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## IMPOSSIBLE WORLDS

By NATHAN SALMON

**I**N a recent commentary on my *Reference and Essence* (Princeton University Press and Blackwell, 1982), William R. Carter represents me as endorsing the first two of the following three modal propositions, which together constitute an inconsistent triad (following Carter's numbering scheme):<sup>1</sup>

- (2) If a given table (ship, bicycle, etc.)  $x$  is originally constructed from a certain hunk of matter  $y$ , then it is a necessary or essential feature of  $x$  that it is originally constructed from  $y$ .
- (3) If a given table (ship, bicycle, etc.)  $x$  is originally constructed from a hunk of matter (collection of material parts)  $y$ , then  $x$  could have originated from a hunk of matter  $z$  98% (or more) of which overlaps with  $y$ ; but  $x$  could not have originated from any hunk of matter  $z'$ , such that less than 98% of  $z'$  overlaps with  $y$ .
- (4') If  $c$  is a material component (e.g., a molecule) of a hunk of matter  $y$ , then it is a necessary or essential feature of  $y$  that it has  $c$  as a material component.

In fact, I endorse (4'), but neither (2) nor (3). The strongest principle along the lines of (2) that I endorse is the following:<sup>2</sup>

- (2') If a given table (ship, bicycle, etc.)  $x$  is originally constructed from a certain hunk of matter  $y$ , then  $x$  could have been originally constructed from any hunk of matter  $z$  which is sufficiently like  $y$  (in mass, volume, composition, etc.) and which sufficiently substantially overlaps  $y$ ; but  $x$  could not have been originally constructed from any hunk of matter  $z'$  which does not sufficiently substantially overlap  $y$ .

I offer (3) as one among uncountably many possible regimentations or sharpenings of (2'), one candidate for what is to count as *sufficiently substantial* overlap. I do not actually endorse (3), however, since I regard the vagueness of the phrase 'sufficiently substantial overlap' in (2') as intrinsic to the epistemic situation.

<sup>1</sup> Salmon on 'Artifact Origins and Lost Possibilities', *The Philosophical Review*, XCII, No. 2 (April 1983), pp. 223-31.

<sup>2</sup> Here I assume the following modal evaluation clause:

$\lceil \Box \phi \rceil$  is true with respect to  $w$  iff  $\phi$  is true with respect to every world determinately accessible to  $w$  and either true or neither true nor false with respect to any world neither determinately accessible nor determinately inaccessible to  $w$ .

For more on indeterminate accessibility, see *Reference and Essence*, pp. 247-52. The evaluation clause assumed here differs from the (strong) rule proposed there at p. 248, note 27.

No precise principle, like (3), which removes the vagueness by substituting sharp cut-off points is knowably true. (Cf. *Reference and Essence*, pp. 240-52.)

A principle like (2') is not the sort of proposition that merely happens to be true. If it is true at all, it is necessarily so. In fact, if it is true at all, then it is necessary that it is necessarily true, and it is necessary that it is necessary that it is necessarily true, and so on. From this observation, a sorities-type construction, the main idea of which has been exploited by Roderick Chisholm,<sup>3</sup> can be made to show that the generally accepted axiom schema of *S4* modal propositional logic,

$$\Box p \supset \Box \Box p$$

or equivalently, the notion that modal accessibility among worlds is transitive, should be rejected in its unrestricted form. Consider any hunk of matter  $z$  which is sufficiently like the hunk of matter  $y$  (in mass, volume, composition, etc.) that originally constitutes an artefact  $x$ , but which does not sufficiently overlap  $y$ . By (2') it is necessary that artefact  $x$  is not originally formed from hunk  $z$ . But there is a (perhaps scattered) hunk of matter  $z_1$  which includes some of the molecules of hunk  $z$  and which does sufficiently overlap hunk  $y$ , so that artefact  $x$  could have been formed from hunk  $z_1$ . Consider now yet another hunk of matter  $z_2$  which includes still more of the molecules of hunk  $z$  and which sufficiently overlaps hunk  $z_1$  (though perhaps does not sufficiently overlap hunk  $y$ ). If artefact  $x$  could have been formed from hunk  $z_1$ , then (even if, in fact,  $x$  could not have been formed from  $z_2$ , still) it *might have been* that  $x$  could have been formed from  $z_2$ . Continuing in this vein, it will follow that, although it is necessary that artefact  $x$  is not formed from hunk  $z$ , still it might have been that it might have been that it might have been ... that  $x$  is formed from  $z$ . More intuitively, if there is a possible world  $w_1$  (possible relative to the actual world) in which artefact  $x$  is formed from hunk  $z_1$ , then there is a world  $w_2$  possible relative to  $w_1$  in which  $x$  is formed from  $z_2$ . Hence there is a world  $w_3$  possible relative to  $w_2$  in which artefact  $x$  is formed from a hunk of matter  $z_3$  which includes still more molecules of hunk  $z$  and which sufficiently overlaps hunk  $z_2$ , and so on. Finally, there will be a world  $w$  which bears the ancestral of the accessibility relation to the actual world, and in which artefact  $x$  is formed from hunk  $z$ , though by hypothesis there is no world accessible to the actual world in which  $x$  is formed from  $z$ . World  $w$  is an *impossible world* from the point of view of the actual world.

<sup>3</sup> See his 'Identity Through Possible Worlds: Some Questions', *Noûs* 1 (March 1967), pp. 1-8; and *Person and Object* (La Salle: Open Court, 1976), pp. 148-9. Chisholm does not accept my conclusions concerning his argument, but instead rejects any principles like (2') and (3) in favour of the inflexible essentialism of (2). See also Saul Kripke, *Naming and Necessity* (Harvard University Press and Basil Blackwell, 1980), at p. 51, note 18; and Hugh S. Chandler, 'Plantinga and the Contingently Possible', *Analysis* 36.1, January 1976, pp. 106-9.

Though the artefact  $x$  could not have been formed from hunk  $z$ , there is no reason why hunk  $z$  could not have been formed instead of hunk  $y$  into an artefact of exactly the same type and form as  $x$  in place of  $x$  itself. Thus there is a world  $w'$  possible relative to the actual world in which an artefact  $x'$ , qualitatively just like  $x$ , is formed from hunk  $z$ . World  $w'$  is, we may suppose, materially exactly like the impossible world  $w$  in every molecular, atomic, and sub-atomic detail. Given a complete accounting of the entire history of all of the matter in the worlds  $w$  and  $w'$ , with its causal interconnections and exact configuration through time, the two worlds are absolutely indistinguishable. Atom for atom, quark for quark, they are exactly the same. Yet they must be distinct, since  $w'$  is, and  $w$  is not, a *genuinely* possible world, i.e., a world possible relative to the actual world. (Cf. *Reference and Essence*, pp. 230–40.)

Carter objects to this 'model of the situation' on the grounds of a principle of the identity of materially indiscernible worlds. If the phrase 'materially indiscernible' is understood in such a way that  $w$  and  $w'$  count as materially indiscernible, then what we have here is an example which gives the lie to this principle. It is important to notice that  $w$  and  $w'$  are indeed discernible, even if not materially discernible in this sense, and in fact discernible not only by their accessibility relations to the actual world. They also differ as regards which facts obtain in them. World  $w$  includes the fact that artefact  $x$  is formed from hunk  $z$ , whereas world  $w'$  excludes this. Some other artefact  $x'$ , distinct from  $x$ , is formed from hunk  $z$  in  $w'$ . In place of Carter's principle, I propose a principle of the identity of factually indiscernible worlds, worlds in which the very same facts obtain. (Cf. *Reference and Essence*, p. 238.) I also propose a principle of the identity of *mutually accessible* materially indiscernible worlds. (Cf. *Reference and Essence*, p. 240, and p. 249, note 28.) But an unbridled principle of the identity of materially indiscernible worlds is refuted by the sorts of considerations raised here.

Is this picture of impossible worlds and mutually inaccessible materially indiscernible worlds really acceptable? There are a number of conceptions of possible worlds presently in vogue. Possible worlds are variously construed as maximal compossible sets of propositions (Robert Adams), possible total histories or states of the world (Saul Kripke, Robert Stalnaker), total ways things or the world (cosmos) might have been (David Lewis, sometimes), maximal states of affairs (Alvin Plantinga). For present purposes, these need not be regarded as competing conceptions of possible worlds (except in the case of Lewis, who usually takes nonactual possible worlds to be something like immense concrete objects, someplace far, far away). On any of these conceptions, whatever grounds there may be for believing that there really are possible worlds yield the same, or related, reasons for believing that there are impossible worlds (maximal consistent though not com-

possible sets of propositions, impossible total histories of the world, impossible total states of the cosmos, total ways things could not have been, etc.), for believing that there are materially indiscernible worlds (materially indiscernible total histories of the cosmos, materially indiscernible total ways for things to be, etc.), for believing the identity of factually indiscernible worlds, and the rest.<sup>4</sup>

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<sup>4</sup> I am grateful to the Editor of *Analysis* for pointing out a significant oversight in the original draft of this note.

## INDEFINITE IDENTITY: A REPLY TO BROOME

By H. W. NOONAN

**I**N 'Can there be vague objects' (ANALYSIS 38.4, October 1978) Gareth Evans argued that there could be no objects about which it was a *fact* that they had fuzzy boundaries, and consequently no identity statements which were indeterminate in truth-value because one or both of their terms denoted such an object. In my 'Vague objects' (ANALYSIS 42.1, January 1982) I endorsed Evans' argument but pointed out that it left open the possibility of identity statements which were indeterminate in truth-value because one or both of the terms flanking the sign of identity lacked a determinate denotation. I then went on to consider some consequences of this being the *only* way in which identity statements could be indeterminate in truth-value, consequences which seemed to me to be interesting particularly in relation to the idea that there might be indeterminate statements of diachronic personal identity.

In 'Indefiniteness of Identity' (ANALYSIS 44.1, January 1984) John Broome challenges Evans' argument. In what follows I defend Evans' argument against Broome's criticisms and argue that the example he produces in support of his own conception of indefinite identity is in fact better understood in accordance with the account of indeterminate identity put forward in my previous paper.

A crucial point in Evans' argument (reproduced by Broome) is an application of Leibniz's Law. He argues that if ' $a = b$ ' is indeterminate in truth-value (where this is a consequence of the fuzziness