Global Supervenience and Identity across Times and Worlds*

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Abstract

The existence and importance of supervenience principles for identity across times and worlds have been noted, but insufficient attention has been paid to their precise nature. Such attention is repaid with philosophical dividends. The issues in the formulation of the supervenience principles are two. The first involves the relevant variety of supervenience: that variety is global, but there are in fact two versions of global supervenience that must be distinguished. The second involves the subject matter: the names "identity over time" and "identity across worlds" are misnomers, for in neither case is identity at issue. The philosophical dividends then follow. Nathan Salmon's argument that identity over time needs no "grounds" in matters of qualitative fact can be answered, as can an argument offered by many, that coincident objects (such as statues and lumps of clay) would require objectionably ungrounded differences in identities across times and worlds.

Supervenience principles assert a kind of functional dependence of one sort of fact on another. They take this form: indiscernibility in such-and-such respect entails indiscernibility in thus-and-so respect. The claim that the mental supervenes on the physical is the claim that the mental is a function of the physical — physical indiscernibility implies mental indiscernibility.

Such principles take on interest for various related reasons. One is that asserting supervenience is a maximally cautious way to assert dependence: psychophysical supervenience is something all materialists can agree on, even if they disagree over whether mentality can be reduced in any finite or intelligible way. Another is that supervenience is presupposed by analysis. Various analyses of mentality in physical terms differ in details, but all presuppose supervenience, for a physical analysans will not distinguish between physical indiscernibles, and hence the mental analysandum will not either.

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Though the philosophy of mind may be the most familiar area in which supervenience has been applied, the same reasons for being interested in supervenience apply elsewhere. The notions of "identity over time" and "transworld identity" raise some of the same issues as does mentality. Theses claiming that facts about identity across worlds and times involve nothing over and above qualitative facts are of interest, both because they are presupposed by attempted analyses of identity over time and identity across worlds, and because they have independent interest to philosophers inclined towards reduction.

Though attention has indeed been paid to the question of the truth of supervenience principles for identity across times and worlds, most notably in the literature on Humean Supervenience[1], the question of their precise nature has not been adequately addressed. The present paper approaches this question from various angles. There are relatively "pure" issues involving the nature of supervenience that bear on this question, which I address in section I. Most notably, where philosophers usually discern a single notion of global supervenience, I argue that there are in fact two importantly distinct notions. Section II adds content to the bare form of supervenience principles introduced in section I: I will articulate what I take to be defensible supervenience principles for identity over time and identity across worlds. Along the way, a challenge from Nathan Salmon to the very idea of grounding identity over time in other facts will be answered. In the final section, the ideas of the paper will be given an application: to the familiar cases of spatially coincident objects (for example, statues and lumps of clay). It turns out that the distinction between varieties of global supervenience is crucially important to the debate over coincidence.

I

Supervenience principles may be divided into global and local versions. Let us focus on psychophysical supervenience; the local versions (e.g., "strong" and "weak" supervenience[2]) say that physically indiscernible objects must also be mentally indiscernible. Thus, *my* physical properties determine my mental properties. Global versions are weaker, because they allow that the physical properties of objects throughout the world are relevant to determining mental facts.

[1] See the introduction to Lewis (1986*b*); Armstrong (1980); Haslanger (1994); Robinson (1989); Lewis (1994), for example.

[2] See Kim (1984*b*).

In this paper I focus on global supervenience. The most familiar sort of global supervenience, which for reasons that will be apparent shortly I'll call "weak global supervenience", may be stated as follows (where A and B are sets of properties and relations):[3]

> A **weakly globally supervenes** on B $=_{df}$ any two possible worlds that are world-B-indiscernible are also world-A-indiscernible

It remains to explain the notion of world indiscernibility presupposed by this definition.[4] One might think to try one of the following definitions: worlds are world-A-indiscernible when i) they have the same A-properties, ii) when the worlds contain the same objects, and those objects have the same A-properties and stand in the same A-relations, or iii) when the same A-properties and relations are instantiated at the same points in space-time. But i) A may contain properties like mental properties, which are instantiated by objects in worlds and not entire worlds themselves; ii) we may want to say that worlds with distinct objects nevertheless are A-indiscernible if they have the same pattern of instantiation of A-properties and relations; and iii) we may want to raise the question of whether spatiotemporal facts globally supervene on some chosen set, and so should not build spatiotemporal facts into the definition of world A indiscernibility.[5] A better strategy would be to say that worlds are indiscernible when their domains are isomorphic.[6] Where A is a set of properties and relations, say that a function, f, is an **A-isomorphism** iff f is one-to-one, and for every n-place relation, R, in A (count properties as 1-place relations) and any n objects in f's domain, those n objects stand in R iff their images under f

[3] I take the terminology of weak and strong global supervenience from chapter 5 of Paull (1994). (Paull, however, uses the alternate formulation of strong global supervenience that I mention in note). That chapter contains an illuminating discussion of formulations of global supervenience, from a technical and historical point of view. It also contains a discussion of the relationship between strong and weak global supervenience. Paull and I came upon the distinction between these types of global supervenience independently.

Supervenience claims can be weakened by restricting the quantifiers over worlds. One might weaken a claim of global supervenience, for example, to the claim that any two nomologically possible B-indiscernible worlds are A-indiscernible. I ignore such restricted versions in this paper.

[4] See McLaughlin (1997) on the definition of world indiscernibility.

[5] For these criticisms see, respectively, i) Paull and Sider (1992, p. 834); ii) Kim (1988, p. 118); iii) McLaughlin (1997); Stalnaker (1996, fn. 8).

[6] McLaughlin (1997) and Stalnaker (1996) pursue this strategy as well.

stand in R.[7] We can now define the notion of two possible worlds being alike with respect to a set of properties and relations:

> w_1 and w_2 are **world-A-indiscernible** $=_{df}$ w_1 and w_2 are possible worlds, and there is some A-isomorphism from the domain of (i.e., set of objects existing at) w_1 onto the domain of w_2

The core idea of global supervenience is that functional determination occurs not necessarily at the local level, but rather at the global level. Weak global supervenience makes this vague idea precise in one way, but there is another.[8] Roughly, the idea is that whether or not a given n-tuple of objects stands in a certain relation in A is determined, not only by what properties in B those objects have and what relations in B they bear to each other, but also by what relations in B they stand in to other objects, and also by what properties

[7] Throughout this paper it will be convenient to make certain assumptions. First, I assume that each object exists in exactly one possible world (so I can speak of absolute rather than world-relative instantiation of properties and relations; let fusions of objects from different worlds be excluded from the domain of quantification in this paper); second, in most cases I will not qualify property instantiation to times, which amounts to making the assumption that the objects of attribution of temporary properties are temporary stages; and third, I will assume that necessarily coextensive properties and relations are identical, and that necessarily equivalent propositions are identical. I regard these assumptions as innocuous because dispensable. If, for example, you believe in genuine transworld identity, you could replace my "object x, whose world is w, has property P", with "object x has property P *at* world w". I also make a more substantive presupposition, that of an "abundant" conception of properties, relations, and propositions (see Oliver (1996); Lewis (1986*a*, p. 59 ff.)) obeying the following principles:

(i) For any class of possible worlds, there is a proposition true at all and only the worlds in the class

(ii) For any class of possible individuals, there is a property had by all and only the individuals in that class

(iii) For any positive integer n, and any class of n-tuples of possible objects in which each tuple contains objects from some one world, there is an n-place relation had by all and only the 'tuples in the class (I ignore transworld, multigrade, and infinite-place relations in this paper)

[8] Since writing this paper, I've learned of two other papers that mention the difference between these two sorts of global supervenience: Stalnaker (1996, p. 227), and McLaughlin (1997). Neither author explores the difference between the formulations in detail, and Stalnaker seems to view the weak version as a misformulation of the intuitive idea of global supervenience. Also note that each author uses the equivalent formulation of strong global supervenience that I discuss in note 10.

and relations in B are instantiated by their worldmates. This seems correctly describable as a kind of global supervenience because the instantiation of the supervening properties and relations can depend on the instantiation of the base properties and relations across all of the objects throughout the possible world in question.

More carefully, let us define an n-place **object sequence** as an n-tuple of objects, each of which is from the same possible world. Then we can characterize the following relation of global indiscernibility between object sequences:[9]

> n-place object sequences $\langle x_1 \ldots x_n \rangle$ and $\langle y_1 \ldots y_n \rangle$ are **globally A-indiscernible** $=_{df}$ there is some A-isomorphism from the domain of $\langle x_1 \ldots x_n \rangle$'s world onto the domain of $\langle y_1 \ldots y_n \rangle$'s world that maps x_1 to y_1, ..., and x_n to y_n

To make the intuitive idea clear, let us consider the special case of one-place object sequences, which may be taken to be their sole members. When objects (one-place object sequences) are globally A-indiscernible, they are alike with respect to A in a very strong sense: they not only have the same properties in A, but also have the same "world perspective" with respect to A. If one bears relation R to some object with property P (where R and P are members of A), then so must the other. If one's world contains exactly 15 objects with property P, then so must the world of the other. We can now formulate our second

[9] Let us stipulate that where $n \neq m$, n-place object sequences are never globally indiscernible from m-place object sequences.

version of global supervenience:[10] [11]

> A **strongly globally supervenes** on B $=_{df}$ any object sequences (perhaps from different possible worlds) that are globally B-indiscernible are also globally A-indiscernible

Return to psychophysical supervenience: the idea is that what mental properties I have is determined, not only by what physical properties I have, but also by what physical properties other things have, by what physical relations I bear to those objects, and by what physical relations those objects bear to each other. Objects with the same physical world perspective must have the same mental world perspective.

Here is an example to highlight the difference between strong and weak

[10] An equivalent way to define strong global supervenience is this:

> A strongly globally supervenes on B $=_{df}$ for any worlds w_1 and w_2, every B-isomorphism from w_1's domain onto w_2's domain is an A-isomorphism

This formulation is due to Phillip Bricker, who thinks it the correct way to formulate global supervenience. Proof of equivalence: i) suppose first that A supervenes strongly globally on B, according to the original definition; let f be any B-isomorphism from the domain of w_1 onto the domain of w_2; we show that f is an A-isomorphism. Let $x_1 \ldots x_n$ be objects from the domain of w_1; let R be any n-place relation in A. In virtue of the existence of f, $\langle x_1 \ldots x_n \rangle$ and $\langle f(x_1) \ldots f(x_n) \rangle$ are globally B-indiscernible, and hence are globally A-indiscernible by supervenience; hence there is an A-isomorphism from the domain of w_1 onto the domain of w_2 under which the members of these 'tuples correspond; it follows that $x_1 \ldots x_n$ stand in R iff $f(x_1) \ldots f(x_n)$ stand in R. Strong global supervenience in the new sense thus holds. ii) For the other direction, suppose that A supervenes globally on B in the new sense, and let $\langle x_1 \ldots x_n \rangle$ and $\langle y_1 \ldots y_n \rangle$ be any globally B-indiscernible n-place object sequences. By definition of global B-indiscernibility, there is a B-isomorphism between the domains of the worlds of these sequences that maps x_i to y_i for all i; by supervenience this function is an A-isomorphism; therefore these sequences are globally A-indiscernible. Strong global supervenience in the original sense thus holds.

Hellman and Thompson (1975, p. 559), contains a footnote mentioning a definition like the present one.

[11] Note that there are purely formal differences between the two varieties; the following three principles hold for strong but not weak global supervenience:

> (P1) If A supervenes on C and B supervenes on C, then A∪B supervenes on C
>
> (P2) If A supervenes on B then A∪B supervenes on B
>
> (P3) If A supervenes on B∪X and B supervenes on C∪X, then A supervenes on C∪X

global supervenience.[12] Consider two properties, P and Q, and two possible worlds as follows:

w_1	w_2
Px & Qx	Pz & $\sim Qz$
$\sim Py$ & $\sim Qy$	$\sim Pu$ & Qu

These worlds are consistent with weak global supervenience of {Q} on {P}, because they are both world-{P}-indiscernible and world-{Q}-indiscernible. (A function, f, mapping x to z and y to u is a {P}-isomorphism; a function, g, mapping x to u and y to z is a {Q}-isomorphism.) But these worlds falsify the strong global supervenience of {Q} on {P}, because objects x and z are globally {P}-indiscernible without being globally {Q}-indiscernible. (In virtue of function f, x and z are globally {P}-indiscernible, but no {Q}-isomorphism can map x to z since x has Q whereas z does not.)

A "real life" case (relatively speaking) which brings out the difference involves the doctrine of "anti-haecceitism", according to which haecceities — properties like *being Ted* — supervene globally on the set, QUAL, of qualitative properties and relations. ('Qualitative' here means something like 'purely descriptive'. Purely qualitative facts cannot involve particular objects; a purely qualitative sentence may not mention any objects by name.) The strong version of this supervenience principle is immediately refuted by the existence of worlds with certain sorts of symmetry, for example, worlds of two-way eternal recurrence. In virtue of functions that map each object to its counterpart in the next epoch, each object will be globally QUAL-indiscernible from its counterpart in the next epoch, but such objects will have different haecceities since they are numerically distinct from each other.[13] The weak version, however, is consistent with the existence of such worlds. Weak global supervenience says that any worlds that are world-indiscernible in one set are world-indiscernible in another. Thus, a claim of weak global supervenience can only be refuted by a pair of two possible worlds, since any world is world-indiscernible from

[12] This example is Phillip Bricker's. The example merely establishes the formal non-equivalence of the two versions of supervenience; it does not on its own establish the (metaphysical) possibility of a set which weakly, but not strongly, globally supervenes on another set. See Paull and Sider (1992, section 2) on formal vs. "metaphysical" equivalence.

[13] I'm assuming that the numerical distinctness of space-time points occupied would not count as a qualitative difference. Also, I have in mind an anti-haecceitist who is not a counterpart theorist; things are a little different for a counterpart theorist.

itself with respect to any set (the identity map is an A-isomorphism, for any set A). The recurrence world on its own, therefore, does not refute the weak version of anti-haecceitism. For the weak global supervenience of haecceities on QUAL to hold, all that is required is that any two recurrence worlds that are qualitative duplicates have the same sequence of individuals. (In section III, I'll give further examples of the philosophical significance of the distinction between strong and weak global supervenience.)

These versions of global supervenience, and the distinction between them, can be made more intuitive by means of certain "equivalence results" that are analogous to Jaegwon Kim's familiar equivalence result for strong (local) supervenience. Kim showed that whenever A strongly supervenes on B, every property in A is necessarily coextensive with some (possibly infinitary) boolean combination of properties from B.[14] It is possible to come up with analogous results for both versions of global supervenience. Strong global supervenience of A on B also entails property correlations between A and B, although the properties "built out" of B may now be "relational" (in a sense to be explained) rather than boolean combinations of properties from B. Weak global supervenience, on the other hand, merely entails equivalences between *propositions* "constructed from" (again, in a sense to be explained) A and B.

First I'll present the property correlations entailed by strong global supervenience (the result generalizes to relations as well; see note 17). I need to formulate a rigorous notion of what I'll call a **generalized A-property**. A generalized A-property is to be a property that is built out of the properties and relations in a set, A, in a quite broad sense which allows relational properties as well as boolean combinations. For example, if property P and relation R are in A, then such properties as *being related by R to some object with P* will be generalized A-properties. This may be accomplished in the following way. The relation of global A-indiscernibility over 1-place object sequences (i.e., objects) is clearly an equivalence relation; with each of its equivalence classes there is an associated property: the property had by all and only those members of the equivalence class. I call these properties **maximal A-properties**. Maximal A-properties are, intuitively, the most specific relational properties one can "construct" from set A, for two objects share one iff they are globally A-indiscernible, and so iff they have the same A-properties, stand in the same A-relations, and similarly for their worldmates. Suppose set A contains just two properties, P and Q, and a single binary relation R. An example of an open

[14] See Kim (1984*a*, 169–170).

formula expressing a maximal A-property would then be the following:

> x has property P but not property Q; there is only one object, y, in the world other than x; y has Q but not P; neither x nor y bears R to itself; x bears R to y but y does not bear R to x.

The recipe for coming up with a maximal A-property is this: select some possible object and describe all its features with respect to A, both intrinsic and relational. *All* relational features must be mentioned, and so along the way it will be necessary to completely describe the distribution of A-properties and relations throughout the entirety of that object's possible world. My example of a maximal A-property was expressible by a finite formula, but there is no guarantee that this will always be possible. For one thing, A might contain infinitely many properties and relations; for another, an object in a world with infinitely many objects might require an infinite description. If we allowed ourselves an infinitary language, this barrier to expressing maximal A-properties would disappear; indeed, we could give a more linguistic account of maximal A-properties: as those picked out by certain formulas in a suitably chosen infinitary language.[15]

Given this notion of a maximal A-property, we may now define a **generalized A-property** as the disjunction of some set of maximal A-properties.[16] This definition seems to capture the intuitive idea of a property "constructable from" set A, in the broad sense which allows arbitrarily complex relational

[15] I have in mind a construction parallel to that proposed in the appendix of Stalnaker (1996). Roughly, we obtain one maximal A-property for each possible individual by constructing a complete description of that individual and its worldmates in an infinitary language. But there is one minor qualification I would make. Stalnaker describes the procedure of constructing a maximal description of a *world* (this is parallel to a maximal description of an object) as follows: "if there are n members of the domain of w, the description will begin with n existential quantifiers." It is important to be explicit that n here may be infinite, since worlds can have infinite domains. Thus, the language in question is infinitary both in the sense that it allows infinite conjunction, *and* that it allows infinite blocks of quantifiers. If there is an upper bound on the size of possible worlds' domains, then the language can have this size; otherwise the language must allow sentences of arbitrary large cardinality. Relatedly, a bug emerges in this strategy if there are worlds with domains so large they do not form sets, since standard infinitary languages identify sentences with set theoretic constructions out of primitive vocabulary.

[16] For any set, S, of properties, whether finite or infinite, the disjunction of S is defined as the property had by an object iff that object has some property in S; its existence is guaranteed by principle (ii) from note 7. Let us count the null set as a degenerate case of a set of maximal A-properties; thus, the disjunction of the null set — the impossible property — will count as a generalized A-property, for every set, A, of properties and relations.

dependence. Intuitively, generalized A-properties are properties such that when an individual has one, this only involves the properties and relations from set A instantiated by it and its worldmates. Any property defined by an open formula with one free variable in a standard first order language with only logical apparatus (including quantifiers) plus predicates for properties and relations in A (but no names!) would be an generalized A-property, but the converse fails since generalized A-properties need not be finitely expressible. (As before, we could give a more linguistic account of generalized A-properties in terms of those expressible by certain formulas in an infinitary language.)

Given this apparatus, we may state the first result to which I've alluded as follows:[17]

(S1) If A strongly globally supervenes on B, then any property in A is necessarily coextensive with some generalized B-property

A related result is this:

(S2) If A strongly globally supervenes on B, then for any property,

[17] I'll prove general principles of which (S1) and (S2) are special cases:

(S1′) If A strongly globally supervenes on B, then any relation in A is necessarily coextensive with some generalized B-relation

(S2′) If A strongly globally supervenes on B, then for any n-place relation R in A, and any n-place object-sequence, $\langle x_1 \ldots x_n \rangle$, that instantiates R, R is entailed by $\langle x_1 \ldots x_n \rangle$'s maximal B-relation

Here, the notion of a generalized A-relation is the natural generalization of the notion of a generalized A-property. An n-place *maximal* A-relation is a relation holding among all and only the n-place object sequences in some equivalence class of the relation of A-indiscernibility; generalized A-relations are then disjunctions of sets of maximal A-relations (again counting the null set – see note 16). Note that in virtue of (ii) and (iii) from note 7, and the assumption that necessarily coextensive relations are identical, every object sequence stands in exactly one maximal A-relation.

Let's begin by proving (S2′). I'll use **boldface** variables like $\boldsymbol{x}$ as variables for n-tuples. Where R∈A, let $\boldsymbol{x}$ have R; let Q be $\boldsymbol{x}$'s maximal B-relation; I'll show that any possible object sequence, $\boldsymbol{y}$, that has Q must have R as well. Since $\boldsymbol{x}$ and $\boldsymbol{y}$ each have Q they are globally B-indiscernible, and therefore globally A-indiscernible by supervenience; hence, since $\boldsymbol{x}$ has R, $\boldsymbol{y}$ has R as well.

Next (S1′): let R be any member of A; I'll show that R is necessarily coextensive with Q, the disjunction of all the maximal B-relations that entail R. By definition of Q, any possible object sequence that has Q has R as well. Suppose on the other hand that some possible object sequence, $\boldsymbol{x}$, has R. Where Q′ is $\boldsymbol{x}$'s maximal B-relation, (S2′) implies that Q′ entails R; Q′ is therefore a disjunct of Q and hence $\boldsymbol{x}$ has Q.

P, in A, and any possible object, x, which has P, P is entailed by x's maximal B-property

(One property *entails* another iff any possible object with the first has the second as well; similarly for relations).

The results for weak global supervenience are nearly exactly analogous. We'll want "generalized A-propositions" to be propositions that are "built out of" properties and relations in A in a broad sense – as propositions the holding of which depends only on the distribution of the properties and relations in A across the entire world. Define a maximal A-proposition as one true at all and only the worlds in some equivalence class of worlds under the relation of world A-indiscernibility; generalized A-propositions may then be defined as disjunctions of sets of maximal A-propositions.[18] Intuitively, generalized A-propositions are the propositions you could understand if you only understood A-properties and relations. The true maximal A-proposition would be expressed by a sentence like the following: "There are objects x, y, z, ..., which have such and such properties in A and stand in such and such relations in A". This sentence would describe how things fare with the properties and relations in A in complete detail. Less than maximal A-propositions will also concern only the distribution of properties and relations in A, but needn't be so specific in their description of that distribution. (Again, using infinitary languages, a more linguistic-looking account of generalized A-propositions would be possible.) We have, then, an analog of (S1):[19]

(W1) If A weakly globally supervenes on B, then any generalized A-proposition is necessarily equivalent to some generalized B-proposition

We also have a companion to (S2):

(W2) If A weakly globally supervenes on B, then for any possible world, w, and any generalized A-proposition, p, that is true at w, p is entailed by the maximal B-proposition that is true at w

[18] I count the disjunction of the null set – the impossible proposition – as a generalized A-proposition. See note 16.

[19] The proofs of (W1) and (W2) are analogous to those of (S1) and (S2). See also Paull and Sider (1992, section 5 and Appendix 3).

One way to see the difference between strong and weak global supervenience, then, is through these equivalence results. Returning to psychophysical global supervenience, the weak version implies that every mental proposition is equivalent to some (extremely complex!) physical proposition, and so fixing the physical facts true at a world fixes the mental facts true there. But it does *not* follow from this that mental properties are necessarily coextensive with physical properties, even if we allow relational physical properties. Even after fixing the physical properties of an object, relational as well as intrinsic, its mental properties may not be fixed. Only the strong version of the supervenience principle implies these further claims. Here is another way to see the difference between fixing mental properties and fixing mental propositions. Suppose you were omniscient with respect to the distribution of the members of MENTAL, the set of mental properties and relations, but, as in the standard examples involving "de se" or "indexical" belief, ignorant of who you were.[20] You would then know exactly which generalized MENTAL-propositions held at your world (for you would know which maximal MENTAL-proposition was true at your world), but you would not know which maximal MENTAL-property you had.[21]

II

Our discussion of supervenience has so far been highly abstract; in this section I'll focus on the formulation of global supervenience principles for one specific domain: identity over time and identity across worlds. These supervenience principles are of considerable philosophical interest (witness the literature on David Lewis's Humean Supervenience, for example), and yet they turn out to be quite tricky to state. One might have thought that the principles would have the form "the identity relation globally supervenes on set B", where B would be some set plausibly thought to determine facts about identity over time. But this will not do. *Any* 1–1 function is an {=}-isomorphism, and hence, trivially, the identity relation supervenes globally (whether strongly or weakly) on any set whatsoever. It would be a confusion to respond that the principle should rather assert the supervenience of the *identity-over-time* relation, for "identity over time" is not another species of identity, but rather identity itself.[22]

[20] See, for example, Lewis's case of the two gods, in Lewis (1979, p. 520).

[21] A side point of interest about these equivalence results is that they form the basis of a response to Jaegwon Kim's (1987; 1988; 1989; 1990) "wayward atom" argument that global supervenience is insufficient for any intuitive sort of dependence. See Paull and Sider (1992).

[22] Even a radical who suggests that everyday objects (such as persons, tables and chairs) are

One could attempt to reformulate the definitions without one-one functions, but the definitions in their present form seem highly intuitive. The attempt would be unmotivated anyway, because there is independent reason to think that controversy over "identity over time" isn't really controversy over *identity* at all. David Lewis has argued nicely that the nature of the identity relation is rarely at issue in philosophy:[23]

> Identity is utterly simple and unproblematic. Every thing is identical to itself; nothing is ever identical to anything else except itself. . . . We *do* state plenty of genuine problems in terms of identity. But we *needn't* state them so. Therefore they are not problems about identity. Is it ever so that an F is identical to a G? That is, is it ever so that the same thing is an F, and also a G? More simply, is it ever so that an F is a G? The identity drops out.

I think Lewis's claim applies to the case at hand. The traditional problems of "identity over time" are misnamed. When we wonder about those problems we are wondering primarily about what have been called issues of *persistence*[24], not about the nature of the identity relation. Supervenience principles in these areas should therefore concern persistence, not identity.

By questions of persistence, I have in mind questions such as the following: can a person survive total amnesia? Can a statue survive the replacement of more than 50% of its original matter? Can a physical object have a temporally discontinuous existence? These questions all concern the concept of objects *existing at times*. The question of whether a person could survive total amnesia is the question of whether a person could exist both *before* and *after* an attack of amnesia. These questions *can* be phrased as questions about identity: Is there ever a statue that exists at some time, and is identical to a statue that, at some later time, has replaced more than 50% of its matter? But they needn't be so phrased; we could say simply: Is there ever a statue that exists at some time and also at some later time at which it has replaced more than 50% of its matter? The fact that the question *can* be phrased in the first way doesn't imply that the question concerns the nature of the identity relation, any more than the fact that the question "is it possible to love two persons at once?" can be rephrased

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really instantaneous stages does not deny this. If 'I was identical to that young boy' means that I bear the I-relation to a stage that is identical to that young boy, 'is identical to' still expresses ordinary identity; what is nonstandard is the treatment of tense. See Sider (1996).

[23] See Lewis (1986*a*, pp. 192–193).

[24] This use of the term has been popularized by David Lewis. See Lewis (1986*a*, p. 202).

as "Is it possible for there to be a person who loves some person at a time, and who is *identical* to someone who loves a second person at that time?" implies that the former question is a question about identity.[25]

Notice that in the familiar debates involving "identity over time", the haecceities of objects involved are irrelevant. When we discuss a case of amnesia, we want to know whether the person at the beginning of the thought experiment survives; it is irrelevant whether that person is *Frank* or *Joe*. The mark of a question purely about persistence is that while it is about what goes on at more than one time, it can be asked using quantifiers rather than names; we can ask: is there *a* person with such and such features who exists at times t_1 and t_2? That the questions primarily concern persistence rather than haecceity can also be seen by inspecting the *theories* in the area. The various theories of personal identity (for example the memory theory and the bodily continuity theory) give conditions under which a person at one time persists until some other time; they don't give necessary and sufficient conditions for a given haecceity's being instantiated. It is possible to run the two concerns together, by asking for example: what are the conditions under which *Frank* exists at times t_1 and t_2? Here we ask not only about what I am calling persistence, but also about what conditions would have to be satisfied to have *Frank* present, and that is a question about haecceity. It is the former questions, I am suggesting, which are really at issue in the discussions of "identity over time".[26]

In formulating supervenience principles relevant to the traditional questions of identity over time, then, we should formulate supervenience principles for persistence.[27] A familiar principle of this sort asserts roughly that persistence

[25]It may be objected that traditional theorizing about "identity over time" does indeed concern identity, since certain solutions to traditional puzzles postulate non-standard accounts of identity, for example that identity is intransitive or sortal-relative (see Geach (1967) on relative identity.) The best response is to clarify the vague assertion that the puzzles in question don't "concern" the identity relation. The core insight here is that one *need not* hold non-standard views of identity to understand the phenomena in this neighborhood. Indeed, I would go further and say that all of the *sensible* views in the area of identity over time share the same, standard conception of the identity relation.

[26] The difference between questions of haecceity and persistence may also be illustrated with the famous example of the rotating homogeneous continuous disk, due to Saul Kripke and David Armstrong. (See Armstrong (1980). Kripke's example was given in an unpublished lecture.) A principle stating that persistence supervenes on matters of temporally local qualitative fact would require that the disk rotates in both or neither of the possible worlds in the example, but the principle does not concern haecceities, and so leaves open the question of whether the worlds contain the same or different disks.

[27]I focus on global supervenience principles here, although local principles have been

supervenes globally on temporally local qualitative facts. (A temporally local fact concerns only a single instant in time; thus, the fact that a certain event was the first event of a certain kind in history would not be temporally local, because of what it requires of previous times.) The precise formulation of this principle depends on whether we accept a metaphysics of temporal parts. If we do, we may formulate supervenience claims for identity over time as concerning the "genidentity" or "unity" relation, which holds between the successive stages of a continuing object. One such principle might look as follows:

> (P) The genidentity relation supervenes weakly globally on the set, B, of temporally local qualitative properties and spatio-temporal relations

(P) may be refined in various ways. As stated, it concerns *the* genidentity relation; but it is natural to distinguish the relations that unify the temporal parts of different kinds of entity.[28] One might want to claim that all of these genidentity relations – genidentity relations for persons, statues, electrons, etc. – supervene on B. Alternatively, one might want to claim that only some do. Yet another possibility is to augment B with certain genidentity relations and then claim that the rest supervene on this set. One might claim, for example, that the genidentity relations for macroscopic objects supervene on the set containing the members of B plus the genidentity relation for microscopic

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defended. For example, in the literature on personal identity concerning Bernard William's duplication argument (Williams, 1956–7), there is a principle discussed according to which identity between x and y cannot depend on the presence of some other object, z. This is in effect a local supervenience principle for the genidentity relation. For theories that violate this principle see Nozick (1981, chapter 1), and Parfit (1984, part three); and see Noonan (1989, Chapter 7) for necessary revisions to and a detailed discussion of Williams's principle.

[28] It is possible to resist admitting multiple genidentity relations by defining a single genidentity relation as the relation that holds between object stages iff there is a continuing object of some kind or other of which each is a stage. But there is a limitation in this approach. The above definition defines genidentity in terms of the notion of a continuing object; but temporal parts theorists like to reverse the order of definition and define continuing objects as maximal aggregates of pairwise genidentical stages. But this definition would fail, given the suggested definition of 'genidentity', if one spacetime worm can ever be a proper part of another. Just this situation, in fact, is commonly suggested to occur in the case of coinciding statues and lumps: the statue spacetime worm is a proper part of the lump spacetime worm. It is better to multiply genidentity relations; one can then define statues as maximal aggregates of objects that pairwise stand in the statue genidentity relation; and analogously for lumps.

particles. Another refinement might be to assert (P) as a contingent thesis, by restricting the class of possible worlds that the supervenience claim concerns.[29]

Things are a bit more complicated if we reject temporal parts. The complication is due to the fact that for any set, A, world-A-indiscernible worlds must have the same number of objects (since their domains must map one-one onto each other). Consider a pair of possible worlds that are alike in all temporally local matters of qualitative fact, each of which contains, seemingly, a single object: a solitary electron which persists throughout all time. But suppose that in fact this description is only accurate in one world; in the other world the electron that is present at first goes out of existence at some time and is replaced by a duplicate electron. (The replacement must be perfectly "seamless" since the worlds are stipulated to match perfectly with respect to temporally local qualitative matters of fact.) If such worlds exist, they ought to count as an exception to the claim that persistence supervenes globally (whether strongly or weakly) on temporally local qualitative matters of fact. However, the second world has one more object than the first world, and so there are no isomorphisms of any kind between their domains; but the claim that A globally supervenes (in either sense) on B is only falsified in cases involving B-isomorphic worlds. Note that the problem does not arise if the metaphysics of temporal parts is correct. Assuming time is continuous, there would be the same infinite number of objects in each world, for each world would have an instantaneous electron temporal part at each moment, and each would contain the same number of mereological sums of temporal parts. The difference between the worlds would be reflected in the pattern of instantiation of the genidentity relation, not in the number of objects.

In the absence of temporal parts there are various ways to proceed, but I prefer the following. Define an "ersatz temporal part" as a pair of an object and a time at which the object exists. Say that two ersatz temporal parts $\langle x,t\rangle$ and $\langle x',t'\rangle$ are genidentical iff $x = x'$. If we take the domain of a possible world to be the set of its ersatz temporal parts rather than its genuine objects, then we can retain (P) as the form of our supervenience principle. (We will need to make certain natural adjustments. Take property instantiation, for example: we'll need to say that $\langle x,t\rangle$ instantiates property P in an extended sense iff x instantiates property P at time t in the ordinary sense.) It might be thought that our supervenience principle now essentially concerns identity, since the

[29]This is Lewis's way of defending Humean Supervenience against the challenge of the rotating disk. See the introduction to Lewis (1986*b*).

definition of genidentity now appeals to identity. But that definition could be rephrased as follows: ersatz pairs are genidentical iff there is some object that is the first member of each. The supervenience principle rather concerns the temporal relation *exists-at*, for what determines the pattern of instantiation of the genidentity relation over ersatz pairs is the totality of facts about when various continuant objects exist.

Supervenience theses for identity over time, then, whether local or global, concern the genidentity relation for stages, whether ersatz or genuine, and not the identity relation. This fact allows us to answer an important challenge to the search for "grounds" for identity over time. Nathan Salmon has argued for the following theses:

> T6: For every x and every y, if $x = y$, then the fact that $x = y$ does not require any "criteria of identity" of things of x's sort or kind
>
> T7: For every x and every y, if $x = y$, then the fact that $x = y$ is not grounded in, or reducible to, qualitative nonidentity facts about x and y other than x's existence, such as facts concerning material origins, bodily continuity, or memory
>
> T8: For every x and every y, if $x = y$, then the fact that $x = y$ obtains by virtue of x's existence, and not at all by virtue of any other qualitative nonidentity facts about x and y, such as facts concerning material origins, bodily continuity, or memory

If true, these theses would be extremely significant. As Salmon puts it, "Much of the literature on cross-time identity (and especially on personal identity), for example, presupposes the opposite of one of more of theses T6, T7, and T8."[30] Moreover, the search for supervenience principles for identity over time is motivated in large part by the belief that facts about identity over time must be grounded in more basic facts. Since supervenience is surely necessary for grounding, whatever exactly grounding amounts to, there must be true supervenience principles if identity over time is to be grounded. Salmon's argument is parallel to Gareth Evans's famous argument against vague identity, and runs as follows:[31]

[30] Salmon (1986, p. 112).

[31] Salmon (1986, pp. 112–113).

> Consider thesis T7: Whatever x may be, the trivial fact that $x = x$ is not at all grounded in, or reducible to, any facts about x like those concerning x's material origins, x's bodily continuity through time, or x's memory of past experiences. If the fact that $x = x$ is grounded in any other fact about x, it is only grounded in the mere fact that x exists. Thus x has the complex property of being such that the fact that x is identical with it is not grounded in any qualitative nonidentity facts about x other than x's existence. Hence, by Leibniz's Law, for every y, if x and y are one and the very same, then y also has this complex property. Thus, if $x = y$, then the fact that $x = y$ is not grounded in any qualitative nonidentity facts about x (which are also facts about y) other than x's existence.

It may be that a vague variant of this argument has also had some influence. The identity relation is a logical relation, and is therefore in a fundamentally different ontological category from qualitative properties and relations; for this reason identity might be thought to need no basis in matters of qualitative fact. But in fact, neither this nor Salmon's argument undermines the requirement that identity over time be grounded in qualitative facts, once that requirement is properly understood. Neither does Salmon's argument undermine the search for criteria of identity over time. Salmon's principles T6-T8 are perhaps true, but they are irrelevant, for they concern identity. As I have argued, "identity over time" has nothing to do with identity; the issue is rather persistence. One can hold that persistence for persons is grounded in facts about memory and other psychological traits; but this does not require assuming that the identity relation is grounded in memory. What is grounded in memory is rather the relation of genidentity between person stages — the "unity relation for persons" — whether those stages are taken as genuine or ersatz.

Though Salmon does not pursue this, an argument similar to his might be advanced against those who claim that "transworld identity" must be grounded. The reply to this argument would be analogous. What is actually at issue in discussion of transworld identity is not the nature of the identity relation, but rather the nature of *de re* modal properties. Consider one of the standard paradoxes of identity across worlds, "Chisholm's Paradox".[32] Given that Adam has a certain set of qualitative properties, Q_1, and that Noah has another set of qualitative properties, Q_2, there is an argument from initially plausible premises about essential and accidental properties to a conclusion that is difficult to swallow: that there is a world qualitatively just like the actual world, but in

[32] See Chisholm (1967).

which Adam and Noah have swapped qualitative roles — the object with the properties in Q_1 is Noah and the object with the properties in Q_2 is Adam. The puzzle may be resolved by appealing to various theories of *de re* modality, for example counterpart theory, or an intransitive accessibility relation, or an extremely restrictive account of essence; but none of these solutions involves any claims about the identity relation.[33] So when we claim that transworld identity must be grounded, what we should really be claiming is that facts about *de re* modal properties must be grounded in certain other facts, and this claim is untouched by arguments concerning the identity relation. Despite Salmon's argument, then, the thought that persistence and *de re* modality must be grounded in some way in matters of qualitative fact is a perfectly reasonable one. In the final section I'll discuss the application of this thought to the much discussed case of two material objects sharing spatial location.

III

David Wiggins and many others have claimed that a statue and the lump of matter from which it is made are coincident numerically distinct entities, distinguished by their persistence conditions: the lump but not the statue can survive being flattened.[34] In many cases the statue and the lump are distinguished by their historical properties, but in certain cases, the statue and the lump have the same history and are distinguished merely by their modal properties.[35]

An interesting pattern of argument against coincidence claims that it would require objectionably "ungrounded" differences between the coincident entities. This argument, different versions of which are offered by Michael Burke, Mark Heller, David Oderberg, Peter Simons, Ernest Sosa and Dean Zimmerman, runs as follows.[36] Coincident entities would share all momentary properties

[33] Salmon (1986) contains an extensive discussion of this and other paradoxes; see his footnote 1 for further references.

[34] See Wiggins (1980, pp. 30–31).

[35] See Gibbard (1975).

[36] See Burke (1992); Heller (1990, pp. 30–32); Oderberg (1996, p. 158); Simons (1987, pp. 225–226); Sosa (1987, section G); and Zimmerman (1995, pp. 87–88). Simons and Oderberg only defend the argument against coincidence in the case of objects of the same "substantial kind"; they accept coincidence for objects of different substantial kinds. This is a strange attitude, since the grounding argument would work equally well in both cases. Perhaps they are thinking that the different substantial kinds of the coinciding objects could ground their differences, but what grounds the difference in their substantial kinds? After writing this paper I discovered that Zimmerman briefly discusses a reply to the coincidence argument that is similar to the reply I develop in the text.

at any time they coincided, would have exactly the same subatomic structure, and would have the same subatomic particles as parts. Given this similarity, what could ground the differences in persistence and modal properties between them? Surely facts about persistence and modality are not utterly "brute", but rather have some basis in other facts; and surely these other facts will be shared by coincident entities.

This argument has, I believe, a lot of intuitive appeal. I suspect that this argument makes precise a common worry that coincident entities would be distinct only in a mysterious or ungrounded way. But what I want to show here is that even if the major premise — the rejection of brute facts concerning persistence and modality — is granted, it is still not clear that the argument succeeds. The problem with the argument results from the distinction between the two types of global supervenience I introduced in section I.

Supervenience is indeed at issue, despite the fact that the argument tends to be formulated in the literature in terms of the "grounds" or "basis" for the differences between coincident entities. As near as I can tell, facts about A-properties are said to be grounded in facts about B-properties when i) A supervenes on B (according to one or another definition of supervenience), and ii) facts about B-properties are in some sense (whether ontologically or explanatorily) "prior to" facts about A-properties.[37] The notion of priority involved in grounding is somewhat elusive, but we needn't worry about that since the grounding argument against coincidence appeals only to the supervenience component of grounding. Supervenience principles say that sameness in one respect entails sameness in some other respect; thus it is supervenience principles that seem to be violated by the statue and the lump, which differ in their historical properties, or their modal properties (depending on the version of the argument) despite their intrinsic, compositional, and relational similarity.

The argument I will address, then, is that the existence of coincident statues and lumps would imply that facts about persistence and modality cannot supervene on certain other facts. I'll begin by considering the version of the grounding argument which concerns only the case where the statue and the lump coincide at all times. These objects are allegedly distinguished, not by their histories, but by their differing modal properties: the lump, but not the statue, is *capable* of surviving being flattened. The problem is to square this

[37] Clause ii) is not redundant: as has often been noted, the notion of supervenience does not by itself entail any relation of priority. For example, according to standard definitions, supervenience is reflexive and not asymmetric, whereas relations of priority are irreflexive and asymmetric. See Kim (1990).

difference with the intimate relationship that would hold between the statue and the lump: at all times at which they existed they would have the same molecular substructure, the same forces would act upon them, etc. As Heller puts it:[38]

> I do not see how the objects in question could differ in their modal properties. There must be some non-modal basis for the modal differences between the lump of clay and the statue.

Formulated in terms of supervenience, the claim is that the coincident statue and lump would violate the global supervenience of *de re* modal properties on a certain other set of properties and relations.[39] Let us call this other set "BASE". Qualitative properties and relations are presumably to be included in BASE. Since persistence is not at issue here we can include temporally non-local qualitative properties and relations as well as the temporally local ones.

In fact, the coinciding statue and lump only violate the strong version of global supervenience of modal properties on BASE. Let f be a function which maps every object from the world in question onto itself except that it permutes the statue and the lump. Since the statue and the lump have the same BASE properties and stand in the same BASE relations to other objects, f is a BASE-isomorphism, and hence the statue and the lump are globally BASE-indiscernible; but they are not globally modally indiscernible since they have different modal properties. Strong global supervenience is thereby falsified. But the defender of coincidence is free to accept the weak version of the supervenience claim. As noted earlier, a claim of weak global supervenience can only be refuted by a pair of two possible worlds, so by itself, the possible world, w, of the coinciding lump and statue does not refute any weak global supervenience claims. And there is no reason to suppose that there exists another world that, together with w, would refute the supervenience claim. For the weak principle to hold, it will need to be true that any possible world that is world-BASE-indiscernible from w must contain two objects, one with the modal properties of the statue, the other with the modal properties of the lump (because a world must contain such objects for there to be a modal

[38] Heller (1990, p. 31).

[39] Local supervenience claims for *de re* modal properties would be less plausible. A homogeneous continuous statue might differ in modal properties from any of its infinitely many duplicates embedded in a suitably large block of the same sort of matter. (This is assuming that the properties in the supervenience base are not closed under relational combinations; if they are, then the difference between local and strong global supervenience disappears.)

isomorphism between it and w). But this seems like a perfectly acceptable thing for the defender of coincidence to say.

Once we are sensitive to the distinction between strong and weak global supervenience, the argument retains appeal only to the extent that we ought to hold the strong global supervenience claim *in addition to* the weak. Of course, if there is strong intuitive or theoretical reason to hold both versions, then the argument remains powerful. But if intuition and theory require only that some supervenience principle or other holds, then the argument is undermined, since the defender of coincidence can consistently accept the weak version of the supervenience principle. Although it isn't vital to my purposes here to decide this issue, I do think that the argument is indeed weakened by these considerations. The argument against coincidence initially seemed powerful because of the appearance that coincidence would require utterly ungrounded or brute modal properties, "utterly brute" in the sense of "not supervenient in any way". *That* would be really bad. But now it has been shown that the defender of coincidence is not stuck with this consequence. (The defender of coincidence could, of course, simply reject the need for any supervenience principles whatsoever. I find this implausible, but have no quarrel with it here; my point is that this heavy-handed approach isn't necessary to answer the argument.)

Materialistic or physicalistic philosophers are committed to thinking that mental properties must supervene in some way on physical properties. There is then an apparent challenge to this view, based on the examples of Tyler Burge and others in which molecule-for-molecule duplicates differ in their beliefs, about arthritis for instance.[40] Materialists feel — correctly, it seems to me — that they can adequately respond to this challenge by pointing out that the examples threaten only *local* supervenience; the examples leave global supervenience (in either of its varieties) untouched. What materialistic theory and intuition require is that some variety or other of supervenience holds; thus the challenge may be answered by pointing out the existence of a sort of supervenience unrefuted by the example. Perhaps the case of coincident objects is parallel.

My reply to the coincidence argument is successful only if weak global supervenience counts in some intuitive sense as a kind of dependency relation. But one might worry that it does not.[41] Consider the property of *being a*

[40] See Burge (1979); Putnam (1975*a*).

[41] I thank Eva Bodanszky and an anonymous referee for this objection; the example is

locomotive, on one hand, and the property of *being a caboose* on the other hand, understood in such a way that locomotives and cabooses are present only in trains, and that every train has exactly one locomotive and exactly one caboose. Any two possible worlds that are world {*being a caboose*}-indiscernible will be world indiscernible with respect to the property *being a locomotive* as well, since caboose-indiscernible worlds must have the same number of trains, and hence the same number of locomotives.[42] Hence, *being a locomotive* weakly globally supervenes on *being a caboose* (the reverse holds as well). But, it may be argued, *being a locomotive* doesn't depend in any intuitive way on *being a caboose*.

In evaluating any argument about the intuitive notion of dependence, it is important to remember that 'dependence' is just as ambiguous as is 'supervenience'. Just as there are many varieties of supervenience (e.g., local and global), there are a variety of types of dependence. So one must take care not to conclude that *no* form of dependency holds in a particular case just from the fact that *one* form of dependence conspicuously fails to hold. In the case of the trains, whether a given thing is a caboose obviously doesn't determine whether it is a locomotive. Consequently, the property *being a locomotive* quite clearly does not depend *in a local way* on the property *being a caboose*. (Likewise, *being a locomotive* fails to supervene strongly globally on *being a caboose*, and so a certain type of global dependence fails.[43]) But it isn't clear that there's *no* sense in which *being a locomotive* depends on *being a caboose*. Remember the very fact of weak global supervenience, which in this case amounts to the fact that any two worlds that are alike with respect to the number of cabooses are also alike with respect to the number of locomotives. This itself seems like a sort of dependency! This may be bolstered by recalling (W1) from section I, which entails in this case that any proposition that "involves" only the property of *being a locomotive* will

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Bodanszky's.

[42] Notice that the supervenience principle in question is *not* the principle that the set {*being a caboose*,*being a locomotive*} supervenes weakly globally on the set {*being a caboose*}. This principle fails, assuming that there can be single car trains, whose single cars are both locomotives and cabooses. A world with two single-car trains would be caboose-indiscernible from a world with two two-car trains, but these worlds wouldn't be {*being a caboose*,*being a locomotive*}-indiscernible. See note 11.

[43] Let *L* be any locomotive that's not a caboose; let f be the function that is just like the identity function from the domain of the actual world onto itself, except that it maps *L* to the Eiffel tower and vice versa. This function is a caboose-isomorphism from the domain of the actual world onto itself (since neither *L* nor the Eiffel tower is a caboose), and so *L* and the Eiffel tower are globally caboose-indiscernible; but they are not globally locomotive-indiscernible since only *L* is a locomotive.

be necessarily equivalent to some proposition that involves only the property of *being a caboose*. Propositions about locomotives, therefore, have their truth values settled by propositions about cabooses. I conclude that weak global supervenience does provide a legitimate sort of dependency after all.

My treatment of the temporal version of the anti-coincidence argument is similar to my treatment of the modal version. Consider a statue, *S*, made up of a lump, *L*. According to defenders of coincidence, if *S* is flattened it goes out of existence, but *L* survives. Thus, before flattening, *S* and *L* are coincident entities, distinguished by their total histories. Burke argues against this account as follows:[44]

> In the present context, to say that objects *x* and *y* differ in their histories is to say that for some past or future time, *x* and *y* differ with respect to the properties (of certain types) that they exemplify at that time. This, in turn, is to say that for some past or future time and for some property (of one of those types), it is true of *x* or *y*, but not of both, that it is numerically identical across time with an object exemplifying that property at that time. But now what could account for a difference in the cross-time identities of [*S*] and [*L*]? The two are composed of just the same atoms. And since they are coextensive, any object spatiotemporally continuous with one is spatiotemporally continuous with the other …

Burke anticipates a challenge to his argument based on the Kripke/Armstrong rotating disk (see note 26). Consider two possible worlds, alike in that each contains a uniform homogeneous disk, but unalike in that the disk is rotating in only one of the worlds. Since the disks are uniform and homogeneous, the worlds share all temporally local qualitative facts. But if the facts about the persistence of the parts of the disks were likewise the same between the two worlds, then the disks could not differ in whether they rotate. The example therefore appears to establish that persistence fails to supervene on the totality of temporally local qualitative facts, and thus might be thought to establish that cross-time identities (i.e., facts about persistence) need no grounds. But as Burke points out, the example doesn't establish that *all* cross-time identities are ungrounded, since it is consistent with the example that the identity over time of the disk and certain of its parts may be grounded in the identities over time of its smaller parts. Perhaps the smallest parts of the disk have utterly ungrounded identity over time. Let us introduce a set, GROUND, which includes i) temporally local qualitative properties and relations, ii) spatiotemporal relations, and

[44]Burke (1992, p. 15).

iii) genidentity relations between temporal parts of very small objects. Burke can consistently accept the example of the rotating disk, and base his argument against coincidence on the claim that genidentity relations between temporal parts of macroscopic objects (like statues and lumps) supervene globally on GROUND.

Burke explicitly addresses his argument to defenders of coincidence who reject temporal parts; to avoid begging any questions, therefore, let us follow the strategy of section II and understand the supervenience principle just formulated as concerning ersatz temporal parts – pairs of continuing objects and times. Thus, the argument is this: the coinciding statue and lump violate the global supervenience of the genidentity relation between ersatz temporal parts of macroscopic objects on GROUND, a set which includes temporally local qualitative properties and relations of ersatz temporal parts, spatiotemporal relations between ersatz temporal parts, and the genidentity relation between ersatz temporal parts of very small objects.

The reply is the same as before: only the strong version of the supervenience principle is inconsistent with the example. Consider a one-one map, f, from the domain of the world in question onto itself, which maps every ersatz temporal part to itself except that it maps $\langle S,t\rangle$ to $\langle L,t\rangle$ and vice versa, where t is some time before the flattening. In virtue of the intrinsic, compositional and relational symmetry between S and L at t, this map is a GROUND-isomorphism. Hence, where t' is some time after the flattening, the following pairs of ersatz temporal parts are globally GROUND-indiscernible: $\langle\langle L,t\rangle,\langle L,t'\rangle\rangle$ and $\langle\langle S,t\rangle,\langle L,t'\rangle\rangle$. But since the members of the first pair are genidentical whereas the members of the second pair are not, these pairs are not globally genidentity-indiscernible. The strong supervenience of genidentity on GROUND therefore fails in virtue of this single world, but no single world can on its own falsify weak global supervenience. To uphold the weak global supervenience of genidentity on GROUND, the defender of coincidence must simply hold that any possible world that is GROUND-isomorphic to the world in question must contain two objects, a statue and a lump, which coincide initially, but only one of which, the lump, survives being flattened.

I would like to conclude by providing a clear picture of how facts about GROUND and BASE could "functionally determine" facts of persistence and *de re* modality via weak global supervenience principles, despite the existence of coincident entities. Let us first consider the statue and lump that coincide at all times; the puzzle is how facts about the properties and relations in these sets could "make true" different facts involving the statue and the lump, given their

similarity. The answer lies in a fact mentioned in section I, that weak global supervenience claims entail propositional rather than property correlations. Let us assume the weak global supervenience of *de re* modal properties on BASE. In virtue of (W2), every proposition that is true in the world in question, and which "involves" only *de re* modal properties, is entailed by that world's maximal BASE-proposition, "the basic proposition" let us call it. Thus, the basic proposition — the most specific true (at that world) proposition that involves only properties and relations in BASE – entails:[45]

(1) There are two objects that share location at all times, one of which has the modal properties of a statue, the other of which has the modal properties of a lump

When God created the world, all he needed to do was decree that the basic proposition was true.[46] It then followed from that decree that there are two coinciding objects, one of which has one set of modal properties, the other of which has another. And notice that the symmetry between the two objects is irrelevant: God's decree resulted in the truth of an *existential* proposition — that expressed by (1). The symmetry between the statue and the lump does indeed rule out one sort of determination of modal properties: since the statue and the lump have the same maximal BASE-property but different modal properties, the modal properties of a given object aren't always entailed by its most specific BASE property. That is, the instance of (S2) in this case is false. But (S2) is only entailed by *strong* global supervenience, and, as I've argued, so long as we can accept at least one form of supervenience, it's legitimate to reject other, stronger supervenience claims.

The story is similar in the temporal case. An extremely specific proposition specifying the totality of facts involving properties and relations in GROUND entails the truth of an existential sentence:

(2) There is an object, x, that is statue-shaped before the flattening and exists after the flattening; and there is another object, y, that has the same temporally local qualitative properties as

[45] Actually sentence (1) is about both modality and basic facts. But we could just take the supervenience principle as being: BASE∪(the set of modal properties) supervenes on BASE. On the strong construal of global supervenience this formulation is equivalent, but not on the weak construal – see principle (P2) from note 11. Similar remarks apply to (2) below.

[46] Stalnaker (1996, p. 222), cites Saul Kripke as the source of the helpful metaphor of thinking of supervenience in terms of God's creation of the world.

> x before the flattening, but, unlike x, does not exist after the flattening

Alas, there is no compelling argument based on supervenience principles to rule out coincidence between numerically distinct statues and lumps of clay. Is there some clear notion of "grounding" independent of the concept of supervenience, on which coincident entities would have objectionably ungrounded differences? I doubt it: supervenience seems the only clear part of otherwise dark talk of grounding. I do, however, think that coincidence should be rejected. The rejection of coincidence lies elsewhere: in the existence of better alternatives.[47]

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[47] The better alternatives I have in mind involve replying to the temporal version of the argument by identifying material objects with short-lived temporal parts (see my Sider (1996)), and rejecting the modal version by accepting counterpart theory (see Lewis (1971)).

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