I

IDENTITY. The word 'is' is multiply ambiguous. When it can be expanded to read 'is the same thing as', or 'is identical with', or (in numerical contexts) 'is equal to', it expresses the relation of identity. The simplest identity statements contain the 'is' of identity flanked by singular terms, either names or definite descriptions: 'Samuel Clemens is Mark Twain'; 'The U.S. president in 1996 is Bill Clinton'; 'Four is the sum of two and two'. A more complex identity statement might, for example, combine the 'is' of identity with quantifiers: 'Every even number is the sum of two primes'.

IDENTITY [4], on its face, is simple and unproblematic: it is that relation that everything bears to itself and to nothing else. Yet discussions of identity in contemporary philosophical logic and metaphysics are brimming with controversy. From where does this controversy arise? Some of it is not genuine, being based on confusion; and some of it, though genuine, is not genuinely about identity. However, a residue of controversy survives, owing to the view, perpetrated by Peter Geach, that identity statements are meaningless unless relativized, that there is no absolute relation of identity.

SOURCES OF CONFUSION

One source of confusion is the ambiguity of 'identical' in English. We do sometimes say that two things are identical, as when we speak of identical twins, or say that some coat is identical with some other. This is qualitative identity: things are qualitatively identical if they resemble one another sufficiently in relevant qualitative respects. Numerical identity is different: two things, no matter how closely they resemble one another, are never numerically identical. Numerical identity is the topic of this article.

A second source of confusion is English grammar, which allows, for example, 'Clemens is identical with Twain' to be rewritten equivalently as 'Clemens and Twain are identical' or as 'they are identical'. But then it seems that two persons (or two *somethings*) are being said to be identical, which is absurd. A general response is familiar from other cases: surface grammar often misrepresents the underlying logic: one must beware inferring logical from grammatical form. More specifically, it can be verified that plural noun phrases in English do not, in all contexts, entail or presuppose reference to a plurality.

A third source of confusion is FREGE's [3; S] puzzle of informative identity statements, sometimes introduced by the following argument. To say of something that it is identical with itself is trivial, to say of something that it is identical with something else is false; therefore, identity statements are all either trivial or false, and there can be no point in asserting them. This conclusion is manifestly incorrect: identity statements are often both true and informative, as witness, 'the capital of Honduras is Tegucigalpa'. The puzzle is to say where the argument goes wrong.

One response rejects the second premise by taking identity to be a relation between names or descriptions rather than between the objects named or described: identity is then the relation of co-designation, the relation that holds between singular terms whenever those terms designate the same object. That would indeed allow identity statements to be both true and informative. But the response is not viable, for many reasons. For one, it fails to account for uses of identity that do not involve singular terms, such as: 'Everything is identical with itself'. For another, it fails to allow identity statements between different singular terms to be uninformative, as they are when the singular terms are synonymous. For another, it fails to provide a unified solution to analogous puzzles of informativeness, such as how 'the capital of Honduras is in Honduras' and 'Tegucigalpa is in Honduras' can differ in informativeness, even though both ascribe the same property to the same thing.

A better response is due to Frege. Identity is a relation between objects; a simple identity statement is true just in case the objects referred to by the singular terms stand in that relation. But singular terms have sense in addition to reference; a true identity statement is informative just in case its singular terms differ in sense. (Just what is included in the sense of a singular term varies from theory to theory; but note that senses must be rich enough to allow co-designative proper names—such as 'Mark Twain' and 'Samuel Clemens'—to differ in sense.) Now the puzzle may be solved by rejecting the argument's first premise: one can say informatively of an object that it is identical with itself by referring to the object twice over, using singular terms that differ in sense. That is how 'The capital of Honduras is Tegucigalpa' manages to be both true and informative. Identity statements are useful in ordinary language because we often refer to the same object from different points of view, using terms with different senses. (Frege's statement of the puzzle, and his solution, is in Frege, 1892; see also KRIPKE [S], 1980; Salmon, 1986.)

THE LOGIC OF IDENTITY: LEIBNIZ'S LAW

Relations may be classified according to their general, logical characteristics. The logical characteristics of the identity relation are easily enumerated. First, as already noted, identity is reflexive: every object is identical with itself. Second, identity is symmetric: if an object x is identical with an object y, then y is identical with x. Third, identity is transitive: if an object x is identical with an object y, and y is identical with an object z, then x is identical with z. A relation that is reflexive, symmetric, and transitive is called an equivalence relation. Finally, identity is the strongest equivalence relation, entailing all other equivalence relations: if an object x is identical with an object y, then x bears R to y, for every equivalence relation R. Since being the strongest equivalence relation (or, equivalently, being the strongest reflexive relation) uniquely characterizes identity in purely logical terms, identity may properly be classified as a logical relation and the theory of identity as a branch of logic.

All of the logical characteristics of identity can be derived from a single principle, sometimes called LEIBNIZ's [4; S] law: An object x is identical with an object y if and only if every property of x is a property of y and vice versa. Leibniz's law is a biconditional and thus the conjunction of two conditionals, one giving a necessary, the other a sufficient, condition for identity to hold. Say that an object x is indiscernible from an object y just in case every property of x is a property of y and vice versa. The half of Leibniz's law that gives a necessary condition proclaims the indiscernibility of identicals: if x is identical with y, then x is indiscernible from y. This principle is useful for establishing nonidentity: to show that x is not identical with y, it suffices to find a property had by x but not by y or vice versa. Most famously, perhaps, the principle has been used to argue that persons are not identical with their bodies. The half of Leibniz's law that gives a sufficient condition proclaims the identity of indiscernibles: if x is indiscernible from y, then x is identical with y (more on this below).

(Note that Leibniz's law is stated within second-order logic: it involves quantification over properties. The first-order theory of identity substitutes for Leibniz's law an axiom schema containing, for each [monadic] predicate of the language, an axiom stating: if x is identical with y, then x satisfies the predicate if and only if y satisfies the predicate. This schema, together with an axiom of reflexivity, entails the entire first-order theory of identity. The first-order theory is weaker than the full second-order theory; in particular, no logically sufficient condition for identity is expressible within first-order logic.)

The indiscernibility of identicals is beyond dispute: if x and y are identical, then there is only one thing; how can that one thing both have and not have some property? Nonetheless, the principle has been disputed. Consider the following attempt at a counterexample (discussed in QUINE [7; S], 1953). It is true that Giorgione was so called because of his size, let us suppose, and that Giorgione is identical with Barbarelli; yet, apparently contrary to the principle, it is not true that Barbarelli was so called because of his size. But to see this as a violation of the indiscernibility of identicals, one would have to hold that the predicate 'is so called because of his size' expresses some genuine property of objects and expresses the same property when applied to 'Giorgione' as when applied to 'Barbarelli'. On the contrary, when considered in isolation the predicate expresses no property at all but rather a relation between objects and names. When applied to 'Giorgione' it expresses the property was-called-Giorgione-because-of-his-size; and that property is true of Barbarelli, in accord with the indiscernibility of identicals. Other attempts at counterexamples are more subtle than this; but all seem to involve naively reading subject-predicate sentences as simple property-to-object attributions. (For examples involving modality see Cartwright, 1971; Quine, 1953).

IDENTITY OF INDISCERNIBLES

The other half of Leibniz's law proclaims the identity of indiscernibles; but now one must be careful just what 'indiscernible' means. If indiscernibles have *all* of their properties in common, where properties are conceived abundantly, then the identity of indiscernibles is trivially true. For, on an abundant conception of property, for any object y there is the property is-identical-with-y. Now suppose that x is indiscernible from y. Then, since y has the property is-identical-with-y, x must have this property too; that is, x is identical with y, as was to be shown. (On abundant vs. sparse conceptions of properties, *see* PROPERTIES [S].)

If we interpret 'indiscernible' instead in terms of properties more sparsely conceived, for example, as 'indiscernible in all qualitative respects', then we arrive at a substantial metaphysical principle, the identity of qualitative indiscernibles; the trivial "proof" above is blocked because properties such as is-identical-with-a (where 'a' names some object) are not (or, at any rate, are not trivially) qualitative. There are different versions of the principle, however, corresponding to different interpretations of 'qualitatively indiscernible'; and for each version one might ask whether the principle is logically necessary, is contingently true, or neither. Let us consider three versions.

According to the strongest (and least plausible) version, objects that share all of their intrinsic qualitative properties—intrinsic duplicates—are identical. This principle seems to be false even at the actual world: according to current physics, distinct elementary particles of the same kind—for example, distinct electrons—have all of their intrinsic properties (charge, mass, etc.) in common.

According to the second (and most familiar) version, objects that share all of their intrinsic and extrinsic qualitative properties—absolute indiscernibles—are identical. Absolute indiscernibles must not only be intrinsic duplicates, they must be exactly similarly situated with respect to all of their surroundings. But, surely it is at least possible that there be distinct yet absolutely indiscernible objects; that is, the principle is not necessarily true. For, to take the standard counterexample (from Black, 1952), it is logically possible that the world contains nothing but two perfectly round globes, exactly similar down to their smallest parts and separated, say, by one meter. The globes share all of their intrinsic qualitative properties, having the same mass, shape, and so on. And the globes share all of their extrinsic qualitative properties—for example, each is one meter from a globe of a certain mass, shape, and so on. (Note that properties that would only be expressible using names for the globes, such as is-one-meter-from-globe$_1$, are not qualitative). In short, the globes are absolutely indiscernible; yet they are two, not one.

A defender of the identity of absolute indiscernibles might simply deny that there is any such possibility; but there is a substantial cost. The claim that it is logically possible that there be nothing but two absolutely indiscernible globes can be backed up by a subsidiary argument (Adams, 1979). Surely, there could be nothing but two almost indiscernible globes, differing, say, only in the placement of a single atom. To hold that that atom could not have been shifted in a certain way (because, if it had, there would have been two absolutely indiscernible globes), but that any other atom could have been shifted in that way, would amount to an implausibly inegalitarian approach to what is and is not possible.

Perhaps an even weaker version of the principle should be considered: objects that share all of their qualitative properties, and stand in the same qualitative relations to any given object—relative indiscernibles—are identical. (On absolute vs. relative indiscernibility, see Quine, 1960.) The possibility just considered of the two globes is not a counterexample to the necessity of this version: the globes are discerned by spatial relations; each globe is one meter from the other globe but not one meter from itself. A counterexample, however, is not far to seek. Consider the possibility that there be nothing but two absolutely indiscernible globes standing in no spatial relation (or other qualitative external relation) to one another, two absolutely indiscernible 'island universes'. (This possibility can be motivated, too, by first considering 'almost' island universes, connected, say, by a single 'wormhole'.) Such globes would be relatively, as well as absolutely, indiscernible; they stand in no relations that could serve to discern them. So even this weakest version of the identity of qualitative indiscernibles seems not to be a necessary truth. (Indeed, it may not be contingently true: so-called 'identical particles' in quantum mechanics are arguably distinct but absolutely and relatively indiscernible.)

IS IDENTITY DEFINABLE?

Identity has been characterized many times over. Do any of these characterizations provide a (noncircular) definition of the identity relation? Can identity be understood in terms not involving identity? Our initial characterization—that everything is identical with itself and with nothing else—clearly will not do as a definition: to be 'else' is to be other, that is, nonidentical. Moreover, the characterization of identity as the strongest equivalence relation fares no better: identity is characterized by quantifying over all relations, identity included.

Leibniz's law gives a necessary and sufficient condition for identity by quantifying instead over properties. But among the quantified properties are haecceities, properties of being identical with some given object (*see* HAECCETISM [S]). The question whether an object x shares with an object y the property of being identical with y is just the question whether x is identical with y; the purported definition takes one around in a circle. Similarly defective is the oft-heard definition 'x is identical with y if and only if x and y belong to the same classes'. The question whether x, like y, belongs to the class whose only member is y is just the question whether x is identical with y.

What if some version of the identity of qualitative indiscernibles were necessarily true (contrary to what was argued above)? That would indeed provide a noncircular criterion for the identity of *objects*. But the identity or distinctness of qualitative properties (and relations) would remain undefined. Indeed, any purported definition of identity would have to quantify over some sort of entity; the definition could not be understood without a prior understanding of the identity and distinctness of the entities quantified over. We must conclude, then, that identity, at least as applied to the most basic entities, must be taken as primitive and unanalyzable; there is no fully general (noncircular) definition of identity.

Questions remain, some of which might seem to pose problems for the classical conception of identity. We shall see, however, that in each case replies exist that leave classical identity unscathed. (Each of the issues raised below is discussed in Lewis, 1993.)

PARTIAL IDENTITY

Classical identity is all or nothing; it never comes in degrees. Yet, when objects overlap, we may say they are 'partially identical, partially distinct'; and when objects extensively overlap, we may say they are 'almost identical'. Do we have here a challenge to classical identity? No, we have an ambiguity: identity, in the sense that admits of degrees, is simply overlap; identity, in the classical sense, is equivalent to the extreme case of total overlap. The two notions of identity are not in conflict; they fit together as well as you please.

VAGUE IDENTITY

Classical identity is determinate and admits of no borderline cases. That is not to say that identity statements cannot be vague or indeterminate in truth value (*see* VAGUENESS [8; S]). If I say 'that cloud in the sky is identical with A', where 'A' names some precisely specified aggregate of water molecules, what I say may be neither determinately true nor false. But such vagueness resides in the reference of singular terms—in this case, 'that cloud in the sky'—not in the identity relation itself.

Some philosophers, however, hold that there is vagueness, not only in our reference to objects, but in the objects themselves; not only in our language and thought, but in the world. Let us suppose, charitably, that such a view makes sense. Might not these vague objects be vaguely identical? That depends. If vague identity is understood so that vaguely identical objects are neither determinately identical nor determinately not identical, then the answer is no, as the following argument shows. (Versions are in Evans, 1978; Salmon, 1981). Suppose *a* and *b* are vaguely identical; then they differ in some property, namely, being vaguely identical with *b*. For although *a* has the property, *b* does not: nothing is vaguely identical with itself. By the indiscernibility of identicals, then, *a* is (determinately) not identical with *b*. So, vaguely identical objects are (determinately) not identical! That sounds odd; but there is no contradiction if vague identity is understood in some way that detaches it from indeterminacy of truth value. So understood, vague identity poses no challenge to classical identity.

TEMPORARY IDENTITY

The Greek philosopher HERACLITUS [3] argued that one cannot bathe in the same river twice, something as follows. Rivers flow. The stretch of water that comprises the river on Monday is not the same as the stretch of water that comprises the river on Tuesday. But a river is not something separate and distinct from the stretch of water that comprises it; be it on Monday or on Tuesday, the river and the stretch of water are one and the same. It follows, by a double application of the indiscernibility of identicals, that the river on Monday is not the same as the river on Tuesday. If one bathes in the river on Monday, and returns to bathe at the same place on Tuesday, one has not bathed in the same river twice.

One wants to say: on Monday, the river is identical with a certain stretch of water; on Tuesday, the same river is identical with a different stretch of water. More generally, identity can be temporary, holding at some times but not at others. Temporary identity, however, is disallowed by the above argument, not just for rivers, but for all entities whatsoever. Should we abandon the classical notion of identity that the argument presupposes?

There are at least two responses to Heraclitus's problem compatible with classical identity. According to the first response (inspired by ARISTOTLE [1; S]), when we say that a river *is* just a certain stretch of water, we are using not the 'is' of identity but the 'is' of constitution; and constitution is never identity (see Lowe, 1989). On this view there are two fundamentally different kinds of entities that occupy space and persist through time. There are ordinary material objects, such as rivers, trees, statues, and tables; and there are portions of matter that may temporarily constitute the ordinary objects. At any time an ordinary object is constituted by some portion of matter or other; but at no time is it identical with that portion of matter, either wholly or in part. In particular, the very same river is constituted by one stretch of water on Monday and by a different stretch of water on Tuesday. No conflict arises with the laws of classical identity, and Heraclitus's problem is solved.

This response, however, is not without problems. A dualism of ordinary objects and the portions of matter that constitute them is neither necessary nor sufficient to solve the general problem of temporary identity. It is not sufficient, because some cases of temporary identity have nothing to do with constitution. Consider a tree that, at some bleak stage of its career, consists of nothing but a trunk. Later, however, the tree sprouts new branches and leaves. Then we have another prima facie case of temporary identity: the tree is identical with the trunk at the bleak time but not identical with the trunk at the happier time. In this case, however, invoking constitution is of no avail: neither the trunk nor the tree constitutes the other, in the relevant sense. (This example is from Hirsch, 1982.)

Nor is such a dualism necessary to solve the problem of temporary identity, because another response is available, one (arguably) more economical in its ontological commitments (see Hirsch, 1982; Quine, 1950). On this second response objects that persist through time are composed of (more-or-less) momentary stages, of temporal parts. A persisting river is a sum of stages unified in a way appropriate for rivers; a persisting aggregate of water molecules is a sum of stages unified in a way appropriate for portions of matter. A persisting river and a persisting aggregate of water molecules may overlap by having a stage in common; in that case a stage of the river and a contemporaneous stage of the aggregate of water molecules are identical. But the persisting river is not identical with the persisting aggregate of water molecules: later stages of the river are in about the same place as earlier stages and are no less spatially continuous; later stages of the aggregate of water molecules are downstream of earlier stages and are spatially scattered. When we say that, at any time, a river is nothing separate and distinct from the water that comprises it, this must be understood as asserting not an identity between persisting objects but an identity between stages. Identity between stages, however, is all one needs to avoid the uneconomical dualism of the constitution view. All objects that occupy space and persist through time are composed of a single kind of entity: stages of portions of matter. (The stage view of persistence is argued for in Lewis, 1986.)

Heraclitus's problem is now easily solved. One cannot bathe in the same river stage twice; but one can bathe in the same river twice by bathing successively in two river stages belonging to a single persisting river. That these two stages are not stages of a single persisting aggregate of water molecules is irrelevant. There is no conflict with classical identity.

CONTINGENT IDENTITY

A change in example, however, makes trouble for the stage view of persistence. Consider a statue called *Goliath* that consists entirely of a lump of clay called Lumpl; and suppose that the statue and the lump came into being, and ceased to exist, at exactly the same times. Then, on the stage view, every stage of *Goliath* is identical with a stage of Lumpl and vice versa; *Goliath* and Lumpl are the same sum of stages and so are identical. But, surely, they are not necessarily identical. *Goliath* could have been destroyed without destroying Lumpl—say, by being squashed—in which case *Goliath* would have lacked Lumpl's final stages and would have been a distinct sum from Lumpl. So, *Goliath* and Lumpl are identical, but only contingently identical. (The example is from Gibbard, 1975.)

Trouble arises because contingent identity, no less than temporary identity, is incompatible with identity, classically conceived—or so the following argument seems to show. Consider the property is-necessarily-identical-with-*y*, for some object *y*. Surely *y* has it: everything is necessarily identical with itself. Now suppose an object *x* is identical with *y*. Then, by the indiscernibility of identicals, *x* has the property as well; that is, *x* is necessarily identical with *y*. Thus, objects are necessarily identical if identical at all; objects are never contingently identical.

Whether this argument is unassailable will depend upon one's interpretation of modal properties, of modality *de re*. If objects have their modal properties absolutely, in and of themselves, then the argument is sound. Since *Goliath* and Lumpl are not necessarily identical, they are not identical at all. *Goliath* and Lumpl are numerically distinct objects that occupy the same place at all times that they exist. *Goliath* is not identical with any sum of matter-stages, contradicting the stage view of persistence.

The stage view can be preserved, however, if one takes the view that modal predicates do not apply to objects absolutely, in and of themselves; their application is relative to how the objects are conceived, classified, or referred to. For example, could the lump of clay—that is, the statue—have survived a squashing? *Qua* lump of clay, it could; *qua* statue, it could not. There is no violation of the indiscernibility of identicals because the modal predicate 'could survive a squashing' expresses no property when considered out of context and expresses different properties when attached to 'the lump of clay' (or 'Lumpl') and to 'the statue' (or *Goliath*). In this way the stage view can accept the contingent identity of Lumpl and *Goliath,* without forfeiting classical identity. (For versions of this strategy, see Gibbard, 1975; Lewis, 1971.)

RELATIVE IDENTITY

Classical identity is absolute: whether identity holds between objects does not depend upon how those objects are conceived, classified, or referred to. In ordinary language we often say '*a* is the same *F* as *b*', for some general term '*F*'; but this is naturally analyzed as a restriction of absolute identity: *a* is *F*, and *b* is *F,* and *a* is (absolutely) identical with *b.*

Geach has argued, on the contrary, that all identity statements are relative: '*a* is the same *F* as *b*' cannot be analyzed as restricted absolute identity, because there is no absolute identity; when we say simply '*a* is the same as *b*', some general term '*F*' must be supplied by context, or what we say is meaningless (Geach, 1970). To support his claim, Geach has presented examples in which we would say: a and b are the same F, and a and b are G's, but a and b are not the same G. Consider the word 'tot'. It contains three letter tokens, two letter types. The first letter token and the last letter token are not the same letter token, but they are the same letter type. That contradicts the claim that 'the same F' is to be analyzed as restricted absolute identity.

The defender of classical identity has a simple and natural reply: sometimes the relation is-the-same-F-as is not restricted identity but rather some weaker equivalence relation; that is, sometimes it is a species of qualitative, rather than numerical, identity (see Perry, 1970). For example: if I say that you are wearing the same coat as I am, I (probably) do not mean the numerically same coat. Similarly, letter tokens of the same type are qualitatively similar—equiform—not numerically identical. To the extent that Geach's point is just that 'the same F' cannot always be analyzed as restricted identity, it is a point no one should deny.

Any rejection of absolute identity, it seems, must be based upon arguments of a more abstract sort. Indeed, Geach explicitly rejects the standard characterization of identity through Leibniz's law on the grounds that second-order quantification over properties leads to paradox. And he rightly points out that, within first-order logic, characterizations of identity are inevitably relative to the predicates of the language. But how does this impugn the meaningfulness of absolute identity? Does Geach's argument simply amount to the demand, Define absolute identity, or count it as meaningless? That demand, certainly, is too strong. No fundamental notion of logic or metaphysics could meet it.

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