Identity and similarity

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Abstract   The standard approach to the so-called paradoxes of identity has been to argue that these paradoxes do not essentially concern the notion of identity but rather betray misconceptions on our part regarding other metaphysical notions, like that of an object or a property. This paper proposes a different approach by pointing to an ambiguity in the identity predicate and arguing that the concept of identity that figures in many ordinary identity claims, including those that appear in the paradoxes, is not the traditional philosophical concept but one that can be defined in terms of relevant similarity. This approach to the paradoxes will be argued to be superior to the standard one.

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Any view of identity must eventually come to grips with the so-called paradoxes of identity, problem cases mostly involving the possibility (or otherwise) of change over time, such as the Ship of Theseus paradox and the paradoxes of personal identity, and questions of constitution, such as the well-known puzzle about the statue and the lump of bronze that makes it up. While what, if anything, these paradoxes show about *identity* is controversial, it is *not* controversial, or at any rate should not be (see Sect. 1 below), that they show at least the following about

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people's *identity judgments*:[1] (i) these judgments are context-sensitive in that one and the same identity statement may be judged true in one conversational setting and false in another; (ii) they do not always respect the putative transitivity of the identity relation; (iii) they can be vague or indeterminate; and (iv) intuitions as to the correctness of a given identity judgment can vary greatly from one person to another, even among conversation partners who apparently share the same context.

These data are readily seen to put some pressure on the dominant view of identity according to which identity is "utterly simple and unproblematic" (Lewis 1986, p. 192).[2] For it is evidently incompatible with this view to hold—what the data *seem* to suggest—that identity is a context-sensitive and intransitive relation that may hold vaguely between its relata and that either is subjective or may easily give rise to subjective interpretation. Surely such a relation could not properly be called "simple," and whether it could be called "unproblematic" would remain to be seen. It is hardly surprising, therefore, that proponents of the said view have expended great effort on trying to show that the designation "paradoxes of identity" is really a misnomer, and that the problem cases that come under this heading do not essentially concern the notion of identity but rather point to certain misconceptions we hold of the notion of an object, or that of a property, or both, or some other metaphysical notion.[3]

While this approach to the paradoxes is clearly motivated by considerations of simplicity, it should be noticed that what we are ultimately after is not so much a simple view of identity per se, but rather a picture of reality that is simple, or more generally, theoretically satisfying, *as a whole*. And it is not so clear that the standard approach to the paradoxes offers the best guarantee of achieving that goal. It must have struck anyone who has studied the extant solutions to the paradoxes of identity that there is little unity to them. We get one solution for the Ship of Theseus paradox, for instance in mereological terms (see, e.g., Krecz 1986); another for the paradoxes of personal identity, for instance in terms of psychological continuity (e.g., Parfit 1984); a third for the statue/lump-of-bronze paradox, for instance in terms of constitution (e.g., Wiggins 1980); and so on, apparently without there being any trait connecting these solutions. Also, some of these and other attempts to deal with the paradoxes commit us to conceptions of objects or properties or other metaphysical categories that are not nearly as simple as the—allegedly misguided—ordinary conceptions they are meant to supplant.

In this paper, we propose an approach to the paradoxes that we believe to be more simple overall and, in particular, more unified than the aforementioned one. Our claim is that the concept of identity that figures in many ordinary identity statements, including those that appear in the paradoxes, is not the traditional

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[1] We use "identity judgment" to refer to judgments about the truth value of what we shall call "identity statements" (or "identity claims"), that is, statements of the forms "*a* is identical to *b*," "*a* is the same as *b*," and related ones.

[2] While this is currently the dominant view, it does have its dissenters. For critiques of it, see Geach (1967, 1972), Deutsch (1998, 2002); Parsons (2000), and Gallois (1990, 2005), among others. Some of the more popular alternative views of identity include theories of relative identity (Geach, Deutsch), time-indexed identity (Myro 1986), and vague or indeterminate identity (e.g., Parsons 2000).

[3] See, e.g., Jubien (1996, 1997, Chap. 4).

philosophical concept but a different one, to be understood in terms of relevant similarity. We will show that this concept of identity can be defined as rigorously, even if not quite as succinctly, as the traditional philosophical notion of identity. It will be seen that the resulting account enables us to explain (i)–(iv), and thereby to handle the paradoxes of identity, in a swift and uniform manner, and that it does so without requiring any special assumptions about the nature of objects or properties or whatnot.

To forestall misunderstanding, it merits remark that we do not contest the propriety of the standard philosophical conception of identity, nor do we deny that the paradoxes of identity do not essentially concern *that* conception of identity. Rather, the claim is that these paradoxes involve what one might call a "folk notion of identity" and that, if conceived this way, they are no longer genuinely paradoxical. So, we deny that the correct approach to the paradoxes is to suppose that they betray some confusion on our part about objects or properties or other metaphysical categories. The confusion concerns the concept of identity at stake in these paradoxes.

We start, in Sect. 1, by briefly going through some well-known paradoxes of identity, mainly for purposes of elucidating (i)–(iv). In Sect. 2, we present our account of the folk notion of identity that we believe to be prevalent in the paradoxes. And in Sect. 3 we argue that, all things considered, our approach to these paradoxes compares favorably with the standard one.

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1.1 Context-sensitivity

Imagine a wife complaining to her husband that he is no longer the same person he was when they married. She might just be speaking figuratively, of course. But add some details to the story, for example the husband became an alcohol or drug addict in the intervening years, or recently underwent a fetal tissue transplant to treat Parkinson's disease, and presumably many would, at least pre-reflectively, deem it possible that she speaks the literal truth.[4] Even so, we can all see that it would probably be no use for the husband to cite these or similar details the next day in court—where, suppose, he has to stand trial for a crime committed at about the time of his marriage—to buttress the claim that he is not (identical to) the perpetrator. Or consider this: for some years now, Emma has been wearing a ring set with many small rubies. She recently lost one of the stones, but it has already been replaced by an indistinguishable-looking ruby. Most people will be inclined to say that the ring on Emma's finger is the same as the one she has worn over the years, notwithstanding the one new ruby: small changes to an object are typically judged to preserve identity. But for Emma the two rings are *not* identical. The ruby she lost

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[4] Some would even deem that possible post-reflectively: See White (2007) for the claim that substance abuse (as well as recovery from it) can alter personal identity, and Northoff (1996) and Hansson (2005) for a discussion of the claim that fetal tissue transplants affect personal identity. Note that we are not committing ourselves to the correctness or otherwise of these claims. Here, we are merely registering facts about people's identity judgments, whether or not these judgments be correct.

was originally part of the brooch that her deceased mother wore on her wedding day; it was *that* stone that made the ring emotionally valuable to Emma. Does not Emma's judgment concerning the nonidentity of the rings appear to be eminently reasonable? The intuitive answer here seems to be that, indeed, from *her* perspective, the rings are *not* identical. Or consider a statue and the lump of bronze that makes it up. Are they identical? It seems that, at least initially, most people are tempted to say *yes*. But once their attention has been drawn to the apparently very different modal (including dispositional and counterfactual) properties the statue and the lump of bronze have, the same people often become inclined to say the opposite. Cases like these strongly suggest that our preparedness to judge a given identity statement true is sensitive to the context in which we assert, or consider asserting, or evaluate, that statement.

1.2 Intransitivity

Few think that replacing just one plank of a ship by a new one yields a different ship, or that the minute changes we undergo from one day to the next make us a different person every day; as already intimated, we typically judge that small changes to an object preserve its identity.[5] But a series of small changes may add up to a big one, and big changes are often *not* judged to preserve identity. Replacing all or even just most planks of a ship may prompt the verdict that the resulting ship is *not* identical to the original one, and Tom at age 16 may well be judged to be a different person from Tom at age 60. This suggests that people's identity judgments may sometimes fail to respect the putative transitivity of the identity predicate (for brevity, call such failure "lack of transitive closure"). If one thinks the original ship s_0 is identical to the ship s_1, where one plank has been replaced, and similarly that s_1 is identical to the ship s_2, where a second plank has been replaced, and so on, until all n planks have been replaced, then in order for one's identity judgments to respect transitive closure one should judge s_0 to be identical to s_n—which, assuming n to be "sufficiently" large, not all appear to do.[6,7]

1.3 Vagueness

At least some people, in at least some contexts, find the intuition compelling that a ship s_0 is nonidentical to the ship s_n that results from replacing all n of s_0's planks. (Proof: The present authors do, for instance when it is assumed that n is large and that, by means of some fully automated procedure, all of s_0's planks are being

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[5] Typically—though not unexceptionably, as the just-described case of Emma's ring exhibits.

[6] Or, more carefully, which at least in some contexts not all persons appear to do. Anticipating the account of identity to be offered below, we may already note that for our judgment concerning the identity (or otherwise) of the ship, it might for instance matter whether we focus mainly (or exclusively) on the shape and nature of the material of the planks or whether we also focus on, say, their origin.

[7] This is not necessarily to say that people would not want to reconsider their identity judgments when it is pointed out to them that these judgments lack transitive closure (supposing they do lack it indeed). Perhaps they would, but that does not alter the fact that sometimes people's identity judgments do lack transitive closure.

replaced within a split second, but still one by one; our intuition is that here, at one fell swoop, an old ship is being dismantled and a new one is being built on the same location.) It is logically possible that people who have this intuition will, while one plank after the other is being replaced, at some stage in the process cease to find the ship identical to the original ship; they might, for some k $(0 < k < n)$, think that whereas s_k is still identical to s_0, s_{k+1} is a different ship. But although this is logically possible, it is not something one would expect to happen in reality. What one would expect is that these people will say that whereas s_0 is clearly identical to s_1 and perhaps also clearly identical to s_2, and whereas it is clearly nonidentical to s_n and perhaps also clearly nonidentical to s_{n-1}, there are indices k such that s_0 is neither clearly identical to s_k nor clearly nonidentical to s_k; rather, s_0 is *more or less* identical to s_k.[8]

To give a different type of example, consider the identity conditions of works of art. Is a symphony with slight retouches the same work of art as the symphony without the retouches? Is a French translation of T. S. Eliot's "Burnt Norton" the same work of art as the poem in English? Here, too, context may matter. But we think that in many, perhaps even most, contexts the intuitively best answer to such questions is neither a *yes* nor a *no*, but rather something like *sort of*. Many other types of example could be given to illustrate the point that our identity judgments can be vague.

1.4 Interpersonal variability

Finally, it appears that people's intuitions about the truth values of identity statements may vary considerably. That is to say, it is not the case that people generally agree about what is the intuitively correct thing to say about a given identity statement, but then (sometimes) disagree about how this intuition is to be accounted for (or even about whether it has to be done justice to or rather ought to be explained away); sometimes the disagreement does concern what it is intuitively correct to say in a given case. Some of these disagreements may simply be further evidence of the already noted context-sensitivity of our identity judgments. But even people who can plausibly be regarded to share the same context often arrive at diverging verdicts about certain identity questions. For instance, anyone having taught a course in metaphysics will have experienced that some students find it pre-theoretically manifestly right to say that a statue and the lump of bronze of which it is made are identical, while others find this pre-theoretically manifestly wrong; or that some think it obviously true that a cat and this cat minus one of its hairs are identical while others think it just as obviously false. The phenomenon was in effect already noted by Plutarch in relation to the Ship of Theseus paradox. As he says, according to some philosophers the ship remained the same in the process of its planks' being gradually replaced, according to others it did not (cf. Rea (ed.) (1997, p. lii)).

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[8] See also Smith (2005, 383 f).

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The above puzzle cases about identity, and related ones, have generally appeared to be problematic, and even paradoxical, because it has generally been supposed that, for any objects a and b, there must be exactly one correct answer to the question whether a and b are identical; that this answer must be objective, determinate, and independent of the context in which the question is being asked; and that our answers to such questions must obey the logic of the identity predicate as it is to be found in the logic textbooks. This is problematic not only because in most of these cases there does not seem to be a single, intuitively clearly correct answer to the relevant question that has all the desired properties, but also because, whichever answer one settles on, one will have to explain why the putatively wrong answer (or wrong answers, if vagueness is involved) seem(s) at least prima facie to be hardly less plausible than the putatively correct answer.

But now suppose that what these cases expose is that identity itself is context sensitive, intransitive, vague, and subjective, or at least that it has some feature that makes the apparent subjectivity of our identity judgments readily explicable. Suppose, that is, that in the context in which the wife claims that her husband is no longer the same person he was at the time of their marriage, she may be speaking truly, and that yet the same assertion may be false when repeated in the context of the trial; that when none of us has any special interest in the origin of the rubies in Emma's ring, it may be true that the ring with the new ruby is the same as the ring with the old ruby that later was lost, but that this may be false for Emma for whom the ruby that was lost was of special emotional significance; that it may be true in some contexts that the ship s_0 is identical to the ship s_1, that s_1 is identical to s_2, and so on, yet false that s_0 is identical to s_n—because identity is not, or not in all contexts, transitive; that it may similarly be true that in some contexts s_0 is *more or less* identical to s_k, for some k—because the identity relation may hold vaguely. Suppose, finally, that the great interpersonal variability in people's identity judgments is due to the fact that there is something subjective to identity, so that a and b may be identical for one person but not for another, or at least that a and b may be plausibly held to be identical by the one person and equally plausibly held to be nonidentical by the other, even if these people share the same context. If something along these lines is right, then we obviously do not have to choose between the judgment that the husband is the same person now as he was at the time of his marriage and the judgment that he is not; nor do we have to choose between saying that s_0 is *not* identical to s_1 and saying that it *is*; nor do we have to say that s_0 is *determinately* identical (or determinately nonidentical) to s_k; nor should we be surprised by the apparent divergence among people's identity judgments. What, then, would remain of the alleged puzzle cases that could be called "problematic" or "paradoxical"?

Naturally, to suppose that identity is context-sensitive, intransitive, vague, and (somehow) subjective, flies in the face of the standard philosophical view of identity—which is why philosophers have sought to solve the paradoxical cases by finding fault in our understanding of metaphysical notions other than identity. As intimated earlier, this approach has failed to yield an even moderately unified

treatment of the paradoxes. An approach that so far has remained unexplored, but that we believe to be more promising, is that "identity," "identical," "same," and kindred words, as they occur in many and perhaps even most ordinary identity claims and judgments that people make, are not meant to refer to the identity relation in the philosophers' sense, but rather to a different one. In fact, that the said words are ambiguous in ordinary parlance has been previously noted. As Jubien (1997, 65 ff) convincingly argues, "identity" and related terms are often used to refer to a relation of relevant similarity. For instance, when the judge asserts that the man before him in court is identical to the man who committed the crime 20 years back, he may well mean no more than that the two are sufficiently similar for all practical concerns to warrant a conviction of the man present in court. But while this observation is not new, to the best of our knowledge no even remotely worked-out account of this other, "relevant similarity" or "folk" notion of identity exists in the literature. Neither do we know of any attempts to relate the observation in a systematic way to the paradoxes of identity. In the following, we aim to provide a precise characterization of the said notion of identity and show that it has precisely the properties the paradoxes of identity at first glance suggest the identity relation to have. Thus, the hypothesis that it is the folk notion of identity that figures in the identity claims and judgments that seem to clash in the problem cases would straightforwardly dissolve their apparent paradoxicality: (i)–(iv) hold because many of our identity judgments are not really judgments about the identity of things in the strict, philosophical sense of the word "identity," but rather about a relation of relevant similarity (to be made precise) holding between things.

First, however, we should like to make a terminological point. By "ordinary identity statements" ("ordinary identity claims," "ordinary identity judgments"), we will mean identity statements (respectively, identity claims and judgments) in which the words "identical," "same," and so on, are meant to refer to the folk notion of identity, and not the philosophers' notion. But neither this terminology nor the label "folk notion of identity" should be taken to indicate that we believe *all* identity statements in the mouth of ordinary folk to involve the concept of identity to be defined shortly. Indeed, we do not doubt that, for instance, mathematical identity statements (such as "$4 + 7 = 11$") in the mouth of the folk involve strictly the philosophical notion of identity. Frankly speaking, we do not know of any litmus test for distinguishing those uses of the word "identity" (etc.) on which it ought to be interpreted as designating the standard philosophical concept of identity and those on which it rather ought to be interpreted as designating the folk concept. We believe that the latter is likely to be more often than not, perhaps even predominantly, the referent of ordinary, nonphilosophical uses of "identity," but what we want to argue for, and all that matters for our present purposes, is merely that it is the referent of that word as it occurs in the identity claims and judgments that figure in the kind of puzzle cases that were surveyed in the previous section.

Our proposal, then, is that an ordinary identity statement to the effect that some object a is identical to some object b is true iff a and b are highly similar in all relevant respects, where "highly" and "relevant" are both to be thought of as being context-dependent terms. That is to say, on our proposal, an ordinary identity statement "a is identical to b," made or evaluated in a conversational context C, is

to be understood as a claim to the effect that a is identical$_C$ to b—or Id$_C(a,b)$, for short—which in turn is taken to mean that a is highly$_C$ similar to b in all relevant$_C$ respects. Another way to put this would be: Id$_C(a,b)$ iff for every relevant$_C$ respect r, any difference in r between a and b is, if it exists at all, negligible$_C$, where again, as the notation indicates, it is assumed that a difference that is negligible in one context need not be so in another.

To be already a bit more specific about the allegedly context-sensitive terms, note that in principle there are indefinitely many respects in which any two objects might be found to be similar (in some degree) to one another. But psychological research concerning people's similarity judgments warrants the claim that, in comparing objects, we never take into account all of these respects. Various studies show similarity judgments to vary systematically with context. It has, for instance, been demonstrated that when research participants are asked whether one object is similar to another, or whether it is more similar to it than to a third object, their answers are predictably influenceable by varying certain parameters of the experimental context. Cognitive psychologists consider as the best explanation for this apparent context-sensitivity that, first, in comparing objects people selectively attend to some proper subset of the possible respects in which the objects might be compared, and second, that it is subject to contextual variation which subset of respects people focus on.[9] The respects attended to in context C are what we call "the relevant$_C$ respects."[10]

The assumption of the context-sensitivity of what counts as highly similar in a given respect is more speculative. Though the literature cited in note 9 reports many experiments in which test subjects were asked to rank objects according to their similarity, we have not found any experiments in which test subjects were explicitly asked whether certain objects are *highly similar in a given respect*. And the fact that researchers found the answers to the first type of question to be context-sensitive does not by itself warrant the assumption that the standards for what counts as highly similar in a given respect are context-sensitive. But while we ourselves do find the assumption of the context-sensitivity of being highly similar at least plausible in light of the reported research, we wish to emphasize that it is dispensable for our purposes: we could explain everything we want to explain even

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[9] The context-sensitivity of people's similarity judgments has been reported in, among others, Tversky (1977); Barsalou (1982); Murphy and Medin (1985); Nosofsky (1986); Medin and Shoben (1988); Medin et al. (1993, and several of the papers collected in Hahn and Ramscar (eds.) (2001b); see also Fairchild (1998, 168 f) for a striking example of how a change in background information can affect similarity judgments. Nosofsky (1986) gives ample empirical evidence both for the claim that selective attention influences similarity judgments and for the claim that selective attention is context-dependent. Also on an experimental basis, Smith and Heise (1992, p. 242) conclude that "perceived similarity is the result of psychological processes and it is highly variable. The central process that changes perceptual similarity is attention. The perceived similarity of two objects changes with changes in selective attention to specific perceptual properties." In the same vein, Medin et al. (1993, p. 272) conclude that "[t]he respects associated with similarity assessments are influenced by the comparison context." Incidentally, the thesis that in comparing objects people selectively attend to certain features was already argued for, on grounds other than the context-sensitivity of similarity judgments, in Fisher and Zeman (1973).

[10] They are thus to be distinguished from respects that, in a given context, one might assert to be relevant to a certain *purpose*, as for instance when two candidates for a job are said to be alike in all relevant respects. Respects explicitly asserted to be relevant in that sense will not generally be all the respects attended to in the context of the assertion.

if we assumed that what counts as highly similar in a given respect is, for any context and any conceivable respect, fixed. So, instead of pushing our intuition about the assumption here, we invite those who do not share this intuition to read the shortly to be introduced notion of a similarity threshold for a given respect as being context-invariant and not—as we shall do—as being context-sensitive.

We expect that some will still be uncomfortable with the seeming vagueness of the phrase "being highly$_C$ similar in all relevant$_C$ respects," and concomitantly with the proposed folk notion of identity. As will now be shown, however, the designated phrase can be given a formally precise explication in scientifically uncontentious terms.

The basic idea for making the above definition precise is to identify each context C with a set S_C of metric similarity spaces, where S_C contains a separate space for each respect relevant in C (because of this one-to-one correspondence between spaces and respects, we shall use "r" as a variable for both). For present concerns, think of such spaces as one-dimensional or multidimensional structures with a distance function (a metric) defined on them.[11] Objects determine points in these spaces. As the name "similarity space" suggests, distances between points are supposed to indicate degrees of similarity: the smaller the distance between the representations of two objects in a given space, the more similar the objects are in the corresponding respect. Perhaps, the simplest example of such a space is a three-dimensional Euclidian space with a Euclidian metric serving to represent proximity in ordinary visual space. Other much-discussed examples of metric similarity spaces include (one-dimensional) temporal space, auditory space (which is typically taken to be two-dimensional), color space (which is typically taken to be three-dimensional), olfactory and tactile spaces, and spaces corresponding to various physical parameters, such as density and hardness. Modal notions (including dispositional and counterfactual ones), such as solubility and fragility, can also be modelled by means of metric similarity spaces. Among the more complex examples are multidimensional shape spaces and action spaces, such as are discussed in Gärdenfors (2000, pp. 94–98, 2007), respectively.[12] As a matter of fact, given the flexibility of this approach—one can go to any number of dimensions, and define any metric one likes—it seems safe to assume that, for any respect in which two

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[11] See Gärdenfors (2000, Chap. 1) for precise definitions.

[12] Because we have become so accustomed to analyzing modal notions in terms of possible worlds, the obvious similarity spaces appropriate for such notions might seem to be some sort of metricized possible world spaces, in the manner of Lewis (1973, 50 ff). But there are other, perhaps simpler, approaches. For example, with each object we could associate not only a point in shape space corresponding to its actual shape, but also a set of points representing what we might regard as its possible shapes. The measure of this set might be taken to indicate the "transformability" of the object, which could be represented on a simple line with two endpoints, one standing for maximal, the other for minimal transformability (and intermediate points standing for intermediate degrees of transformability; various obvious metrics can be defined for this space). To illustrate, we may suppose that, in this space, a statue would be represented as very close to the minimal endpoint (a lowering by one tenth of a millimeter of the torch of the Statue of Liberty might be assumed to result in a shape that is still among the possible shapes associated with the statue); the lump of bronze of which it is made, on the other hand, would, we may suppose, be represented as close to, or even at, the other extreme.

objects might ever be sensibly found to be similar by anyone, there exists a corresponding metric similarity space.

The idea, as intimated, is that for each respect that is relevant in a context, the context contains a corresponding similarity space.[13] If color is a relevant respect in C, then S_C will contain a color space; if shape is relevant, S_C will include a shape space; if time is relevant, it will include a temporal space; and so on. For each similarity space $r \in S_C$, let $d_r(\cdot, \cdot)$ be the distance function associated with that space; so $d_r(a,b)$ measures the distance between the representations of objects a and b in r. Also associated with each $r \in S_C$ is a threshold value $\mathbf{t}_C^r \geqslant 0$, which may be different for different r and also—though for reasons given above this may be taken as optional—different for the same r in different contexts C. With this at hand, we can state a precise definition of folk identity:

$$\mathrm{Id}_C(a,b) \Longleftrightarrow \forall r \in S_C : d_r(a,b) \leqslant \mathbf{t}_C^r. \tag{1}$$

Variants of this definition are not hard to conceive. For example, we might stipulate that two objects are identical$_C$ iff the *sum* of the distances between their various representations in the similarity spaces corresponding to the respects that are relevant in C does not exceed a certain threshold value, which depends on the context; or we might consider taking a *weighted average* of those distances, supposing that all relevant respects need not bear equally heavily on our identity judgments in a context.[14] However this may be, here we will not attempt to decide which of these definitions or still further variants is the correct one (supposing our basic idea is correct, so that at least some definition along the above lines characterizes the word "identity" as it occurs in ordinary identity statements). Nor need we, for it is reasonable to think that, given any plausible such specification of the phrase "being highly$_C$ similar in all relevant$_C$ respects," our account is able to explain in a swift and seemingly natural way the data about our ordinary identity judgments elucidated in Sect. 1.

To appreciate this, consider that given such an account, the folk notion of identity is contextual by definition; it is obvious, then, that our ordinary identity judgments are context-sensitive. What causes the occasional lack of transitive closure of these identity judgments should be equally obvious. That a and b differ at most negligibly$_C$ in any relevant$_C$ respect and that b and c do so as well does not guarantee that a and c differ at most negligibly$_C$ in all relevant$_C$ respects; negligible$_C$ differences may add up to nonnegligible$_C$ ones. Furthermore, it is natural to suppose that there is, or at least may be, some vagueness in what counts as being highly similar in a given respect and context; that is, assuming (1) once more,

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[13] From a mathematical point of view, it would be possible to combine the various similarity spaces in one unique similarity space, viz., the product space of the similarity spaces related to the relevant respects. However, our proposal is inspired by the way psychologists look at similarity; see, e.g., Hahn and Ramscar (2001a, p. 260): "[M]ost interesting uses of similarity in psychology involve the assessment of similarity in multiple respects. For instance, comparing two objects in terms of overall similarity will be a composite of their similarity with respect to colour, texture, size, shape, etc. This negates the reduction of similarity to a single 'respect' …"

[14] As might be realistic; see, e.g., Nosofsky (1986), especially Eq. 6 (or Eq. 2 of Shin and Nosofsky (1992)).

what the threshold value $\mathbf{t}_C^r$ is may not be precisely fixed for every or even any respect r in every or even any context C.[15] Finally, if our theory is correct, then the context-sensitivity of folk identity would certainly partially explain the interpersonal variability that is exhibited by people's identity judgments: people may come to different judgments as to the identity of two things because they are judging in different contexts. As we noted, however, the data suggest that even people who share the same context may sometimes disagree about the truth values of certain identity claims; that sort of interpersonal variability cannot be explained in terms of context-sensitivity. In our view, the best explanation of these cases involves the fact that there is often some interpersonal variability in the interpretation of vague terms, so that there may be some interpersonal variability in the interpretation of "highly$_C$," which, as remarked a moment ago, is plausibly thought of as being somewhat vague.

A number of further comments on the theory are in order. First, it cannot be stressed enough that by relying on the notion of a metric similarity space we are not availing ourselves of anything outlandish: Metric similarity spaces nowadays belong to the standard equipment of cognitive scientists and other researchers studying human cognition.[16] Moreover, if someone were to conceive of different means for quantitatively representing similarity, then they might serve our purposes just as well.

Second, there is not the slightest linguistic evidence to suggest that the folk's identity judgments do not always respect the putative reflexivity and symmetry of the identity predicate. So presumably we should not regard as admissible explications of the phrase "being highly$_C$ similar in all relevant$_C$ respects" that do not render folk identity reflexive and symmetric. In any event, it is clear that, assuming (1) or the suggested variants thereof, we do have, for all a, b, and C, both $\mathrm{Id}_C(a, a)$ and $\mathrm{Id}_C(a, b)$ iff $\mathrm{Id}_C(b,a)$. The former holds in virtue of the fact that, by the definition of a metric, $d_r(a,a) = 0$ for all r, the latter in virtue of the fact that, again by the definition of a metric, $d_r(a,b) = d_r(b,a)$.[17]

Third, on our theory, a shift in context, say from C to C', can be brought about in more than one way. It can be effected by the becoming relevant of a presently irrelevant respect or, conversely, the becoming irrelevant of a presently relevant

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[15] With respect to the threshold of discrimination between colors, which may well be thought of as being the threshold, in the sense of our definition, for the respect color, Hardin (1988, p. 175) notes that "the 'classical' conception of the fixed, sharp threshold … must be abandoned, and has in fact been abandoned in psychophysics for many years." See in the same vein Wyszecki and Stiles (2000, 323 ff). To make this technically precise, $\mathbf{t}_C^r$ could be thought of as an interval rather than as a number. Another option would be to assume fuzzy set theory and allow expressions of the form "$d_r(a, b) \in [0, \mathbf{t}_C^r]$" to hold to any degree in the interval [0,1] (with degree 1 corresponding to classical membership and degree 0 to classical non-membership). Following Williamson (1994), we could also make the vagueness a matter of our ignorance of the exact value of the threshold, where this is always sharp. We want to remain neutral regarding these options, as well as regarding how to best interpret the expression "$d_r(a,b) \leqslant \mathbf{t}_C^r$" in (1) depending on which option is chosen for modelling vagueness. (Thanks to the anonymous referee here.)

[16] See, among many others, Churchland (1989, 2007), Clark (1993), Gärdenfors (2000), Shepard (2001), and Feldman and Tremoulet (2006). For critical discussion of the similarity space approach, see Fodor and Lepore (2002, Chaps. 8 and 9).

[17] As the metrics (1) assumes are supposed to measure similarity, their symmetry might seem to conflict with experimental findings in psychology to the effect that people's similarity judgments can be asymmetric. For reasons given in Gärdenfors (2000, 112 ff), the conflict is apparent only.

one; formally, this would correspond to the addition, respectively the removal, of a similarity space to (from) S_C, resulting in $S_{C'}$. But it can also be effected by a tightening or loosening of some standards for sufficient similarity in already relevant respects, in which case the shift will formally consist in a raising or lowering of the threshold values associated with the similarity spaces corresponding to the respects. Of course, it is possible for both of these mechanisms to be in play at once. If, as was briefly suggested, we attach weights to the respects relevant in a context, then a shift in context might also consist in or involve a shift in those weights. It must be admitted that the foregoing only describes the relatively crude mechanisms behind context-shifting. The finer mechanisms, in particular those having to do with how things we assert or suggest determine and change conversational contexts, have recently been given some attention in epistemology and the philosophy of language, areas in which contextual tactics have become popular.[18] But it is generally agreed upon by philosophers who are interested in contextualist issues that still more work in this direction needs to be done.

Fourth, it may be good to note what our theory is *not*. While folk identity is "relativized," our theory should be hard to confuse with Geach's so-called relative identity theory: The latter theory relativizes identity not to contexts but to sortal concepts, in the sense that things that are the same K_1 can be distinct K_2's (with K_1 and K_2 designating sortal concepts).[19] It should be equally hard to mistake our theory of folk identity for a theory of qualitative identity. There being a great number of relevant$_C$ respects in which objects a and b differ non-negligibly$_C$ is compatible, as far as our theory goes, with rightly judging a and b to be qualitatively identical.[20]

Fifth, it is worth pointing out that (1) entails a contextual version of Leibniz's Law. Within the similarity space approach, properties are representable as regions in the domain of a similarity space; for instance, the property *blue* corresponds to a certain region in color space.[21] Let $P \subset r$ mean that P is a property representable as a region in similarity space r, and, for any object a and property $P \subset r$, define

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[18] This is especially true of epistemology, where they are among the most hotly debated topics. For some influential defenses of epistemological contextualism, see Cohen (1988, 1999), DeRose (1992), and Lewis (1996); for an early general attempt to chart the finer mechanisms behind context-shifting, see Lewis (1979).

[19] See Geach (1967, 1972); see also Deutsch (1998, 2002).

[20] How exactly the folk notion of identity relates to qualitative identity depends on how one defines the latter notion. The referee suggested to define two objects being qualitatively identical as their having zero distance in every similarity space that corresponds to an intrinsic or qualitative respect (whether or not relevant). But it might be plausible to think of qualitative identity as being a context-sensitive notion, too, in which case it would seem better to contextualize the foregoing definition by requiring only zero distance in every similarity space that corresponds to a relevant qualitative respect. Alternatively, or in addition, one might want to relax the definition by requiring a distance below a certain positive threshold value instead of zero distance. Given both the referee's definition and the contextualized version thereof, we could have that Id$_C(a,b)$ for some a, b, and C without a and b being qualitatively identical (or being qualitatively identical in C). Whether we could have this if the zero distance requirement is abandoned would depend on how the threshold values for qualitative identity are related to those for folk identity.

[21] See Gärdenfors (2000, Chap. 3) for a detailed account of the representation of properties in similarity spaces.

$D_r(a,P)$ as the smallest distance between the representation of a in r and points in the region corresponding to P in r; that is, more formally,

$$D_r(a, P) := \inf_{b \in P} d_r(a, b).$$

Furthermore, let the predicate $P(\cdot)$ denote property P. Then from (1) we obtain:[22]

$$\forall a, b \left[\mathrm{Id}_C(a, b) \rightarrow \forall r \in S_C \forall P \subset r \big(P(a) \rightarrow D_r(b, P) \leqslant \mathbf{t}_C^r \big) \right]. \tag{2}$$

The proof is straightforward: Assume the antecedent. Further assume that $P(a)$ holds, where $P \subset r$ for some $r \in S_C$. By (1) it holds that $d_r(a, b) \leqslant \mathbf{t}_C^r$, and hence, by the symmetry of the metric, $d_r(b, a) \leqslant \mathbf{t}_C^r$. Because, first, $P(a)$ holds and so a lies in region P, and thus second, by the definition of $D_r(\cdot, \cdot)$ we have $D_r(b, P) \leqslant d_r(b, a)$, it must be that $D_r(b, P) \leqslant \mathbf{t}_C^r$.

To see how close (2) is to the original version of Leibniz's Law, first observe that if $\mathrm{Id}_C(a, b)$, and $P(a)$ holds for some $P \subset r \in S_C$, then it may be that $D_r(b, P) = 0$, which means that b lies *in* region P, in which case both a and b have property P; but if $D_r(b, P) > 0$, then we will still have that b lies, while outside the region P, within a—in context C—*negligible* distance from it.[23] That is to say, although the identity of things in the above-defined sense does not entail the sharing of all properties, it does entail the *near* sharing, or better still, the *so near as to make no odds* sharing, of all *relevant* properties (as we may think of the properties that are representable in any of the similarity spaces corresponding to the relevant respects). As we might also say, within a negligible margin of error, two objects that are identical in the folk's sense have all contextually relevant properties in common. A thus contextualized version of Leibniz's Law deviates from the original one only in ways that, given a context, are negligible: In each context, the restricted version at most neglects differences that are small enough to be negligible indeed in that context; and compared to the original version, the restricted version at most fails to quantify over properties which, in the given context, count as irrelevant.

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[22] It may be noted that the consequent of (2) could also be taken to *define* folk identity. Would that yield a definition equivalent to (1)? No. To see this, let r be a one-dimensional similarity space consisting of the interval [0,1] with the Euclidian metric $d_r(a,b) := |a-b|$ defined on it. Let the properties representable in this space be $P_1 = [0,.5]$, $P_2 = [.1,.3]$, $P_3 = [.12,.4]$, and $P_4 = [.6,1]$, and let $a = .11$ and $b = .31$. Furthermore let r be relevant in C, and let $\mathbf{t}_C^r = .02$. Now $P_1(a)$ and $P_1(b)$ both hold; $P_2(a)$ holds and $D_r(b,P_2) < \mathbf{t}_C^r$; $P_3(b)$ holds and $D_r(a,P_3) < \mathbf{t}_C^r$; and neither $P_4(a)$ nor $P_4(b)$ holds (predicate $P_i(\cdot)$ denotes property P_i, for $i \in \{1, 2, 3, 4\}$). Supposing, without loss of generality, that r is the only respect relevant in C, we would have that a and b are identical$_C$ if the consequent of (2) were taken to define folk identity. However, because $d_r(a,b) = .31 - .11 = .2 > \mathbf{t}_C^r$, according to definition (1) it is *not* true that a and b are identical$_C$. (Here it is important to observe that if P is a property representable in r, then the complement of P with respect to r is not necessarily also a property representable in r, or representable in any other similarity space, for that matter. As Gärdenfors (2000, 66 ff) explains, it would be wrong to think that any region of a similarity space corresponds to a property; only regions that satisfy certain conditions do. And the class of regions satisfying these conditions is not closed under, for instance, the operation of taking the set-theoretic complement in a space.)

[23] To be mathematically precise, we should remark that if $D_r(b,P) = 0$, the point b could also be a limit point not lying within P; for example, if property P is characterized by the open interval $]0,1[$ in a one-dimensional similarity space and $b = 0$, then $D_r(b,P) = 0$ although $b \notin P$. Clearly, though, in that case it still holds true that b lies within a negligible distance from P.

Some might wonder whether (2) does not fall prey to the critique Koslicki (2005) has mounted against restricted versions of Leibniz's Law proposed in defense of other conceptions of identity, such as the restrictions to be found in Gibbard (1975), Deutsch (1998), and Parsons (2000). According to Koslicki, some of these restrictions are flawed in that they simply stipulate which properties Leibniz's Law is to be restricted to, and all of them are flawed in that they are overly restrictive, excluding properties that it would be harmless to include and that one also intuitively would expect identical objects to share. For instance, she argues that, by excluding *de re* modal properties in general, Gibbard is not just excluding properties like *being essentially a statue*, which are troublesome for his view of contingent identity, but also properties like *being fragile*, which one would expect a statue and the lump of bronze of which it is made to share (or jointly fail to have). Also, the proposal lacks any independent motivation, Koslicki thinks, and is thus both ad hoc and overly restrictive.

But (2) is neither ad hoc nor overly restrictive, we claim. It is not ad hoc because, as we saw, the restriction follows directly from (1), which in turn we take to be supported by the fact that it yields a simple and unified explanation of the data listed under (i)–(iv) and thereby a simple and unified solution to the paradoxes of identity. Nor is it overly restrictive, given that in each context it excludes precisely those properties that are found irrelevant anyway in that context. In fact, it would seem hard to press the charge of being overly restrictive against it, as it does not exclude any property in any absolute sense. For instance, it is not that, when we are in a context in which the folk judge a statue to be identical to the lump of bronze of which it is made, they are somehow absolutely excluding the property *being transformable*.[24] It is just that, taking into consideration this property, and thereby making it relevant, effects a change in context that may be expected to alter the folk's judgment that the statue and the lump of bronze are identical.

As a final comment, we should like to stress that, contrary to what some of the above phrasings might suggest, our theory is not confined to ordinary identity statements relating material objects but applies to any such statement as long as the things it relates can be represented by points in a similarity space. For instance, it seems unproblematic to think of the theory as delivering the truth conditions for ordinary identity statements concerning color shades, which are not commonly regarded as material objects: Color shades are easily located in three-dimensional color space, and various metrics exist for that. It is possible to extend the scope of the theory still further. As intimated, the similarity space approach allows us to think of properties as regions in a similarity space. So, to apply the theory to identity statements concerning colors as categories—to mention but one example—we would only need to define a metric on color space that enables us to measure distances between regions in that space, which can easily be done. In fact, an existing metric that would do the job is the so-called Hausdorff distance. For properties $P \subset r$ and $Q \subset r$, this metric defines the distance between them, $h_r(P, Q)$, as follows:

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[24] This property may be thought of as a segment (the "upper" segment) of the similarity space described in note 12.

$$h_r(P, Q) := \max\{\sup_{x \in P} D_r(x, Q), \sup_{x \in Q} D_r(x, P)\},$$

where $D_r(\cdot, \cdot)$ is as defined above.

3

We saw that our theory of folk identity furnishes a simple explanation of why ordinary identity statements have the various characteristics the paradoxes of identity exhibit them to have: These characteristics all flow directly from the meaning of the words "identity," "identical," and so on, as they occur in ordinary identity statements. For example, on this theory there is nothing unsettling about the fact that *both* the wife may seem to be right that her husband is *no* longer the same person he was at the time of their marriage *and* the judge may seem to be right that the husband still *is* the same person he was at that time: Within their respective contexts, and on a folk understanding of "same," both the wife and the judge may be right. Similarly, people may find the original ship s_0 to be identical to the ship s_1 where one plank has been replaced, s_1 to be identical to s_2 where two planks have been replaced, and so on, and yet not find s_0 identical to s_n, because, on a folk understanding of "identical," it may be that s_0 *is* identical to s_1, s_1 to s_2, and so on, and yet s_0 *not* identical to s_n; this is consistent to suppose, because folk identity is not, or need not be in all contexts, a transitive relation. It will be clear from the previous section that answers to the other questions concerning "identity" (and related words) that have appeared puzzling follow equally straightforwardly from our account.

That we are thereby able to solve, or rather dissolve, the paradoxes of identity is by itself no advantage of our approach to these paradoxes over the orthodoxy, which prefers to stick to a traditional philosophical interpretation of the identity predicate. After all, this orthodoxy, too, has produced solutions to the paradoxes, as consulting almost any modern metaphysics textbook will tell, and it is not our intention here to argue that none of these solutions really "work." Yet we do think that our approach does a *better* job in handling the paradoxes than the rival approach does.

First, our approach affords a highly unified treatment of the paradoxes. The hypothesis that the identity statements giving rise to the paradoxes are ordinary identity statements, and thus that the words "identity," "identical," "same," and so on, as they occur in these statements, are to be understood along the lines of (1), entails that, in fact, the paradoxes are not paradoxes at all. By contrast, as intimated at the outset, there is apparently no trait connecting the solutions that have come out of the orthodox approach to the paradoxes.

Second, solutions to the paradoxes follow *directly* from our proposal in that they do not require any additional metaphysical assumptions. This is an important advantage of our approach over the standard one, especially since virtually all solutions to the paradoxes of identity that the latter has delivered seem to commit one to holding things that fly in the face of common sense, be it that only the present time is real, and past and future times are unreal, be it that what we commonly think of as nonrelational properties are really relational ones, be it that objects are not

really the things we have taken them all our lives to be, be it some other prima facie untoward assumption.

Third, our account does not require us to assume that people are often mistaken in making identity claims of the sort that occur in the paradoxes, in contrast to the rival approach, on which it is for instance typically held that people are wrong when they say that the lump and the statue are identical (or, if according to the author's view the other verdict is correct in this case, that they are wrong when they say that the two are *not* identical). It should be uncontroversial that if we can solve, or dissolve, the paradoxes of identity without having to attribute massively erroneous judgments to people, then, all else being equal, we should do so.

It might be said that, on the negative side, we are postulating an extra sense of "identity" and related words, and that thereby our proposal violates a linguistic version of Occam's razor, according to which senses are not to be multiplied without necessity. But this objection would misfire. For we are clearly not *postulating* a new sense of "identity." As we said, it had been observed before that there is an ambiguity in the use of the word "identity." Our sole aim here has been to be as precise about *one* of the meanings of this word as philosophers have always tried to be about the *other* meaning—what Jubien (1997, 65 f) calls the "just-one-thing meaning"—of the word, and then to relate the thus specified notion to the paradoxes of identity. Put differently, it is not as though we have invented a new meaning for the identity predicate; we have explicated an already familiar, though by philosophers somewhat neglected, meaning and shown how elegantly the hypothesis that *this* meaning is at play in the so-called paradoxes of identity allows us to handle these paradoxes.[25]

In short, we believe our approach to the paradoxes of identity to do better than the standard one on at least three counts: It affords a unitary treatment of these paradoxes; solutions to the paradoxes flow immediately from definition (1) in that they do not require the adoption of extra metaphysical assumptions; and our approach does not require that we assume people's identity statements to be often mistaken.

To make the above rather abstract considerations a bit more concrete, and thereby to bring further into relief the merits of our approach, we want to look in some detail at a specific paradox and compare how it is handled on our approach with how the paradox has been dealt with by proponents of the rival approach. Consider, once again, the statue/lump of bronze problem. While the solutions to this problem that can be found in the literature differ in their details, they virtually all entail, as already intimated, that the statue and the lump of bronze fail to be identical. Lowe (2002, p. 72), who advocates a solution of this type, acknowledges that it has the odd consequence that different material objects may spatially coincide. He thinks this oddness can be explained away to some extent, or at any rate assuaged somewhat, by arguing that we may find the thought of differing but coinciding material objects odd because we easily confuse it with the claim that two

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[25] As the referee noted, if qualitative identity is defined in the way s/he suggests (cf. note 0), then folk identity could be thought of as a generalization of qualitative identity, which would buttress our claim that are we not inventing a new notion of identity.

material objects *of exactly the same kind*—for instance two statues, or two lumps of bronze—can coincide. Clearly, in the present case the objects are not of the same kind. This explanation is anything but satisfactory, however. For consider that we find it just as odd to think that two material objects of very *different* kinds—like a dog and a violin, for instance—can coincide, as that two statues can coincide.

We indicated that on a folk understanding of the identity predicate there may be contexts as well in which it is true that the statue and the lump of bronze are not identical to one another. In those same contexts, it will also be true to say that different material objects—material objects that are not in all contextually relevant respects highly similar to one another—can spatially coincide. Unlike Lowe, however, we have a perfectly good explanation available for why this consequence seems odd. The explanation starts by noting that in ordinary, nonphilosophical contexts we are typically not attending to any modal respects in which a statue and the lump of matter that makes it up may differ. For instance, typically when we look at a bronze statue, we do not wonder about the things that might destroy it yet not destroy the lump of bronze. This fuels our intuition that we are looking at just one object, and not two different yet coinciding ones. Generalizing over other objects we have encountered in similarly mundane contexts, we come to have the intuition that different material objects never coincide. Yet when our attention is drawn to the fact that, along various modal dimensions, the statue and the lump of bronze do differ from one another, we become inclined to accept that they are distinct objects after all. But that inclination does not all of a sudden annihilate our deeply rooted intuition that no two different material things ever coincide.

Our solution seems to have another advantage over the kind embraced by Lowe and others. These philosophers tend to invoke the notion of constitution to account for the relationship between different yet spatially coinciding objects. This notion provides their answer to the question "[I]f that relationship is not one of identity, what then is it?" (Lowe 2002, p. 73). While, as we saw, on our view it may hold in some contexts that material objects that fail to be highly similar in some contextually relevant respect can spatially coincide, we do not have to invoke an extra concept to explain the relationship between such coinciding objects. Even in a context C in which we consider modal dimensions of evaluation, and thus rule that the statue and the lump of bronze are nonidentical, it will typically be true that the objects are highly$_C$ similar in *most* relevant$_C$ respects. Thus, on the proposed folk interpretation of "identical," it would make sense in that context to say that the objects, though distinct, are *close to being identical*. It is hard to see what further illumination is to be gained by introducing the concept of constitution for the purpose of describing the relationship between the objects, if the folk account of identity already endows us with a notion—that of near-identity—that can do the requisite explanatory work.

In closing, we should like to address a question that may be raised by the foregoing. The question is as follows: If there is really this contextual folk notion of identity at play in the paradoxes of identity, then how come this has not been clear from the start? Differently put, why at all have *philosophers* taken these paradoxes to be paradoxes of identity, if they do not involve the traditional *philosophical* (just-one-thing) concept of identity?

First note that, for better or for worse, in metaphysics no less than in other areas of philosophy, we tend to appeal to linguistic intuitions to support or criticize particular positions, where by "linguistic intuitions" we mean something like judgments that we would pre-reflectively, or clearer still, pre-philosophically, make. This is true with a vengeance for the part of metaphysics concerned with the paradoxes of identity, which come in the form of homely stories together with a typically explicit appeal to "what we would ordinarily say." So, in discussing these paradoxes, we *qua* philosophers give pride of place to intuitions about which identity statements we *qua* ordinary people would find it reasonable to make and which not. That is to say, while intending to discuss the philosophical notion of identity, we heavily draw on intuitions about statements that involve a different concept of identity, or so we have been urging.

A second thing to notice is that the ambiguity of the identity predicate that we and others have pointed at is not of the customary type that we find in, for instance, "bank" (financial institution vs. ridge) or "cape" (body of land vs. short cloak). The philosophical and the folk concept of identity are intimately related. Recall, in this respect, that the folk notion of identity satisfies a close cousin of Leibniz's Law. Also recall that the folk relation of identity is, like the philosophical one, both reflexive and symmetric. And while folk identity is not transitive, ordinary identity judgments may still *typically* be supposed to be transitive. Paradoxical cases in which transitivity breaks down appear to be abnormal in the straightforward statistical sense that they are rarely, if ever, considered in daily life. (When, outside the philosophy classroom, did you ever even contemplate whether or not a ship with a number of planks replaced was identical to the original ship?) And still in the same connection, we note that it will obviously hold that if a and b are identical in the philosophical sense—they are one and the same object—then, for every context C, a is identical$_C$ to b; supposing a rich enough arsenal of similarity spaces, we may also have that if, for every context C, a is identical$_C$ to b, then a and b are one and the same object.[26]

What is more, in every context C, a judgment to the effect that two things are identical$_C$ may plausibly be assumed to "feel" like a judgment as to their identity in the philosophers' sense. After all, it is easily conceivable that people mistake the restricted quantifier "for all contextually relevant respects," which is part of the meaning of the identity predicate on the folk interpretation, for an unrestricted one, given that in each context they are attending solely to respects relevant in that context; that is, the restriction may easily go unnoticed precisely because the respects outside the domain of quantification are ones that are being ignored in the given context. Much the same applies to the possible differences in relevant respects between things that are identical$_C$ in C: These differences are negligible in that context, so, in that context at least, we neglect them.

We believe that, in view of these facts, it should be unsurprising that even in philosophical discussions the folk notion of identity, which on our analysis occupies

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[26] The latter claim seems unproblematic for ordinary objects. For elementary particles, it may be more controversial; see Muller and Saunders (2008) and van Fraassen and Peschard (2008) for recent discussion.

center stage in the paradoxes of identity, is easily conflated with the traditional philosophical notion, which we believe not to be jeopardized by these paradoxes.

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