case of petrification as do the independence and sufficiency approaches. This is only a first impression. It is difficult to know whether or how a sophisticated branching times approach might support an origin result in the petrification case without being in possession of the details. But there is, as yet, no compelling reason to abandon the claim that independence results alone ground origin theses.

[22]See Penelope Mackie (1998) for a clear and sustained argument for this point.

9 Conclusion

One measure of the strength of a philosophical approach is the questions it allows one to frame and the resources it provides for answering them. The independence approach shows such strength as one moves beyond the model case of tables. The plausibility of origin theses turns on a host of further questions about the truth and scope of independence principles: Are there ways, other than competition for raw materials, that creation processes can compete, giving rise to necessary interference? What about competition for time, place, or agent of creation? For what kinds of objects do we get independence principles? Are they all material? Do they all involve initial constitution? Not every kind will support such a principle, as the prototypical-table example shows, but what is the widest class? Is it philosophically interesting? The independence approach, in turn, suggests that we may answer such questions by considering the source of independence principles, the invulnerability of creation processes to non-local prevention.

Despite such questions, we draw two firm conclusions. First, there is a valid, non-circular argument from independence principles to origin theses. Second, the independence approach is distinct from both branching and sufficiency approaches and does not rely on their primary assumptions. What is more interesting, and more tentative, is the idea that independence principles derive from a more basic and general truth about processes of creation, that they are essentially local phenomena. From this perspective, origin theses are mere consequences of what has the look of a genuinely basic metaphysical truth. We believe that the independence approach offers a novel and insightful framework for thinking about origin theses and, ultimately, for assessing their truth.[23]

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