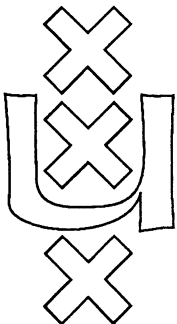


Institute for Logic, Language and Computation

**IDENTITY
QUARRELLING WITH AN UNPROBLEMATIC NOTION**

Jacques van Leeuwen

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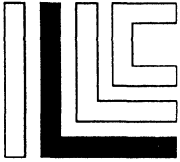
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IDENTITY

QUARRELLING WITH AN UNPROBLEMATIC NOTION

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Identity

Quarrelling with an Unproblematic Notion

Jacques van Leeuwen

abstract

This paper has two parts. In the first part a progressive series of questions about identity is answered. As a preview I shall list the questions, and, if possible, the one-word answer which is argued for in the text:

- are there genuine questions of identity? (yes)
- why can there be problems of identity if identity is such a simple and unproblematic relation?
- how can it be guaranteed that in each specific identity statement the relevant criterion of identity is co-satisfiable with the general structural properties of identity (especially the principle of indiscernibility)?
- does the fact that there are incompatible criteria of identity imply that the basic properties of identity must be denied for the corresponding identity relations? (no)

The second part of the paper deals with the treatment of identity in possible world semantics. The interplay between identity, reference, quantification and intensional operators has been frequently discussed in the literature on possible world semantics. I hope to shed some new light on these discussions with the help of the philosophical insights exposed in the first part of the paper. I shall concentrate thereby on the opposite approaches of Kripke and Hintikka in their treatment of cross-world identity. The first two sections contain a critical study of the philosophical motivations of these writers. In my opinion, the use of alternative "world lines" in Hintikka's approach is important for the purpose of knowledge representation. In the last section I propose to use world lines in order to represent the identifications of a subject of knowledge, including cases of misidentification. In this way a drawback of Kripke's approach is overcome.¹

¹ An earlier draft of this paper has been read in the Symposium Logic, Language and Philosophy, Nederlandse Vereniging voor Logica, febr. 15, 1992, Utrecht and in the Leyden Seminar on the Philosophy and History of Logic of the University of Leyden. Many people have commented on it, but I want to thank especially Renate Bartsch, Martin Stokhof and Frank Veltman.

I.1

The first question I want to discuss is whether there are genuine questions of identity. In his book *On the Plurality of Worlds* David Lewis makes the rather provocative statement that there are no problems of identity. He says:²

Identity is utterly simple and unproblematic. Everything is identical to itself; nothing is ever identical to anything else except itself. There is never any problem about what makes something identical to itself; nothing can ever fail to be. And there is never any problem about what makes two things identical; two things never can be identical. ... We *do* state plenty of genuine problems in terms of identity. But we *needn't* state them so. Therefore they are no problems about identity. Is it ever so that an F is identical to a G? That is, is it ever so that the same thing is an F, and also a G? More simply, is it ever so that an F is a G? The identity drops out.

Lewis' characterization of identity is true enough, though circular: it is blatantly circular to say that nothing is identical to anything else. However, I don't agree with Lewis that there are no problems of identity. There are problems in terms of identity which cannot be reduced in such a way that identity doesn't play a role anymore. Consider a reduction along the lines proposed by Lewis:

- 1 Is it ever so that a mouse is identical to a heap of molecules?
- 1' Is it ever so that a mouse is a heap of molecules?

I want to state that either identity did not drop out at all in 1', or the reduction is not right. This is because the *is* in 1' is either the *is* of identity or it is not. In the last case it may be that the *is* means something like *is coincident with* and 1' asks whether it is ever so that a mouse and a heap of molecules occupy the same region of space at a time. This is not the same question as 1, in my opinion. But perhaps the example is not entirely convincing because it is highly involved theoretically. A full evaluation of it would have repercussions for one's stance in the dispute about absolute or relative identity. I don't want to be ahead of a decision about that. I come to it in section I.4. Let us consider now a more homely example:

² D. Lewis 1986, *On the Plurality of Worlds* p.192,3.

2 The mouse which my cat caught last night is the same as (the) one which has eaten from my cheese.

2' The mouse which my cat caught last night has eaten from my cheese.

In the reduction sentence 2' identity does not appear on the surface indeed, but it did not drop out really. There is an identity problem involved in the question whether 2' is true. This is because the truth condition of 2' requires reidentification of the mouse in the mouth of my cat in happier parts of its history. Of course, this example stands for many. After all, it appears not only that Lewis fails in his trials to analyse away identity in contexts where it is present, but also that identity is involved in many predications in which it seems to be absent.

I.2

The second question I want to raise is: why can there be problems of identity if identity is such a simple and unproblematic relation? Of course, this question is closely akin to the question how it can be that some identity statements are informative. It also resembles this question in the respect that much can be learned from the writings of Frege. I have especially in mind some very illuminating statements in Frege's *Die Grundlagen der Arithmetik*. The first is a requirement on the introduction of a name for a (self-subsistent) object:³

If we are to use the symbol a to signify an object, we must have a criterion for deciding in all cases whether b is the same as a , even if it is not always in our power to apply this criterion.

This remark is formulated as being about names, but its range is much wider. Let me explain. If we present some object, that object can only be a self-subsistent object, (this expression is used by Frege in the same work), if it is determinate, in principle, how it can be recognized as the same again when it is given in a different way. The idea is, of course, that an object presented in a particular act of thinking can not get any degree of independence (or separate identity) if it is tied up wholly with the particular way in which it is presented in that particular act of thinking.

An answer to our second question begins to stand out. Identity is a relation between self-subsistent objects and it is a very simple one, indeed. But there may nevertheless be problems of identity, because for us, for human thinkers, a self-subsistent object is never directly accessible: it can only be given indirectly, by way of some mode of presentation, in some concrete context, etc. Perhaps one may say that the

³ Frege *Foundations of Arithmetic*, translation by Austin, par. 62

presentation of an object in an act of thinking or perceiving is always incomplete in a sense. In any case, it does not comprise all the characteristics or properties of the object. This phenomenon has induced some writers to take not objects as the basic elements of their ontology, but things which Castañeda calls "guises", objects-in-a-certain-guise, in a certain appearance, whereby the appearance is intrinsic to the thing, so to speak.⁴ This view is exaggerated, to my mind, and it is also certainly not Frege's. Frege's view would be that the guise and also the mode of presentation must be considered as being extrinsic to the object, the object itself being self-subsistent and not dependent on any particular thought of it. A statement of Frege which is particularly illuminating in this respect can be found again in *Die Grundlagen der Arithmetik*:⁵

The way of introduction of an object should not be treated as a property of that object.

I agree with Frege's view in this, though I want to make a remark in a moment which induces perhaps some qualification of it. At any rate, these considerations, even if they are qualified in a certain manner, suggest an answer to our question: there are problems of identity because there are many situations in which we don't know whether an object, presented in some way at one occasion is "in reality" the same object as an object presented in another way, mostly at another occasion. Note that the simpleness of the relation of identity- in any domain of objects the minimal reflexive relation- is not at variance with the possibility of such problems of identity, but that, to the contrary, it is presupposed in these problems.

Now I want to make the remark which I have promised. The statement that the way of introduction of an object is not a property of the object is perhaps too strong. For example, directions can be introduced as equivalence classes of lines under the relation of parallelism and what stops us then from saying that it is a property of a direction to be a certain equivalence class? Perhaps the consideration that a direction can be introduced in quite another manner. One may introduce directions alternatively, for example, by identifying them every time with some unique line from an equivalence class. But even if this is granted, one can say that the alternatives in ways of introduction of a certain kind of object are severely bound and that the supposed structure underlying these strictures must surely be considered to be a genuine property of the objects defined. But this qualification does not deny the possibility that one and the same object can be introduced in several

⁴ See e.g. Castañeda 1974 'Thinking and the Structure of the World, Discours d'ontology' in *Philosophia* vol 4.

⁵ Frege *Foundations of Arithmetic*, translation by Austin, par. 67. The quotation could not be literal, because Frege's statement is in the context of a longer sentence.

ways, and that the particularities of these ways should not be treated as properties of the object.

The solution of the second question implies also a natural explanation of why a certain other principle plays an important role in identity, though identity is already completely characterized, as we stated above. It is the so-called *principle of indiscernibility of identicals*, and it says that identical objects share all their properties. The principle is only trivially true in view of the simple characterization of identity. Its significance must be understood otherwise. It can be explained by the considerations about the human situation sketched above: if we attribute a certain property to a certain object we must always make use of some way of presentation of the object. The point of the principle then is that the question whether the property can rightly be ascribed to the object must not be dependent on the particular way of presentation. Mostly, the principle is schematically represented by:

If $a=b$, then for all properties F : if Fa , then Fb .

With a shift of focus this becomes:

For all properties F : if Fa , and $a =b$, then Fb .

In line with the requirement on the introduction of a name for an object quoted above we now meet a requirement on the introduction of a predicable of an object. For a predicable P which is introduced as signifying a property of an object a it must be true that if Pa and $a=b$, then Pb . This principle holds generally. There are cases in which it seems to fail, but these cases do not really contradict the principle. If we have a case of some predicable P , for which it holds that Pa and $a=b$ and for which Pb does not hold, the predicable is not an appropriate predicable for the object denoted by a , or so I want to argue. For example, $2/3$ and $4/6$ denote the same object, namely a certain rational number, and the following three sentences seem to be true:

$2/3$ has denominator 3

$4/6$ does not have denominator 3

$2/3=4/6$

Here we have a case in which substitutivity fails and in which the principle of indiscernibility of identicals seems to be violated. However, the last is not the case. We draw another conclusion, namely that the predicable *has denominator 3* is not an appropriate predicable for the object which is denoted both by $2/3$ and $4/6$. For if it would be an appropriate predicable for that object, it cannot be simultaneously true and false of it.

The point of examples like this is that predicables which would apply to an object if it is presented in some mode, but would not apply if the object is presented in another way cannot be accepted as viable predicables for that object. Perhaps they can be viable predicables for an object of another kind, an object which would have structurally different identity conditions. For example, the predicable *has denominator 3* would be a viable predicable for fractions construed as ordered pairs of integers, but these would be objects which structurally differ from rational numbers, and the sentence $2/3=4/6$ would not be true if $2/3$ and $4/6$ would denote objects of that other kind.

It flows from this account that the principle of indiscernibility, though it is in fact a necessary and perhaps even a sufficient condition for identity, cannot constitute the concept of identity. The reason is that in the quantification over properties (signified by predicables) it must be presupposed that only appropriate predicables for the kind of object in question are allowed and it cannot be determined in the absence of a criterion of identity of these objects what predicables are viable.

I.3

Frege's requirement on the introduction of names owes its significance to factual existence of a variety of criteria of identity. Dummett attributes to Frege also the thesis that there is not a single criterion of identity of objects of all kinds and indeed there is a lot of evidence for that. But Frege has not given a comprehensive account of this thesis, and perhaps that's why, after the revival of Frege some decades ago, Frege's remarks on identity have given rise to nearly opposite views on identity. In the next section I come back to that.

Dummett explains Frege's requirement on the introduction of a name as implying that a criterion of identity is contained in the sense of a name. To quote:⁶

Merely to know that a name has as its referent an object with which we are confronted, or which is presented to us in some way, at a particular time is not yet to know what object the name stands for: we do not know this until we know, in Frege's terminology, "how to recognize the object as the same again", that is, how to determine, when we are later confronted with an object or one is presented to us, whether or not it should be taken to be the same object.

Let us stipulate here what is meant by me, and by Dummett and Frege, I think, with the notion of a criterion of identity:

⁶ Dummett 1973, *Frege Philosophy of Language* p.545

A *criterion of identity* is a rule according to which we judge whether an object given in one situation or in one mode of presentation is identical to an object given in another situation or another mode of presentation.

The criterion of identity, which must be associated with a name, is not uniform for all names: it depends on the kind of thing the name is intended to stand for. For example, the criterion of identity which governs correct reidentification of a living organism is quite different from the criterion of identity which governs reidentification of a heap of molecules. (The heap is certainly not reidentified correctly if some molecule is lacking, and this is not the case for the organism). Therefore, if I want to name something before me which attracts my attention right now, the action would be otiose if I am not clear about what I intend to name; for example, if it is not decided whether it is some living being in front of me or just the sum of the materials present there. For naming would be pointless if we could not use the name again on new occasions in order to denote the same thing. And we would be principally unable to do so if the name did not determine a criterion of identity which governs the reidentification of the named thing.

The next observation is that names may share their associated criterion of identity. Mostly, names can be grouped under a general name, a common noun. The common noun determines a certain criterion of identity and this criterion is associated with all proper names which fall under the common noun. For example, names of individual cats share the criterion of identity which is determined by the common noun *cat*. Here an old distinction is revived, which goes back to Aristotle, the distinction between substantival terms which denote kinds of things (primary substances in Aristotle's sense) and adjectival terms and verbs, which denote qualities, relations, actions, states, etc. of things.⁷ The distinctive mark has been found now in the fact that substantival terms determine a criterion of identity for the things which fall under them, the other group of terms do not: they only determine a criterion of application and either do not imply anything about the identity principle of the things to which they apply, or presuppose that the identity has been determined otherwise, i.e. not by their own meaning or sense.

I formulated the distinction as one among general terms, but of course, more fundamentally, the distinction applies to the concepts which these terms denote. The content of a concept of the one class, a sortal concept, implies a principle of identity for the things which fall under it, whereas for a concept of the other class, a quality-concept for example, this is not the case. Nearly parallel to this distinction between

⁷ See e.g. Aristotle, *Categories* 3 b17-21

different kinds of concepts and in its wake the semantic distinction between the general terms which stand for these concepts there is the independent syntactic distinction between substantival terms on the one hand and adjectival terms and verbs on the other hand. The syntactic distinction and the semantic distinction must not be conflated, for the former, not the latter is dependent on the contingencies of syntax of a language.

However, it is not by sheer coincidence that the two distinctions nearly coincide. This fact can be explained. A very important syntactic mark of common nouns is that they, in contrast to adjectives or verbs, combine with determiners and quantifiers in order to form expressions which can fill the argument places of predicates. For example, the sentence forms

All X are Y

The X which was Z is now Y

Five X are Y

turn only into grammatically correct sentences if a common noun or a nounphrase is substituted for X. Now, under the assumption that common nouns stand for sortal concepts a natural explanation for this syntactic mark is available, namely that substantival terms and not verbs or adjectival terms determine a criterion of identity. It is just this fact about substantival terms that qualifies them for their role in quantification and reference, because quantification over objects and reference to objects presupposes that the identity of these objects is well determined and this is guaranteed then by the presence of a substantival term.

But the point of the semantic distinction between substantival terms and other general terms can be shown more directly too. For example, the general term *mouse* determines what counts as particular instances which fall under it, individual mice, and what counts as occurrences of the same particular. On the other hand, a general term like *white* does not determine what counts as particular things which fall under it. Such things may vary structurally in kind: there are many kinds of white things, white mouses, white parts of mouses, white clouds, white surfaces, white light and whatever, and these kinds may vary in the associated principle of identity. That principle of identity has not been determined by the conditions contained in the meaning or sense of *white*. On the other hand, though one can say, perhaps, that there are many kinds of mice, these kinds do not vary in the associated principle of identity, and I claim that the common principle of identity for mice is contained in the meaning or sense of *mouse*.

The presence of a variety of criteria of identity induces a certain problem. For a determinate question of identity some specific criterion of identity

must be determined and the question I want to raise is how it can be guaranteed that in each specific identity statement the relevant criterion of identity is co-satisfiable with the general structural properties of identity (especially the principle of indiscernibility).

This problem has been posed explicitly by Brody. He thinks that the principle of indiscernibility plays a role as a general criterion of identity. But I argued in the preceding section that it cannot play such a role. Let me quote Brody's question:⁸

If you have a view (because of Leibniz' Law) that a certain condition C is necessary for identity, then the adoption of the view that some other condition C* is sufficient for identity of a certain type of entity commits you to the claim, that C* can be satisfied by entities of that type only when C is. Since these conditions often seem unrelated, and, consequently these commitments often seem to be unjustified, this result casts doubt upon theories of identity that contain both of these conditions.

I think Brody's question can be answered. It can be guaranteed a priori that specific criteria of identity do not contradict the principle of indiscernibility. My answer begins by repeating that the principle of indiscernibility cannot constitute the concept of identity of a specific kind of objects. In our search for criteria of identity indiscernibility is not an original source of evidence. Rather, the situation is, as Butchvarov states, that we enforce the indiscernibility of what we have judged otherwise to be identical.⁹

A major example, in my view, is our conception of continuants, things which persist through time, like horses, flowers, tables and bikes. Their properties change through time, though they remain the same things. For example, consider a flower by day and a flower by night, and suppose that they have different form, and that several other properties are not shared. Indiscernibility would let us judge that they are distinct things. However, we do not always judge in this way. In many cases we judge that the flower by night is the same flower as the one by day. How is this possible? The answer is that we conceive the particulars involved as *continuants*, i.e. as things which may be present at several times and which may have incompatible properties, at different times. This I accept as a datum. (Some philosophers, David Lewis for example,¹⁰ refuse to accept it as a datum). The contradiction with indiscernibility can be reconciled by not attributing to these things the property of having a certain form, colour, etc., absolutely, but by ascribing these properties only

⁸ Brody 1972 'Locke on the Identity of Persons' in *American Philosophical Quarterly* 9, p. 331

⁹ Butchvarov, *Being qua Being*, p. 66

¹⁰ See e.g. D. Lewis, 1986, *On the Plurality of Worlds*, p.202 ff.

indexed by a certain time. For example, yesterday, a table, it is clean; today, again a table but it is dirty. This does not induce us to conclude that these tables are distinct things. The table yesterday and the table today can be judged to be the same thing by saying that they share the attributes of being clean yesterday and being dirty today. And this move prevents the criterion of identity of tables from colliding with the principle of indiscernibility.

In principle, the possibility of enforcing indiscernibility is always open, if we want to treat certain things as identical. Butchvarov presents an unusual example which may be instructive:¹¹

Consider two persons, John and Mary. *Prima facie*, they differ in many respects; one is tall, the other short. But *if* we were willing to assert that they *are* one and the same individual (not just parts of one and the same scattered individual), say Joma, such alleged discernibility would not stop us at all. We could easily avoid the appearance of discernibility by saying that Joma is male here and female there, that Joma is both here and there, though known here as John and there as Mary, that Joma is tall and male here but short and female there.

I conclude that, as an answer to Brody's question, it can be ensured a priori that identity statements made on the basis of a specific criterion of identity satisfy the requirement of indiscernibility. This line of thought is certainly not alien to Frege as may be illustrated by his treatment of abstract objects like directions, word types, rational numbers, etc.. All these objects can be constructed from other kinds of object by means of an equivalence relation; e.g. directions by means of the equivalence relation of parallelism defined on a domain of lines. Directions can be defined such that it holds that:

for all lines x and y : the direction of x is identical to the direction of y ,
iff x is parallel to y .

Predicables for directions are mostly induced by predicables on lines. The requirement on the introduction of appropriate predicables is at work here: only predicables for which parallelism is a congruence relation induce appropriate predicables. For example, if one wants to introduce *is square to** as a predicable on directions by:

the direction of a is square* to the direction of b iff a is square to b .

one has to verify that the following holds:

¹¹ Butchvarov, *Being qua Being*, p. 67

For all lines x, y and z , if x is square to z and x is parallel to y , then y is square to z .

The case of directions does not stand alone. The examples presented earlier, namely that *has denominator 3* is not an appropriate predicable for rational numbers and *is in John's handwriting* is not an appropriate predicable for word-types (as contrasted with word-tokens) are cases in point. They are repeated here because they illustrate nicely how it can be that the principle of indiscernibility is reconciled in each case with a specific criterion of identity.

I.4.

As I said earlier, Frege's remarks on identity have given rise to nearly opposite views on identity. The observation that there are incompatible criteria of identity seems to imply that there are in fact several relations of identity and the question arises whether the basic logical properties of identity hold for each of these relations. Though Frege's view on this question should be clear (cf. the preceding section¹²) the observation above has led to a nearly opposite view, the so-called "relativistic view of identity", put forward, for example, by Geach.¹³ Geach stresses the fact that different substantival terms may determine different criteria of identity, and lets it follow that the identity sign, in the absence of a substantival term does not denote a definite relation. The expression *is the same as* does not denote a determinate relation, only expressions of the form *is the same F as* denote well determined relations. Only the latter have a definite criterion, namely the criterion of identity associated with the substantival term, and there is not one criterion which would hold for all of them.

The specific relations of identity are equivalence relations, that is true enough, but according to Geach they need not satisfy the principle of indiscernibility, i.e. it is not generally true that

if x is the same F as y , then x and y share all their properties

For Geach does not exclude the possibility that there are objects which are identical according to one identity relation, but distinct according to another; i.e. that they satisfy the criterion of identity associated with one substantival term but do not satisfy the criterion of identity associated with another one. He provides putative examples for this situation. Geach admits the above possibility and therefore he must reject the indiscernibility of F -identicals: F -identicals a and b may be discernible,

¹² Cf. also Perry 1970

¹³ Geach, several writings, e.g. Geach, P.T. *Reference and Generality: An Examination of Some Medieval and Modern Theories*.

because it is possible that they do not share a predicable of the form *being the same G as a*.

These developments from Frege are alien to Frege, as has been stressed more than once, in an early stage by Perry,¹⁴ and later by Dummett. Most logicians don't take the relativistic view of identity seriously at all, because they consider the incompatibility of the view with the principle of indiscernibility to be more than sufficient evidence against it. Basically I agree with that, but a difference with most of them is that I want to take seriously the presence of a variety of identity criteria, and investigate how this fact can be compatible with a general logical notion of identity. This line of thought is consistent with Frege. Let me explain that. In Frege's` view specific identity statements can be analysed as follows:

a is the same F as b, iff a is an F and b is an F and a =b.

Geach rejects this analysis. According to him the third conjunct in the analysans makes no sense as it stands. Moreover, if the analysis is right, examples in which a is the same F as b, but a is not the same G as b, are impossible. Apart from these considerations on the basis of Geach's view, one may think that the analysis moves in the wrong direction altogether. For in the analysandum it is explicit which criterion of identity is involved, and in the analysans it is not, it seems. But that's appearance: it is not explicit in the third conjunct a=b, but it is implicitly determined by the other conjuncts that a and b are F's. That is , they are objects for which the identity principle is determined by the substantival F, and identity of objects of a certain kind must be judged according to the identity principle associated with that kind.

In my view, Geach should be criticized, because he underestimates the scope of the specific criteria of identity. Let me explain. I agree with Geach that identity criteria are specific and that there is not a single general criterion. One can even say that in every case it is only by a specific criterion that identity is determinate. But the scope of identity criteria extends beyond that: they also determine the objects of the identity relation. One can equally say that it is only by a criterion of identity that these objects are determinate. But if this is conceded, the absoluteness of identity can be maintained.

This criticism can be made concrete by a close examination of the alleged examples which must show that identity is not an absolute relation. According to Geach the following propositional function is satisfiable:

x is the same statue as y, but x is not the same lump of clay as y.

¹⁴ Perry.1970, 'The Same F' in *Philosophical Review*.

I don't want to go into the details of the specific examples here, and I want to confine myself to a basic point of criticism which strikes all of them. My criticism against this kind of example is that the x's in the two conjuncts must refer to the same object, and the y's too. However, it is not clear at all what objects are meant here, and what kind of sameness is involved. As soon as one begins to be explicit about that, it appears that we no longer have a genuine example of objects that are identical according to the F-criterion, but distinct according to the G-criterion. For example, is the sameness of the x's in the two conjuncts determined by the relation of being the same statue, or is it determined by the other one of being the same lump of clay. It makes all the difference; in this I agree with the relativist. But if it is decided that the first alternative holds, the second conjunct makes no sense, because we would be asked to judge the identity of objects according to a criterion which is at variance with their own principle of identity. A similar argument holds of course, if the second alternative is chosen. Typically, the relativist is unwilling to choose at all. He wants to judge the identity of objects without having determined about which kind of objects he is thinking. Moreover, he withdraws expressly any specification of that which would imply an identity principle. In my view this way of thinking is incoherent.

My diagnosis is affirmed by the study of a characteristic example of Geach's.¹⁵ He introduces an artificial substantival term *surman* by stipulating that:

a is the same surman as b, iff a and b are men having the same surname.

Further, it is said that surmen are just men, i.e. men of flesh and blood. For Geach the relation *is the same surman as* is an equivalence relation over the same domain of objects as that of the relation *is the same man as*. And, one could foretell it, there may be objects in that domain which are the same surman, but not the same man. My line of argument against this procedure would be, of course, that if the relation *is the same surman as* really functions as an identity relation, the objects for which the relation obtains must be constituted according to the criterion of this identity relation. And then they are objects of another kind or category than men. The category would determine also another range of appropriate predicables applicable to objects in the category. Not so for Geach: he insists that without any provision properties of men can be applied to surmen and make sense in these cases. For example, we can say of a surman that he lives in Leeds, has black hair, etc. This is rightly

¹⁵ Geach 1972 'Identity' in *Logic Matters*, p.245ff.

criticized by Dummett.¹⁶ He shows that Geach's stipulations yield odd results. Consider sentences of the form:

Some F is both P and Q

Such sentences are just true in case there are objects x and y such that x is P, y is Q and x is the same F as y . But if this is conceded, Geach's stipulations imply that:

Some surman lives in Leeds and does not live in Leeds
(simultaneously)

For, under Geach's assumptions, the propositional function x *lives in Leeds*, y *does not live in Leeds and x is the same surman as y* is satisfiable. I agree with Dummett's conclusion that Geach is mistaken in his view that after laying down the identity criterion for a substantival term no requirements are needed for viable predicables of objects that fall under the substantival.¹⁷ If F is a substantival term, then viable predicables P of F's must satisfy the requirement:

if x is the same F as y and x is P, then y is P

Of course this is a specification of the general requirement on appropriate predicables of objects which we have met in section II. It corresponds in fact with the principle of indiscernibility of F-identicals, and Dummett's criticism supplies a nice argument in addition to my main argument in favour of that principle and against the relativistic view of identity.

Finally, I want to stress that my main argument does not appeal at all to the principle of indiscernibility. It only draws from presuppositions which the relativist has to acknowledge. After all, the case against indiscernibility of F-identicals disappears. The reader may guess already why, but I shall shortly explicate the reason because of the importance of the point. If a is the same F as b then a and b are F's and constituted according to the identity criterion associated with F. If G is a substantival with a different identity criterion, a and b cannot be G's. The alleged property of *being the same G as a* , which would discern the F-identicals a and b , is not an appropriate property for F's at all, because it does not make sense to ask whether objects constituted according to some identity principle are identical according to a different identity criterion. As regards Geach's example above, it appears that it is not only unduly artificial, but even impossible. The first requirement on *surman*, that surmen are men of flesh and blood, is incompatible with the second, about being the same surman, because the first implies that surmen and

¹⁶Dummett 1981, "Geach on Identity" in *The Interpretation of Frege's Philosophy*, p.207ff.

¹⁷ Dummett o.c. p.209.

men share their identity conditions. So, after the first requirement, there is no margin at all to stipulate something new about the identity principle for surmen. As soon as this is recognized the force of Geach's example is rebutted. I conclude that the fact that there are incompatible identity criteria does not imply that the basic properties of identity must be denied for the corresponding identity relations.

II.1.

In the last decades identity has been frequently discussed in connection with possible world semantics. Identity is a crucial notion in possible world semantics. It is not only relevant in the interpretation of identity sentences, it has a role much more fundamental. It plays a structural role in the interpretation of sentences with an intensional operator, both singular sentences and quantified sentences with the intensional operator within the scope of the quantor. This is because identity of individuals across worlds is involved in the interpretation. This fact is surely the main reason for the extensive discussion about identity among modal logicians, semanticists and philosophers of logic. However, these discussions have not led to anything like a general agreement among these people. It may be useful to study the relevance of the philosophical discussion on identity of the first part of the paper for the discussions on identity in possible world semantics. But the scope of this paper prevents me from being anything like complete. I shall concentrate on two opposite approaches in the treatment of "cross-world identity, namely those of Kripke and Hintikka. Thereby I shall presuppose that the reader is familiar with the main arguments in their work.¹⁸

In the philosophy of intensional logic two problems of identity are central: the problem of substitutivity of identicals in intensional contexts and the so-called problem of cross-world identity. It will appear that the problems are intertwined in a rather complicated manner. Substitutivity of identicals (SI) is a rule of inference. It says that expressions referring to the same object are interchangeable in sentences *salva veritate*, i.e., if S stands for a declarative sentence:

$$\begin{array}{l} a=b \quad S(a) \\ \hline \text{hence } S(b) \end{array}$$

Substitutivity of identicals is closely related to, but must not be confused with the principle of Indiscernibility of Identicals, that identical objects share all their properties (cf. sect. I.3). The two would amount to the same if all objects could be referred to by singular expressions and the contribution of these singular expressions to the truth conditions of a

¹⁸ Another important question which relates the philosophical view on identity of the first part of the paper with possible world semantics is not discussed in this paper. It is the question whether the intrinsic connection between common nouns and identity (see sections I.3 and I.4) can be represented in a system of intensional logic. Dummett (1973 and 1981) and Gupta(1980) have opposite answers to this question. My view is different both from Dummett's and from Gupta's. It is exposed in the second chapter of my dissertation and must wait for another publication.

sentence would always be exhausted by their reference. As a matter of fact SI fails in intensional contexts, but the failure of SI is compatible with the validity of the principle of Indiscernibility of Identicals. For it is plausible that in intensional contexts the contribution of these singular expressions to the truth conditions of the sentence is not exhausted by their reference (at the point of evaluation, in the actual world). In intensional contexts also the references of the singular expressions at other indices than the actual world are involved in the truth conditions. So far, Kripke and Hintikka surely agree¹⁹. They disagree about the bound variable form of Substitutivity of Identicals.

$$(1) (x) (y) (x=y \rightarrow (Fx \rightarrow Fy))$$

and on the necessity of identity, which is a consequence of (1) and the necessity of self-identity, $(x) \Box (x=x)$,

$$(2) (x) (y) (x=y \rightarrow \Box x=y)$$

Kripke says:²⁰

What pairs (x,y) could be counter-examples? Not pairs of distinct objects, for then the antecedent is false; nor any pair of an object and itself, for then the consequent is true.

And he continues:

If a and b are rigid designators, it follows that $a=b$, if true, is a necessary truth. If a and b are not rigid designators, no such conclusion follows about the statement $a=b$ (though the objects designated by a and b will be necessarily identical).

All this seems to be crystal clear. However, Hintikka thinks otherwise; he admits the possibility that the bound variable form of Substitutivity of Identicals fails, and denies the necessity that identity between individuals carries over from one world to another. Further, as we shall see later, Hintikka will relativize the very notion of a rigid designator, and in any case he would deny SI even for cases where a and b are proper names, whilst Kripke would accept SI in these cases, as a consequence of his supplementary thesis that proper names in natural language behave as rigid designators. How can this be? Is Hintikka denying here the self evident principle of Indiscernibility of Identicals? A more careful study reveals that this is not the case. In fact, Kripke and Hintikka do not interpret (1) in the same way, if F contains an intensional operator. Let

¹⁹ See e.g. Kripke 1980 preface, Hintikka 1989, essay 4.

²⁰ Kripke 1980, p.3

me show this by comparing the ways in which Kripke and Hintikka interpret the sentence

$$(3) (\forall x)(\forall y)(x=y \rightarrow (\Box Gx \rightarrow \Box Gy)).$$

where G does not contain any intensional operator. For Kripke (3) is true in a world w_0 if and only if

for all pairs of identical objects (x, y) in the domain of w_0 it holds that if for all worlds w which are alternatives for w_0 G holds of x in w , then for all such worlds w G holds of y in w .

In this truth condition the identities between objects of the different world domains are assumed to be given: the x and y from the domain of w_0 must recur in the domain of w , for otherwise the question whether G holds of each of them in that world would not make sense. (The same assumption is present in the very notion of a rigid designator.) Several philosophers have seen a problem in cross-world identification, but Kripke has rebutted their quarrels for a good deal, as we shall see in a moment.

Hintikka does not take cross-world identities as primitive in his use of the framework of possible world semantics. In Hintikka's model theory²¹ one has to specify a subclass of the class of individual concepts (i.e. functions which take as their arguments possible worlds and give as their values objects in the corresponding world domain). Elements of this subclass (F) are called *individuating functions* or *world lines*, and they serve to connect individuals from the various domains. Individuals which are connected by some individuating function are just the individuals which are supposed to be identical in the absolute approach of Kripke. The truth condition of (3) now reads:

for all pairs of identical objects (x, y) in the domain of w_0 it holds that if for all worlds w which are alternatives for w_0 and for all individuating functions f in F with $f(w_0)=x$: G holds of $f(w)$ in w , then for all such worlds w and for all individuating functions f in F with $f(w_0)=y$: G holds of $f(w)$ in w .

A consequence of this truth condition is that the bound variable form of SI, i.e. (1) above, only holds if, in Hintikka's phrase, "branching" is excluded.²² This is the case if and only if the class of individuating functions is *separate*, i.e. if F has the following property:

²¹ See e.g. Hintikka 1969A

²² Note that in Hintikka's approach also $(\forall x)(\Box x=x)$ is not valid, unless branching is excluded.

if two functions from F coincide at one index they coincide at each index

In other words, individuating functions are either equal (coincide at every index) or separate (do not coincide at all). According to Hintikka no conclusive argument has been presented for the impossibility of branching. He says:²³

One of Saul Kripke's putative arguments for SI [Hintikka means here the bound variable form of the necessity of identity, JvL] consists in first pointing out that the validity of SI amounts to ruling out branching. Then he answers that a branching situation involves a violation of the transitivity of identity: one individual in (say) the actual world would be identical with two members of an alternative world. These two would not be identical even though by transitivity they ought to be. Hence he takes SI to be inviolable.

This line of thought is patently circular, however. Transitivity of identity can mean two different things, either transitivity in one and the same world, or transitivity across world lines. The plausibility which seems to belong to identity pertains to the former case, not the latter. Indeed, to assume transitivity for the trans-world case is precisely to rule out branching. Hence the argument assumes what it is designed to prove.

Hintikka's comment reveals an important assumption of his line of thinking, namely that there is an essential distinction between the relation of identity in the intra-world case and that in the trans-world case. In my opinion this assumption is unwarranted and I shall argue for that in the last section.

It is important to realize that the invalidity of (1) under Hintikka's interpretation does not violate Leibniz' Law. For intensional predicables (i.e., predicables which involve intensional operators) do no longer denote properties of the objects in a world domain (cf. the reasoning in section I.2). For example, it makes no sense to ask without further specification whether an object x satisfies predicables such as *being necessarily G*, or *being G if S would obtain* or *being G in all worlds compatible with A's knowledge*, because it all depends: x may satisfy such a predicable under one world line and fail to do so under another.

Kripke and Hintikka have two quite different approaches to possible world semantics. The possible world framework admits both, and in my opinion the choice between them depends on the use one wants to make of the models. My discussion will concentrate on the use of the model

²³ Hintikka 1989, essay 12, p.195

theory in the representation of ordinary language, with a central focus on the treatment of identity and individuation of continuants (ordinary objects). The main feature of Hintikka's approach is that he does not treat cross-world identities as primitive. As against Kripke, Hintikka says that the bland assumption of a set of individuals which may or may not crop up in each possible world, and the dismissal of the whole problem of cross-identification as trivial, is bluff.²⁴ However, Kripke's approach seems to be in agreement with the way in which we think about continuants and with the intended meanings of sentences in which we refer directly to continuants or quantify over them.²⁵ As I said in section I.3, our conception of a continuant accomodates "apparent incompatibilities": it is part of our general conception of a continuant that a continuant at one time may be strictly identical with a continuant at another time though these continuants have incompatible properties. This very idea is easily generalized: continuants under different possible circumstances may be strictly identical though they have incompatible properties. I share Kripke's view that in fact we suppose such things in ordinary language use. Therefore it is a natural policy when dealing with natural language representation to assume that the domains of objects in the relevant possible worlds (courses of events) litterally overlap.

Philosophers have found the assumption of cross-world identity of objects problematic. I think their main query is this: how can we assume that an object of this world can be reidentified in another possible world if it is not guaranteed that it has (enough of) those properties there which we need for reidentification? In answering this question reflection on the case of cross time identification is illuminating again. I find Plantinga's rebuttal convincing:²⁶

No doubt there was a time, some fifty years ago, when Spiro Agnew was a precocious baby. But if I understand that assertion, must I not be able to *pick him out, locate* him, at that time? If I cannot identify him, if I cannot tell which of the things that existed at that time was Agnew, then (so goes the argument) I cannot make sense of the claim that he existed at that time. But the argument is manifestly confused. To suppose that Agnew was a precocious baby at *t* it is not necessary that I be able to pick his picture out of a galery of babies at *t*. Of course I must know who he is to understand this question; I must be able to answer the question "Which of the things existing at *t* is Agnew?". But the answer is trivial; it's that man sitting right over there- the Vice President of the United States.

²⁴ Hintikka 1989, essay 12, p.191

²⁵ Cf. the reasoning of Kripke in Kripke 1980, esp. the preface.

²⁶ Plantinga 1973, in Loux 1979, p.153

If this is correct, however, why suppose otherwise in the Transworld case?

In ordinary language use we do not suppose otherwise, I think. (This does not imply that philosophical analysis must take the identity of continuants through time and through worlds as primitive; on the contrary, identity of continuants is an extremely interesting topic for philosophical analysis.)²⁷ The assumption of cross-world individuals and the "bluff" as regards to the problem of cross-world identification is not an idiosyncrasy of Kripke's, but a common place in ordinary language use. With regard to natural language representation Kripke's approach seems to be appropriate. But I have to make an important qualification: Kripke's approach is not well suited for the interpretation of epistemic reports in natural language, whereas, in general, possible world semantics is effective in the representation of knowledge. This is because, as Lewis puts the matter in a nutshell,²⁸

... information admits some possibilities and excludes others. Its content is given by the division of possibilities into the admitted ones and the excluded ones. The information is that some one of *these* possibilities is realized, not any one of *those*.

In knowledge representation and, as a consequence, in the interpretation of epistemic reports one must have the margin to represent misidentifications, i.e. the situation that objects which are held to be identical by a believer are distinct, or, conversely, the situation that objects which are held to be distinct by a believer are identical. Kripke's use of the possible world framework does not supply such a margin. For example, identity questions as mentioned in the first section of this paper cannot be represented in it. This is a serious drawback of Kripke's approach. On the other hand, Hintikka's approach is promising in this respect, and therefore I shall turn to it again.

²⁷ In my dissertation I defend the view that the identity of continuants through time is governed by our sortal concepts of continuants and these in turn are built upon considerations of spatio-temporal and qualitative continuity, along with supposed causal regularities underlying these continuities. An important consequence is that trans-world identity of continuants is problematic in cases (worlds) in which the kind of causal regularities which underly our practice of reidentification of continuants through time do not obtain. The reader is referred to the second part of my dissertation.

²⁸ Lewis 1983, p. 4

II.2

Hintikka does not treat cross-world identity as primitive, because he wants to represent and not simply assume our capacity of reidentification of individuals:²⁹

....the role of the functions f in F (the individuating functions) highlights an extremely important non-trivial part of our native conceptual skills, namely, our capacity to recognize one and the same individual under different circumstances and under different courses of events. What the set F of functions embodies is just the totality of ways of doing this. The non-trivial character of the possibility of this recognition would be lost if we should simply speak of the members of the different possible worlds as being partly identical.

Further, Hintikka explains the close connection between cross-world identity and individuation:³⁰

Since it was the identity of the respective references of a singular term in the different worlds we are considering that made it possible to say that it specifies a unique *individual*, the method of cross-identification which is presupposed in my account of the logic of propositional attitudes might also be called a method of *individuation* in contexts governed by propositional attitudes.

And after this explanation Hintikka points to the repercussions of his insight for quantification into modal contexts:

Since variables bound to quantifiers range over individuals, a method of individuation is an indispensable prerequisite of all quantification into modal contexts. A quantifier that binds (from the outside) a variable occurring in a modal context does not make any sense without such a method of individuation, and its meaning is relative to this method.

The insight of the possible multiplicity of methods of individuation appears to be really important in the light of an additional thesis of Hintikka, namely that, as a matter of fact, we all use two different methods of identification. The contrasting methods are called the *perspectival* mode of identification and *public* mode of identification, but, as Hintikka remarks, these terms are somewhat misleading, because there is nothing private or subjective about the perspectival mode of

²⁹ Hintikka 1969; in Linsky 1971, p.160.

³⁰ Hintikka 1969, p.169

identification, even though it is relative to a person.³¹ The distinction is clearest in visual perception. Let me quote Hintikka's short characterization:³²

(In visual perception) one can use as one's identificatory framework some person's, say John's, visual space. Persons and bodies occupying the same slot in this visual space (in the different situations compatible with what John sees) can be considered identical, even if John does not see who they are. This results in a *perspectival* or subject-centered identification principle. That it is not the only possible one here, nor the only one we actually use, is obvious. For the very fact that John does not see who these chaps are means that in different situations compatible with his visual information they are (in an obvious sense) different persons. What is involved in nevertheless insisting that *that man over there* is one and the same person is *perspectival* identification. What is involved in *seeing who* he is is identification based on *public* (object-centered) criteria.

Hintikka's distinction is nicely affirmed by a certain consequence. The notion of a rigid designator ought to be relativized, to a mode of cross identification, and now it is plausible that rigid designators corresponding to the *perspectival* mode of identification are just the ones which Russell has called the logically proper names, whereas in natural language proper names come closest to rigid designators in the *public* mode of identification, though, according to Hintikka, they are not always rigid.³³

It is tempting to distinguish *perspectival* or "perceptually individuated" objects and *public* or "physically individuated" objects corresponding to the two modes of individuation,. But Hintikka comments:³⁴

Striking though this way of speaking is, it is highly misleading. There is no question here of any ontological difference between different kinds of entities. ... The only difference lies in the distinction between the two methods of individuation. This is a matter of the relation of the different possible states of affairs to each other. It does not appear as long as we are merely considering the different states of affairs one by one; it becomes relevant only when an implicit or explicit comparison between different states of affairs is made.

³¹ Hintikka 1989, essay 8, p.114.

³² Hintikka 1989, essay 8, p.115.

³³ Hintikka 1989, essay 8, p.116

³⁴ Hintikka 1969, p.172

And he adds:

... quantification into a context governed by a perceptual term involves such a comparison. Hence the meaning of quantifiers that from the outside bind variables occurring inside perceptual constructions (e.g., within the scope of the expression *sees that*) will depend on the method of individuation employed. In other words, when quantifying into perceptual contexts we have to reckon with two different pairs of quantifiers with different meanings.

Hintikka's use of the possible world framework is, like Kripke's, formally perfectly possible, and it has surely its merits from an epistemological point of view, as I shall show in the next section. But before that I want to make some critical remarks about the philosophical motivations which Hintikka himself supplies. There is a real tension in Hintikka's view of the matter, which is reflected in such statements as that the individuals under the different modes of cross-world identification do not differ in kind, ontologically, though they are differently individuated. Here I would protest, with an argument which is essentially the same as the one that I raised against the relativistic view of identity in section 4 of the first part of this paper. The argument there can be summarized in the condensed statement that a principle of identity constitutes the very objects which are related by identity. Actually, Hintikka acknowledges the connection between identity and individuation because he admits that a mode of cross-world identification is at the same time a mode of individuation. But he tries to have his cake and eat it if he wants to let the individuals in the world domains be unaffected by these differences in modes of individuation. However, in fact Hintikka's way of representation of intensional sentences implies a definite choice. Let me explain.

As I remarked earlier, in Hintikka's treatment intensional predicables do not denote properties of the individuals of a world domain. For an intensional predicable of such an individual might be true and false of it simultaneously, namely under different world lines. Let us consider an example. Suppose, in a certain situation a man sits beside H, and H sees that he trembles, but does not see who he is. In Hintikka's representation the man beside H is surely an inhabitant of the various world domains which are involved in the interpretation of the sentence *H sees that the man beside him trembles*. My question now is whether in Hintikka's approach the predicable *H sees of ... that he trembles* is an appropriate predicable of the man beside H (cf. the requirement on the introduction of a predicable of an object in sect. I.2), and I claim that it is not because that man would satisfy the predicable in the perspectival mode of

identification but not in the public mode.³⁵ Since H does not see who the man beside him is, there is a world compatible with what H sees in which another man sits beside him than the one who actually sits there and in which the first trembles but the last not. The alternative identifications yield different answers to the question whether the perceived man trembles or not in that world, and this fact would imply different answers to the question whether the man satisfies the intensional predicable above.³⁶

I conclude that Hintikka's use of possible world semantics implies that intensional predicables do not denote properties of the individuals in the world domains. Hintikka could have chosen another option: he could have conceived of the individuals in the world domains as being constituted according to the supposed different cross-world identity principles. In that case it would be a property of the "perspectival object" that it trembles in alternatives compatible with H's perception, whereas the public object does not have the property that it trembles in all alternative worlds which are compatible with H's perception. That public object would not be identical with the perspectival object, though it would coincide with it in the actual perception situation.

However, the drawback of this option is clear: the domains would be populated with objects of several kinds, which are only abstractly distinguished from each other. An approach along this line would cause a rupture with a main tenet in Hintikka's conception of possible world semantics. In the early days of this kind of semantics Hintikka has repeatedly put forward a strong philosophical argument in favour of it: it enables one to handle epistemological problems (concerning identity, substitutivity and existential generalization) without postulating separate categories of objects beyond our familiar concrete objects. Examples are the so-called "sense data", conceived of as a kind of objects, "perceptual objects", to be distinguished from ordinary physical objects; another famous example are the Fregean senses, again a separate category of objects postulated in the foggy area between the knower and the concrete

³⁵ The reader may think that I neglect a familiar distinction here, namely the distinction between two readings of the sentence *H sees that the man beside him trembles.*, dependent on the question whether the occurrence of the expression *the man beside him* is referentially opaque or transparent. However, the distinction is not relevant for my question, because I do not ask for an interpretation of a certain sentence. My question explores the structure in terms of which sentences in general are interpreted. In particular, it explores how the individuals in the world domains are conceived of and it does so by asking what are appropriate predicables of them.

³⁶ Of course, one may construct other predicables which are appropriate predicables for the man beside H, but these predicables would be highly artificial; they would amount to predicables which could be circumscribed like *H sees "perspectively" of ... that he trembles*, and *H sees "publicly" of ... that he trembles.*

things in the world.³⁷ The general insight of Hintikka in these fields is that

...the breakdown of existential generalization and substitutivity of identity in modal contexts is not a symptom that our free singular terms refer to entities different in kind from their normal references. Rather, the breakdown is a consequence of the fact that in modal contexts we have to consider our individuals as members of more than one state of affairs or course of events.³⁸

For example, it seems to be inevitable to conclude from the failure of substitutivity of identicals in perceptual contexts that the objects we are talking about in perceptual reports must be distinguished from ordinary physical objects and it is natural then to suppose that they just coincide with what has been called in the philosophical literature *sense-data*. But Hintikka stresses that an analysis in terms of possible worlds is superior because it avoids the assumption of a problematic separate category of objects. In that analysis, if *c* and *s* are singular terms, the coincidence of *c* and *s* in the actual world (i.e. the identity of their denotata in the actual world) does not guarantee their coincidence in other worlds compatible with H's perception. This fact supplies a natural explanation that substitutivity of identicals fails in perceptual contexts. It is also clear under what extra condition the inference holds: it is the condition that in all relevant possible situations *c* refers to the same individual as *s*. This condition is expressed by:

(4) H sees that $c=s$

Thinking in terms of possible worlds also enables one to explain that the rule of existential generalization fails in intensional contexts as, e.g., in:

H sees that $P(c)$
ergo: $\exists x (H \text{ sees that } P(x))$

The inference fails because it is not guaranteed that *c* refers to the "same" individual in all relevant possible situations. The inference holds if *c* refers to the "same" individual in all situations which are compatible with what H sees. This condition is expressed by:

$\exists x (H \text{ sees that } c=x)$

³⁷ See e.g. *On the Logic of Perception* in Hintikka 1969 and *On Sense, Reference and the Objects of Knowledge* in Hintikka 1989

³⁸ Hintikka 1969, p.159

Hintikka paraphrases this formula with the ordinary language locution that H sees who or what c is (or knows who he sees in the perception that P(c)).

It appears that in his way of representing propositional attitudes Hintikka is faithful to his early insights, and I agree with this choice. But, as I remarked, there is a tension between Hintikka's actual approach and his philosophical elucidations. It seems that Hintikka does not realize that, if he populates the world domains with ordinary continuants, then the identity of these objects is already determined, namely by the principles which constitute them as continuants. And because of the fact that these principles involve cross-time connections and in their wake cross-world connections it would not do to represent the situation as if one has free choice between methods of cross-world identification in order to individuate in different ways.³⁹

In my view it would be the so-called "public way of individuation" which delivers the principles that are constitutive for the objects of the world domains. For these objects are supposed to be ordinary continuants,⁴⁰ and the other way of individuation, the "perspectival" one, does not constitute our ordinary continuants at all. It connects continuants (in several worlds, at several times and under several circumstances) by ties other than identity. I want to propose that a "perspectival" world line connects two continuants if and only if they are *held to be identical* by some person in a certain knowledge state. In the last section I shall elaborate this proposal.

II.3

As I said at the end of section II.1, Kripke's approach with respect to cross-world identity has its flaw: it is not appropriate with regard to knowledge representation. In the representation of the knowledge of somebody, say

³⁹ The situation is different in David Lewis' approach (see e.g. Lewis 1986, sect.4.2, p.198ff). Lewis does not populate his world domains with continuants. Even in the case of identity through time, in the representation of this-worldly changes he would populate the domains of objects at different times not with continuants ("perdurers", in his sense), but rather with time slices of them. The last are basic, according to him, and continuants are built up out of relations between them, other than identity. In other words, in Lewis it is unambiguous that so-called relations of trans world identity are not relations of identity at all. Lewis' approach demands separate motivation. In my opinion it is not a natural way for the purpose of the representation of natural language and ordinary knowledge, but it may have some advantages in the representation of scientific knowledge.

⁴⁰ More must be said about this. Most importantly, the intrinsic connection of these principles with our sortal concepts of continuants must be stressed. In these concepts continuity and causality are involved. The reader is referred to Wiggins 1980, Hintikka, 1989, essay 6 and the second part of my dissertation.

A, about an actual object, say *b*, one has better not to stipulate a priori that in every possible world admitted by A's knowledge state the counterpart of *b* in that world is identical with *b*. If one does so, and in Kripke's approach there is no other option, misidentifications of A cannot be represented. I want to suggest here a certain use of Hintikka's world lines in which the limitations of Kripke's approach are overcome.

Suppose, someone, say A, believes of a certain object that it has property P, and consider the question how to represent this belief of A in the possible world framework. Let us first remark that in *this* question the distinction between *de re* and *de dicto* belief is not relevant, or, better perhaps, that here we have a clear case of *de re* belief. In both Kripke's approach and Hintikka's approach the object of belief is an inhabitant of the domain of the actual world. However, in Kripke's approach a world would be compatible with A's belief only if in that world "the same aforementioned object" has property P, whereas in Hintikka's approach this need not be the case. It is clear that the identity principle involved in the phrase "the same aforementioned object" would be, given Hintikka's distinction, the usual, "public" one.

In Hintikka's approach a world in which "the same aforementioned object" does not have property P may be compatible with A's belief, for example because in the counterfactual circumstances of that world A would fail to identify it correctly as being the same object (according to the "public mode"), while at the same time the object which he, incorrectly, would hold to be the same aforementioned object does have property P. It is possible to represent this peculiarity of many belief states with the help of alternative world lines, whereas Kripke is in trouble here.⁴¹ So, the use of alternative kind of world lines is extremely useful in the representation of belief states and in that of reports of them. But Hintikka's suggestion that here we are dealing with alternative ways of individuation, or with alternative principles of identity, is misleading. Only the usual, public, principles of identity and individuation are relevant in the cross-world connections between individuals in the world domains, even in cases where these connections are determined by misidentifications: a basic fact of misidentifications is that the believer clearly intends to identify according to the public principles.

In line with these observations Kripke's thesis that proper names behave as rigid designators must be qualified. It must be qualified with respect to what Frege has called "ungerade Kontexte". Though it can be maintained, against Frege, that proper names also in these contexts refer to their usual denotata, the claim that they behave as rigid designators of these denotata is not tenable without qualification. One has not to stipulate a priori that the world lines involved in the truth condition of a

⁴¹ I think Kripke would admit that; cf. Kripke 1979, A Puzzle about Belief, and Kripke 1980, Preface, p.20,21.

report of a propositional attitude are in accordance with the factual identities. The world line associated with a proper name in a context of belief follows the identifications of the subject of belief and if these contain misidentifications the world line is not in accordance with the factual identities, and therefore it is not constant in that case. However, the intuition of the thesis of rigid designation of proper names is affirmed in that the qualification of the thesis just assumes that the subject of a propositional attitude intends to use the name as a rigid designator.

At this juncture we can shed a new light on Hintikka's rejection of the bound variable form of substitutivity of identicals. Let us consider again formula (3):

$$(3) \quad (\forall x)(\forall y)(x=y \rightarrow (\Box Gx \rightarrow \Box Gy)).$$

As we saw, (3) is valid only if branching of individual functions (of the class F) is excluded. And, clearly, branching is not excluded if both individuating functions corresponding to the public mode of identification and individuating functions corresponding to the perspectival mode of identification are members of that class. But now it is time to consider the question how to determine which individual concepts are allowed in the class of individuating functions. To my mind, for this question we have to distinguish between situations in which alethic modalities (involving such concepts like possibility and necessity) must be interpreted and those in which epistemic modalities (involving such concepts as knowledge and belief) must be interpreted. The individuating functions corresponding to the perspectival mode of identification, or corresponding to the identifications of a believer, are not relevant in the interpretation of alethic modal sentences, whereas they are relevant in the interpretation of belief reports, etc. I share Kripke's firm intuition that in the interpretation of (alethic) modal sentences the concept of identity which governs the world lines (the identities between individuals of several worlds) must not be construed as different in kind from the concept of identity which governs the intra-world identities. Therefore, I do not agree with Hintikka's distinction of two concepts of identity in his opposition to Kripke's argument for the validity of the bound variable form of the necessity of identity, formula (2) above. This formula is valid because only alethic modal operators occur in it, and as far as these contexts are concerned Kripke's reasoning is conclusive.

Next I want to discuss in some more detail what Hintikka says about identity and identification in epistemic contexts. As we saw above, in line with his distinction of two kinds of world lines Hintikka distinguishes two kinds of quantifiers. For example, in addition to the "public"

existential quantifier, $(\exists x)$, he uses the "perspectival" existential quantifier (Ex) , and by means of these two Hintikka distinguishes between the following formulas, expressing, as he says, two modes of identification:

(6) $(\exists x)$ (A knows/perceives that $b=x$)

(7) (Ex) (A knows/perceives that $b=x$)

These formulas play an important formal role, because, as we saw in the preceding section, they are crucial links in the interplay between the epistemic operators and the quantifiers. Hintikka explains the intuitive content of these formulas as follows:⁴²

It is not difficult to form an idea what the contrast between the two modes of identification amounts to when applied to visual cognition. To identify b in the perspectival sense means finding a slot for b among my visual objects, in other words, locating b visually. This means in effect being able to answer a "where" question.

In contrast, identifying b in the sense of public cross-identification means being able to put b on the map of abstract impersonal knowledge. ...It means being able to answer a "who" or "what" question. The explanations can easily be extended to other propositional attitudes.

At another place⁴³ Hintikka illustrates the distinction with examples. Substitute in (6) and in (7) for b : *the man who ϕ 's*. Sentence (6) says that there is some physically individuated person x with whom b is identical in all the states of affairs compatible with what A perceives. In other words, A perceives that the man who ϕ 's is this particular person ("physical object") x . Clearly, this is tantamount to *A's perceiving who the man who ϕ 's is*. On the other hand, according to Hintikka, (7) would say that one of A's perceptually individuated objects is perceptually identified by A with the man who ϕ 's. In other words, A can (so to speak) find a place among his perceptual objects for the man who ϕ 's; in short, he *perceives the man who ϕ 's*.

These explanations point to an important distinction indeed, but the talk about different kinds of individuation, or identification is misleading. In characterizing the difference between (6) and (7) we have to stick to the truth conditions only. It appears that the only difference is that (6) says that there is an object such that for all situations compatible with what A perceives (including the actual perception situation) b is identical with that object. As to (7), it is similarly required that there is

⁴² Hintikka 1989, essay 8, p.120

⁴³ Hintikka 1969, p.173,4; I have adapted the example a bit in order to make the comparison more precise.

an object (in the perceptual situation) such that b is identical with that object, but now it need not be the case that in all situations compatible with what A perceives b is identical with that object. In both cases the object which makes the existential generalization true is a certain physical object, a continuant, present in the perceptual situation at hand. Therefore it is misleading to say that the object is individuated or identified differently in the two cases. Even the truth conditions of (7) guarantee that A succeeds in identifying b in the perception situation, because the actual perception situation is included in the relevant A -alternatives and there is an object in that situation which is identical with b . This is as it should be, because even when A does not see "who the man in front of him is" the identity of the relevant object of perception is sufficiently determined by A 's (implicit) use of a sortal concept (man) and a localization in space and time relative to his own position. The identity of our ordinary continuants is determined by these conditions, and both in the truth conditions of (6) and in those of (7) no other concept of identity, i.e. no other principles of identity, is operating than that which is constitutive for our ordinary "public" continuants. As I said, the connection of individuals by the world lines in the interpretation of (7) is not governed by identity, but by "what is held to be identical by A " in the relevant epistemic state.

Finally, I want to consider what the connection is between knowledge of identity statements and "identifications" of the kind expressed by (6), representing knowledge of who someone (b) is. In order to do so, I want to raise the question whether the following inference is valid:

- (8) $(\exists x) (A \text{ knows that } b=x)$
- (9) $(\exists x) (A \text{ knows that } c=x)$
- (10) $b=c$
- ergo: (11) $A \text{ knows that } b=c$

In Hintikka's interpretation the inference seems to be valid. It is guaranteed by the truth of the first three formulas that in all worlds compatible with what A knows b is identical with c . For from (8) it follows that there is a single object such that b is identical with that object in all those worlds and that the actual world is among them. The same holds for c , and because b and c are identical in the actual world, it follows that they are identical in all worlds compatible with what A knows.

But intuitively the inference is surely not valid. Consider, for example, the case that in one situation A meets someone, say b , and knows who he is. I.e., (8) is true, because there is a single object corresponding to b in all situations compatible with what he perceives/knows in *that* situation: he would not misidentify b in *those* situations. Suppose further that A has met the man, the very same man,

earlier, in another situation, but he does not realize this. Then A does not know that the men of the two occasions, say b and c, are in fact the same. Nevertheless, it may be that A knew who it was that he met, and that he did not forget that, and therefore that he also knows who c is. So we have an example in which the premisses (8)-(10) are true, but the conclusion (11) is false. Moreover the possibility sketched in the example is a very important one and frequently realized in daily life.

Actually, Hintikka's formulation of the truth conditions of the analogues of (8)-(11) in the perceptual case admits the possibility that the premisses are true and the conclusion is false. This is because the relevant possible situations are restricted in that case to situations which are compatible with what A perceives in the perception situation which is in focus. And the requirement that A identifies b correctly in these situations (i.e. that there is a single object such that for all these situations b is identical with that object) does not guarantee that A identifies b correctly in other situations compatible with his knowledge in general, which includes for example knowledge with respect to other perception situations. It appears that the interpretation of a perceptual report like

(12) $(\exists x) (A \text{ perceives that } Px)$

requires a two-step relativization. First, the interpretation is relative to a time t and implicitly to the knowledge of A at that time. Second, it is not the knowledge of A at t in general which is relevant, only the knowledge with respect to the perception situation in which A is involved at t is relevant. So the interpretation of (12) must also be relativized to the perception situation in focus.

This idea can be generalized to other kinds of epistemic reports. For example, the interpretation of (8) must be relativized not only to a certain time t and the knowledge state of A at t, but also to a certain actual situation and the part of the knowledge of A at t which relates to that situation. These relativizations restrict the relevant class of possible states of affairs: the class of states of affairs compatible with A's knowledge at t with respect to the situation in focus.

Now it is easy to find a condition under which the inference (8)-(11) would be valid: it would be valid if the epistemic reports (8), (9) and (11) refer to a single epistemic state of A and only to the knowledge of that state which relates to a single actual situation. In the case that (8) and (9) refer to knowledge of A with respect to different situations an additional premiss is needed in order to infer the conclusion. It is the condition that (8) and (9) are true also with respect to the conjunction of these situations. I.e. there is a single object with which b is identical in all states of affairs compatible with what A jointly knows with respect to the two situations, and there is a single object with which c is identical in all

possible courses of events⁴⁴ compatible with what A jointly knows with respect to the two situations. In that case the inference is allowed if (11) is also interpreted relative to the conjunction of the two situations in focus.

Intuitively, the additional premiss amounts to an extension of A's knowledge *who b is in one situation* to knowledge *who b is* through more extensive parts of his history, including other situations in addition.⁴⁵ Such an extension typically requires reidentification of a continuant through time from one situation to another. The principles which govern these cross-time identifications of continuants are the usual sortal dependent conditions of continuity, i.e. the principles which govern Hintikka's "public" way of individuation.

I want to conclude that the use of alternative world lines in the framework of possible world semantics is indispensable because it provides a possibility of representing the identifications of the subject of a knowledge state, including his possible misidentifications. In knowledge representation one must be able to represent misidentifications and therefore Hintikka's approach is better suited than Kripke's in this field. However, it is argued here against Hintikka that the "perspectival" identifications of a believer must not be conceived of as a separate way of individuation, in addition to the "public" one.

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⁴⁴ Note that the use of the term *possible state of affairs* is no longer appropriate here because a single alternative must combine now what is the case in various states of affairs. The term *possible course of events* seems to be more appropriate.

⁴⁵ It would be interesting to investigate whether such extensions of knowledge can be satisfactorily represented in a system of "Update Semantics" or in "Dynamic Semantics". Such systems are proposed, for example, by J. Groenedijk, M. Stokhof, J. van Benthem and F. Veltman. However, this question is beyond the scope of this paper.

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