Proper Names and Relational Modality

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Abstract

Saul Kripke's thesis that ordinary proper names are rigid designators is supported by widely shared intuitions about the occurrence of names in ordinary modal contexts. By those intuitions names are scopeless with respect to the modal expressions. That is, sentences in a pair like

(a) Aristotle might have been fond of dogs
(b) Concerning Aristotle, it is true that *he* might have been fond of dogs

will have the same truth value. The same does not in general hold for definite descriptions. If one, like Kripke, accounts for this difference by means of the *intensions* of the names and the descriptions, the conclusion is that names do not in general have the same intension as any normal, identifying description.

However, this difference can be accounted for alternatively by appeal to the semantics of the *modal expressions*. On the account we suggest, dubbed 'relational modality', simple singular terms, like proper names, contribute to modal contexts simply by their actual world reference, not by their descriptive content. That account turns out to be fully equivalent with the rigidity account when it comes to truth of modal and non-modal sentence (with respect to the actual world), and hence supports the same basic intuitions.

Here we present the relational modality account and compare it with others, in particular Kripke's own.

Keywords: *actuality, definite descriptions, Kripke, modality, necessity, possible worlds semantics, proper names, rigid designators, two-dimensionalism, truth.*

1 Introduction

In *Naming and Necessity*, Saul Kripke presented a number of now classical arguments against the description theory of proper names. The most influential may be the modal argument: Kripke argued that proper names in general cannot have the same intensions as co-referring definite descriptions, since substituting the one for the other in modal contexts can change truth value. The intuitions on which this argument is based are widely shared and very robust. Kripke suggested that they be explained by the doctrine of rigid designation.

In this paper, we are going to suggest an alternative explanation, one that is compatible with the description theory of names. We agree with Kripke that in ordinary modal thinking we operate with concepts of *de re* modality. That is, we are interested in the objects we refer to, no matter how they are designated. And we want to know what would be true of *these very objects* in counterfactual circumstances. The intuitions made use of in Kripke's modal argument testify to this feature of ordinary modal reasoning; these are data to be accepted and explained by any good semantic theory. However, we do not agree that the best way of explaining them is by means of a thesis concerning (nothing but) the intension of *names*.[1] The observed phenomena, we claim, are essentially due to the *de re* nature of ordinary modal thinking and are, therefore, better explained in terms of a semantics for *modal expressions*. In what follows we shall propose such a semantics. Its basic idea is that, in ordinary modal contexts, names and other simple singular terms occur *referentially*. Therefore, we suggest calling this an account of *relational modality*.

As far as we can see, this account has a number of significant advantages. Not only does it seem to fit the basic modal evidence even better than the rigidity account, it is also considerably more flexible. It does not commit us to any particular concept of modality. It is compatible with rigidity, but not committed to it. It even allows for some proper names to be rigid while others aren't. And the basic account itself does not have any consequences for names in other intensional contexts, such as propositional attitude contexts, where the rigidity account clearly is at its weakest. Moreover, it can be combined with a possible worlds semantics for attitude contexts in a way that allows for handling mixed modal/doxastic contexts.

We are going to proceed as follows: In the next section, we present in some detail the intuitions that Kripke uses in his modal argument. In section 3, we outline the account of these intuitions that we propose. In section 4, we compare our account with the rigidity account in several respects and consider some objections that could be made to ours on behalf of the rigidity account. Among other things, we present the main ideas for extending the semantics to doxastic and mixed contexts. In section 5, we spell out in some detail both the view of linguistic meaning in general and of the function of the intensional operators in particular that come with our semantics. Here, we also compare it with two-dimensionalist semantics and note that despite some interesting structural similarities, two-dimensionalism has counter-intuitive consequences when it comes to mixed contexts. In the appendix, we spell out the extension

[1] The motivation for and exact nature of the proviso will become clear below, cf. section 5. Here only this much: Since a difference between the semantic contributions of names and descriptions in modal contexts will be induced by the semantics we suggest for modal expressions, a name and a (non-rigid) co-referring definite description with the same descriptive content will nevertheless not be synonymous on our account. In other words: on our account, linguistic meaning cannot be equated with (standard possible worlds) intension.

to doxastic and mixed contexts in more detail.[2]

2 The modal intuitions

In his modal argument, Kripke asks us to compare proper names and definite descriptions in modal sentences, that is, in natural language sentences containing modal expressions such as 'might' or 'it might have been the case'. In modal sentences, substituting a co-referring description for a proper name can change truth value. A case in point would be the following pair of sentences:

(1) Aristotle might not have gone into pedagogy

(2) The teacher of Alexander might not have gone into pedagogy

(cf. Kripke 1980, 61-63). Here, the intuitions are that (1) is true, while (2) is false. Examples of such intuitive truth value changes in modal sentences can easily be multiplied. Put in the terms of possible worlds semantics, these changes occur whenever the description substituted for the name is not a rigid designator, i.e. does not denote the same object in every possible world in which that object exists.

A corresponding intuitive difference can be observed with regard to the scope that the name or description is given with respect to the modal operator. Intuitively, it does not make any difference to the truth value of (1) whether 'Aristotle' is read as having wide or narrow scope. Rather, the name is 'scopeless' or scope indifferent with respect to the modal operator. In general, a sentence with a name in a modal context is equivalent to the sentence formed by moving the name out of that context and linking it by cross-reference to its old position. In natural language, we thus have the intuitive equivalence of

(3) It is necessary that Aristotle is F

(4) Concerning Aristotle, it is necessary that he is F.

Or, in the language of quantified modal logic, the equivalence of

(5) $\Box F(\text{Aristotle})$

(6) $\exists x(x = \text{Aristotle} \ \& \ \Box Fx)$

The corresponding equivalence does not hold for modal sentences containing (non-rigid) definite descriptions, however. Once alerted to the different possible

[2] Because of space limitations, the presentation in this paper is informal. In a companion paper, 'Relational modality', we give a formal truth definition for a language with a relational modal operator. We prove that this language is semantically equivalent with a classical (notional) modal language with rigid singular terms, in a weaker and a stronger sense. First, they are equivalent with respect to the truth (in the actual world) of sentences with modal operators. Second, there is a definition of logical consequence for relational modality equivalent to standard logical consequence for classical modality (within the class of reflexive models with non-empty domains). Moreover, this equivalence holds for the usual systems of modal logic. See Glüer and Pagin 2005.

readings, speakers' intuitions have it that truth values differ with the scope given to the description. Read with wide scope, the truth value of modal sentences containing definite descriptions depends on the properties one particular individual x would have in counterfactual circumstances. This is the individual *actually* fulfilling the description in question. Thus, the two sentences

(7) Concerning the teacher of Alexander, it is necessary that he is F

(8) $\exists x(x = \text{the teacher of Alexander} \ \& \ \Box Fx)$

intuitively have the *same* truth value as (3), for arbitrary predicate F, while

(9) It is necessary that the teacher of Alexander is F

(10) $\Box F(\text{the teacher of Alexander})$

do not. This, again, holds whenever the definite description is not a rigid designator. Intuitively, definite descriptions thus are not 'scopeless' with respect to modal operators.

In what follows we shall simply call this complex of intuitions regarding names and definite descriptions in modal contexts 'our (basic) modal intuitions'. All of these are intuitions concerning the truth values of modal sentences, that is, sentences that contain names or definite descriptions in modal contexts. Our basic modal intuitions have it that substituting a co-referring definite description for a name in such a sentence can change truth value. They also have it that names are 'scopeless' in such contexts, while that does not generally hold for definite descriptions. These modal intuitions are widely shared and very robust. They should be considered as providing data that any good semantic theory has to explain.

However, there are two basic options for explaining these modal intuitions: by means of the semantics of proper names and by means of the semantics of modal expressions. Today, only the first route is well-explored. Even those trying to defend the description theory accept the claim that the battle concerns nothing but the semantics of names and descriptions. That might be a mistake, however. It might be worthwhile to explore the second option. In the next section, we do.

3 Relational modality

On our account, the difference between (1) and (2) depends on a feature of ordinary modal thinking, not on the (standard) intensions of names. When people consider alternative possibilities in ordinary modal thinking, they are interested in alternative scenarios involving the objects they refer to. They are interested in what might have happened to *these very objects*, regardless of how the names of them are evaluated with respect to those alternative scenarios. At least, this is our empirical hypothesis about ordinary modal thinking, and hence about the ordinary modal concepts expressed by locutions like 'possibly', ‘necessarily’, ‘it might have been’ and ‘it would have been’, as used in everyday discourse.

Put in a nutshell, the proposal is that simple singular terms, including proper names, occur referentially in the contexts of ordinary (alethic) modal expressions. However, these contexts are intensional with respect to other types of expression, in particular first order predicates.[3] Because of this, (1) is evaluated as follows: (1) is true if, and only if, what ‘Aristotle’ *actually* refers to, in some possible world did not go into pedagogy. (2), on the other hand, is true if, and only if, what ‘Alexander’ actually refers to is such that, in some possible world, his teacher did not go into pedagogy. This accords nicely with our basic modal intuitions.

First, on this evaluation, (1) is intuitively true and (2) false, just as they should be. This explanation of the *semantic* difference between (1) and (2) makes use of the *syntactic* difference between name and description: Names, like any simple singular terms, here contribute to truth and falsity with their actual reference, regardless of their (standard) possible worlds intension. For all we care, ‘Aristotle’ might have the same descriptive content as ‘the teacher of Alexander’.

Note that we do not claim that modal expressions in general must be understood as taking simple singular terms transparently in their scope. Indeed, for any modal expression (expressing physical necessity, metaphysical necessity, logical necessity, normative necessity or whatever) that does take simple singular terms transparently, there is a corresponding expression that takes them opaquely. We just propose that in ordinary modal thinking, speakers use the modal expression as taking singular terms transparently.

Second, on our account the ‘scopelessness’ of names with respect to modal operators holds as a matter of course. If names do occur referentially in modal contexts, of course (3) and (4) ((5) and (6)) are equivalent, and, again, this does

[3]In Kaplan’s terminology (Kaplan 1986, 230), the position of a singular term within a sentence is *open to substitution* if the result of replacing a term in that position by a co-referential one does not affect the truth value of the sentence. A sentential context is then *referentially opaque*, in Quine’s terminology (Quine 1952, 142) if any sentence (i.e. sentence occurrence) embedded in that context loses the positions open to substitution that it has on its own. In Kaplan 1986 it is argued against Quine that a position that is not open to substitution can nevertheless contain a variable that is bound by an initially placed quantifier (as in $\exists x \Box Fx$).

When we say that proper names occur referentially in modal contexts we do not mean that they occur in positions open to substitution. A name in a modal context cannot in general be replaced *salva veritate* by a description or functional expression co-referential with it. So modal contexts are opaque. However, on our interpretation, all co-referential *simple* singular terms, including proper names and free variables, can be interchanged *salva veritate* in modal contexts. This is what we mean by saying that names occur referentially in modal contexts, and that modal contexts take names transparently (we might call these contexts *semi-transparent*). Because of this feature, Kaplan’s objection against Quine is exemplified by the interpretation we propose.

not depend on the descriptive content of names (or its absence).[4,5]

In order to implement this basic idea in our semantic theory, we suggest the following interpretation of 'necessary':

(N) $\ulcorner$ It is necessary that $\phi\urcorner$ is true iff ϕ is true no matter what extensions are assigned to its non-logical predicates and functional expressions.

With this clause in a truth definition, the extension of singular terms is simply left unaffected by the evaluation, while there is a variation in extension of the non-logical predicates and functional expressions. For instance,

(11) It is possible that Plato's father was richer than Aristotle's father

comes out true, on this interpretation, just if in some extension assignment to the two-place predicate '...was richer than...' and to the functional expression "...'s father" the embedded

(12) Plato's father was richer than Aristotle's father

comes out true.

Of course, this is not formally precise. As stated, it is also inadequate, for there is no mention of how the extension assignment to a predicate is restricted by its meaning, nor of how assignments to different expressions may be combined. Both these problems are solved by switching to the standard framework of possible worlds semantics. The question is how to formulate the intended equivalent to (N) within that framework.

The answer comes in two very simple ideas. The first idea is what we call *actualist evaluation*. Standardly, an atomic sentence $Pt_1, \ldots, t_n$ is evaluated as true in a possible world w just in case the n-tuple of the referents of $t_1, \ldots, t_n$ in $\boldsymbol{w}$ belongs to the extension of P in $\boldsymbol{w}$. That is, where $\mathbf{I}$ is an interpretation

[4] Scope indifference has sometimes been equated with a designator's rigidity, it has even been held as an alternative way of stating the rigidity thesis about names (Kripke does so himself in 1980, 12, fn 15). This is correct only if names do not occur referentially in modal contexts, for then the equivalence of the wide and narrow scope readings such as (3) and (4) ((5) and (6)) depends on the intensions of names. If names do occur referentially, then these equivalences hold whether names are rigid designators or not.

[5] It is because of the similarity with Quine's distinction between the notional and the relational concepts of belief (in Quine 1956) that we have chosen to call our account 'relational modality'. This was first suggested to us by Sten Lindström. Our proposal is in analogy with Quine's usage in the respect that Quine was making a point about the lexical semantics of 'believes' (claiming that the word is ambiguous between the two readings), and insofar as the difference is that between terms occurring referentially and occurring non-referentially. The analogy fails when it comes to logical form, for referentially occurring terms are outside the scope of 'believes'. On the relational reading of

Ralph believes of Ortcutt that he is a spy

'Ortcutt' does not occur in the intensional context, which is the context following 'that'. By contrast, on our understanding of natural language modal expressions, simple singular terms do occur referentially within their scope. The analogy fails more superficially, too, since relational belief on Quine's view relates a believer and the things he believes something of, whereas there is no modal counterpart to the believer.

function assigning referents to terms and extensions to predicates in possible worlds, we normally have

(P) True$(Pt_1, \ldots, t_n, \boldsymbol{w})$ iff $\langle \mathbf{I}(t_1, \boldsymbol{w}), \ldots, \mathbf{I}(t_n, \boldsymbol{w}) \rangle \in \mathbf{I}(P, \boldsymbol{w})$.

In the actualist evaluation we consider instead the referents in the *actual world*, $\boldsymbol{a}$.

(A) True$(Pt_1, \ldots, t_n, \boldsymbol{w})$ iff $\langle \mathbf{I}(t_1, \boldsymbol{a}), \ldots, \mathbf{I}(t_n, \boldsymbol{a}) \rangle \in \mathbf{I}(P, \boldsymbol{w})$.

For the predicate, the extension in $\boldsymbol{w}$ matters, but for the terms only their extension in $\boldsymbol{a}$.[6] When considering different worlds, we consider different extensions of the predicate, but just the same extensions of the terms. To complete the definition of the actualist evaluation, one adds clauses for connectives, quantifiers and modal operators, no different from the ordinary ones (see Glüer and Pagin 2005). Not surprisingly, the actualist evaluation is semantically equivalent to a standard semantics with rigid singular terms (Glüer and Pagin 2005, Fact 3). Since a rigid term denotes the same object in every world where that object exists, $\mathbf{I}(t, a)$ is bound to be the same as $\mathbf{I}(t, \boldsymbol{w})$, if t is a rigid term (and the object denoted exists in $\boldsymbol{w}$).

As stated, (A) is well defined only for simple terms, for which the reference is given primitively by the interpretation function $\mathbf{I}$. Since we prefer to stay neutral on the question of whether there are complex singular terms, we have to take such terms into account. Suppose, then, that applied functional expressions, like '$g(u)$', where 'u' again is a singular term, simple or complex, are singular, and that definite descriptions, like 'the x such that Fx', or '$\imath xFx$', are singular too. In order to accommodate these terms with the desired result, (A) needs to be replaced by

(A+) True$(Pt_1, \ldots, t_n, \boldsymbol{w})$ iff $\langle \mathbf{V}(t_1, \boldsymbol{w}), ..., \mathbf{V}(t_n, \boldsymbol{w}) \rangle \in \mathbf{I}(P, \boldsymbol{w})$

where the term evaluation function $\mathbf{V}$ is defined as follows:

(V) $\mathbf{V}(t, \boldsymbol{w}) = \mathbf{I}(t, \boldsymbol{a})$, in case t is simple
$\mathbf{V}(g(u), \boldsymbol{w}) = \mathbf{I}(g, \boldsymbol{w})(\mathbf{V}(u, \boldsymbol{w}))$
$\mathbf{V}(\imath xFx, w)$ = the unique object b such that True$(Fx, \boldsymbol{w})$ with b assigned to x, and undefined if there is no such object

where $\mathbf{I}(g, \boldsymbol{w})$ is the function (in extension) assigned to g in $\boldsymbol{w}$ (for a formally precise statement, see Glüer and Pagin 2005). By $\mathbf{V}$, simple singular terms are evaluated with respect to the actual world, while functional expressions and predicates within complex singular terms are evaluated with respect to the possible world in question.

[6]This makes it different from simply applying the actuality operator to the sentence, for that affects the evaluation of both terms and predicates: True$(A\phi, \boldsymbol{w})$ iff True$(\phi, \boldsymbol{a})$. Still, it is possible to have a semantics equivalent to the actualist evaluation by adding the actuality operator to a standard semantics with non-rigid singular terms: let each non-rigid term t occur only in the following context: 'the x such that $A(x = t)$'. The result will be that only the actual world reference of terms will matter, while predicates are evaluated as usual.

An actualist evaluation semantics does not make use of the extension of a singular term in any other world than the actual world. That is, it doesn't make use of intensions of singular terms. So if we were using an actualist evaluation as our semantics across the board, it would be better to drop the intensions and simply speak of the reference of a singular term. This would be to follow the Kaplan-Almog line of direct reference (see Almog 1986).

Our second idea, however, is to use the actualist evaluation only for the semantics of *modal* sentences. We propose using the standard (P) for the ordinary truth conditions of atomic sentences, and using (A+) for the semantic contribution of an atomic sentence to a modal sentence containing it. The idea, then, is to have a truth definition clause for the modal expression that runs something like this:

(M) True($\ulcorner$ It is necessary that $\phi\urcorner, \boldsymbol{w}$) iff Actua-true($\phi, \boldsymbol{w'}$) at any world $\boldsymbol{w}$' accessible from $\boldsymbol{w}$

where 'Actua-true' just means true according to the (completed) actualist evaluation. In this way we distinguish between ordinary truth conditions and the semantic properties a sentence contributes to the truth conditions of modal sentences containing it (which is its actualist truth conditions).[7]

The resulting interpretation does accommodate all our basic modal intuitions. For instance, if we adapt the proposal to 'might have', understood as 'not necessarily not', using classical predicate logic and for simplicity treating 'go into pedagogy' as a simple predicate, we get the following result for (2):

> (2) is true iff there is some accessible world $\boldsymbol{w}$ such that $\mathbf{V}$('the teacher of Alexander', $\boldsymbol{w}$) does not belong to $\mathbf{I}$('goes into pedagogy', $\boldsymbol{w}$). The right hand side holds iff there is a unique object b of which 'x teaches Alexander' is true (with b assigned to 'x') in $\boldsymbol{w}$, and b does not go into pedagogy in $\boldsymbol{w}$. Again, this holds iff there is a unique object b such that the pair of b and $\mathbf{V}$('Alexander', $\boldsymbol{w}$) belongs to $\mathbf{I}$('x teaches y', $\boldsymbol{w}$), and b does not go into pedagogy in $\boldsymbol{w}$. Since $\mathbf{V}$('Alexander', $\boldsymbol{w}$) is $\mathbf{I}$('Alexander', $\boldsymbol{a}$), this holds iff there is a unique object b that in $\boldsymbol{w}$ teaches what 'Alexander' refers to in $\boldsymbol{a}$, and b does not go into pedagogy in $\boldsymbol{w}$.

This is the desired interpretation. And it is now very easy to see that we also get the desired interpretation for (1) as well as the desired 'scopelessness', i.e. the semantic equivalence of (3) and (4) ((5) and (6)). We therefore conclude that the relational modality account can indeed account for all our basic modal intuitions.

But, of course, the relational modality account is not alone in this. There

[7]This spells out a difference corresponding to Dummett's distinction between content and ingredient sense. In the semantics Kripke proposes there is no such difference, and he has been criticized by Dummett (cf. Dummett 1981b, 572f, 1991, 48), Evans (1979), and Stanley (1997a,b) for not taking account of the distinction. In our semantics, the distinction corresponds to a real difference.

are other accounts around, most notably Kripke's own rigidity account but also Dummett-style wide scope conventionalism, to name just two, that explain this basic evidence quite well. In the next section, we shall therefore provide additional motivation for the relational modality account by comparing it to what we take to be the main contender: the rigidity account. Our claim is that relational modality not only provides a better explanation of the basic data than rigidity, but has a number of other significant advantages as well.[8]

4 Rigidity or relational modality?

4.1 The rigidity account: formal comparison

Rigid designators are "scopeless": the truth conditions of modal sentences containing them are not affected by the scope order between name and modal operator (cf. Kripke 1980, 12, fn. 15). As observed above, this is not true of ordinary (non-rigid) definite descriptions; here, truth conditions differ with the scope given the description.[9] Therefore, the doctrine of rigidity is rightly acclaimed for offering an ingenious explanation of the basic modal intuitions. How does the present alternative measure up?

Let's start comparing the accounts by looking at some formal matters. As such, relational modality is not committed to any specific account of the intensions of names; it is perfectly compatible with their being rigid as well as with their having descriptive intensions, with some of them being rigid and some not or, for that matter, with any other (mixture of) kind(s) of intension for proper names. However, there clearly would not be much point in combining relational modality with the claim that all proper names are rigid. It offers a worthwhile alternative only if combined with the claim that at least a significant number of proper names are not rigid. Given the body of rather convincing examples of descriptive names in the literature, offering such an alternative already seems like a pretty clear advantage of the relational account.[10] On the assumption that

[8]We do think that similar cases can be made in comparison to other accounts on the market, but space does not permit us to make them all here. See section 5, however, for a comparison between our account and two-dimensionalism.

[9]As also observed above, when read with wide scope, modal sentences containing definite descriptions share this feature with those containing rigid designators: their truth value depends on the properties one particular individual x would have in counterfactual circumstances. This is the individual actually fulfilling the description in question. Accordingly, a defender of the description theory of names can try to emulate its effects syntactically. On such an account, what the initial modal intuitions show is not that names are rigid, but that we normally give proper names wide scope in modal sentences while we give definite descriptions small scope. This was first suggested by Dummett (cf. Dummett 1981a, 110ff). See also Loar 1976 and Yu 1980. A more recent defense of the wide scope proposal is Sosa 2001. According to Dummett, this behavior of names in modal sentences is to be explained by convention: there is a convention to the effect that names take wide scope in modal contexts. Hence the label 'wide scope conventionalism' for this kind of account.

[10]Think, for example, of Dummett's 'St. Anne' and 'Deutero-Isaiah' (cf. Dummett 1981a, 112ff, 1981b, 562ff). These names were introduced to name whoever in fact was the mother of the Virgin Mary and the person that wrote the prophecy of chapters 40 to 45 of the Book

a significant number of proper names are not rigid, there are some important formal differences between the relational and the rigidity account.

If we use rigidity to explain our basic modal intuitions, the decisive factor in the explanation is the intension of the designator in question. The difference between (1) and (2) depends on nothing but a difference in intension between the name and the description. The syntactic difference between names and descriptions is not relevant to modal contexts on this view. For even though there is an intensional property common to all the (semantically non-empty) members of the syntactic category of proper names, the property of having a constant function from worlds to objects as intension, this is not a property belonging exclusively to names. Every rigid definite description has it, too. What is relevant is only that some descriptions are not rigid.

This has the consequence that according to the doctrine of rigidity the truth conditions of modally simple sentences, that is, natural language sentences not containing modal expressions like the following

(13) Aristotle did not go into pedagogy

(14) The teacher of Alexander did not go into pedagogy

(cf. Kripke 1980, 6f) differ, too. Relational modality by itself does not give any prediction about modally simple sentences. Whether there is a difference between the truth conditions of (13) and (14) depends on the descriptive contents (if any) given to proper names; if 'Aristotle' is given the same descriptive content as 'the teacher of Alexander', the truth conditions of (13) and (14) will be the same.

This difference, however, does not result in any divergent evaluations with respect to the actual world. It is provably true that the relational modality interpretation will give the same evaluation of any formula with respect to the actual world as the standard interpretation with rigid singular terms. Since truth in the actual world simply is truth, if by 'the actual world' we do mean

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of Isaiah (respectively). Other, more worldly examples to be found in the literature would be Evans's 'Julius', a name of the inventor of the zip (cf. Evans 1979), and 'Jack the Ripper'. In these cases, Dummett argues, we in fact do reckon with two readings of sentences like

(i) St. Anne might not have been a mother

(ii) Deutero-Isaiah might not have written the prophecy,

one on which they would be true and one on which they would be false.

According to Jason Stanley (2002, 333-38), it is a challenge to semantic theories to show how the two sentences

(iii) a. Julius liked figs
b. The inventor of the zip liked figs

can express the same proposition, despite the fact that (iiia) has a rigid name (even though descriptive) where (iiib) has a description. On our semantics (iiia) and (iiib) do express the same proposition (= intension), in case the name *does* have the same intension as the description, but will still embed differently under modal expressions, i.e. it will embed *as if* 'Julius' were rigid.

the actual world, not just some entity designated as such in a model, this means that the rigidity interpretation and the relational modality interpretation will agree with respect to simple truth and falsity of any modal and non-modal statement. Hence, they are empirically equivalent with respect to basic modal intuitions.[11]

Moreover, despite the disagreement over the evaluation of simple sentences in non-actual possible worlds, the two interpretations will again agree, with respect to any possible world, on the truth value of modal sentences, i.e. sentences of the form $\ulcorner$ It is necessary that $\phi\urcorner$ etc.

When it comes to validity and consequence (in the usual model-theoretic sense), there are differences. As emphasized by Kripke, a sentence of the form

(15) $$a = b \rightarrow \Box(a = b)$$

is true in all worlds in every model that interprets 'a' and 'b' as rigid singular terms.[12] In this sense, being true at all worlds in all models, it is *universal-valid* in the classical rigidity interpretation. It is *not* universal-valid in the relational modality interpretation, for in some (in fact, most) relational modality models (15) is false in most worlds: to be true in a world $\boldsymbol{w}$, it must be the case that if 'a' and 'b' refer to the same object in $\boldsymbol{w}$, they also refer to the same object in the actual world $\boldsymbol{a}$ (since that is what matters for the evaluation of the consequent, by this interpretation), and since terms are not in general rigid in that interpretation, this is not in general true. Nonetheless, it is guaranteed to hold precisely in the actual world. (15) is true in $\boldsymbol{a}$, in every model for relational modality. We can say that in this sense (15) is *actual-valid* in the relational modality interpretation.[13]

This generalizes. Any sentence (in an ordinary language of quantified modal logic) that is *universal-valid* in the classical rigidity interpretation is *actual-valid* in the relational modality interpretation. This holds not only for validity, but also for consequence. Corresponding to the distinction between *universal-validity* and *actual-validity*, we have the distinction between *universal-conse-*

[11] It should be stressed that we have relied on the assumption that any proper name (individual constant) that has reference in some possible world also has reference in the actual world. This is philosophically well motivated. Indeed, we think that Kripke is entirely right in denying that Sherlock Holmes might have existed (Kripke 1980, 157-8), since there is no actual referent with which to identify any particular individual in any particular possible world.

This goes for our account, too. It is, of course, compatible with our view that 'Sherlock Holmes' has reference in other possible worlds, but because of our interpretation of 'might have' we have to deny that Sherlock Holmes might have existed. Since actual reference is all that matters to actual truth, even of modal statements, on our interpretation, we are justified in restricting attention to names that do have actual reference.

[12] This is not quite correct unless terms are strongly rigid in all models, i.e. have reference in all worlds in all models, or a semantics is employed according to which $a = b$ is true in a world $\boldsymbol{w}$ even if the terms don't have reference in $\boldsymbol{w}$. In this context it doesn't matter much in which of several appropriate ways the claim is corrected, since the contrast between the interpretations (concerning sentences like (15)) is brought out anyway.

[13] It would be in line with the terminology that Kripke introduced in *Naming and Necessity* to say that in this sense (15) is *a priori*. Anything that is true in the actual world, whatever the actual world is like, is *a priori*, even if it false in other possible worlds, and hence not necessary. Cf. section 5.

quence and *actual-consequence*. It turns out that universal-consequence in the rigidity interpretation coincides with actual-consequence in the relational modality interpretation, under certain model restrictions. More precisely, if we employ a partial semantics, where formulas will lack truth value with respect to worlds where any contained singular terms do not refer, the following holds for all models with a reflexive accessibility relation and non-empty world-bound domains: for any formula ϕ, any set of formulas Γ, it holds in every classical rigidity model and in every world $\boldsymbol{w}$ that ϕ is true in $\boldsymbol{w}$ if all formulas in Γ are true in $\boldsymbol{w}$ if, and only if, it holds in every relational modality model that ϕ is true in the actual world if all the sentences in Γ are true in the actual world (Glüer and Pagin 2005, Theorem 16). And if we assume an invariant non-empty world-bound domain, the equivalence holds even without the reflexivity condition.[14]

The connection between the interpretations concerning consequence is in fact even stronger, for it still holds (for the most common systems, at least) if we distinguish between consequence in different modal systems. For instance, ϕ is a S4 universal-consequence of Γ in the classical rigidity interpretation if, and only if, ϕ is an S4 actual-consequence of Γ in the relational modality interpretation. Similarly for B, T, and S5 (Glüer and Pagin 2005, Theorem 20).

Since (ordinary) modal reasoning proceeds by asserting sentences, modal and non-modal, as true (with respect to – if anything – *the actual world*), sometimes on the assumption that others are true, we can conclude that the correctness of modal reasoning would be left intact by switching from the rigidity interpretation to the relational modality interpretation, or vice versa. To the extent that *logical* reasons for preferring the one interpretation over the other are concerned with reasoning about simple truth of sentences or propositions, including modal ones, there are therefore no such reasons.[15] We will have to

[14] In fact, in the rigidity interpretation, universal consequence itself coincides with actual consequence under these restrictions (Glüer and Pagin 2005, Lemma 13). The same does not hold for the relational modality interpretation.

[15] We have met the objection that we could have the same result (in a simpler way) by using an actuality operator (on terms). The idea would be that for the operator $\mathcal{A}$ we have, for any simple closed term t and any world $\boldsymbol{w}$, $\mathbf{I}(\mathcal{A}(t), \boldsymbol{w}) = \mathbf{I}(t, \boldsymbol{a})$. A couple of remarks on this are in order.

First, just adding this operator to the logical language L that is used as an intermediate step for interpreting English is not adequate, for although $L + \mathcal{A}$ has a sentence which is truth conditionally equivalent with (1), i.e. '$\Diamond(\neg P(\mathcal{A}(Aristotle)))$' (where '$P$' represents the complex predicate 'went into pedagogy'), it also has the sentence '$\Diamond(\neg P(Aristotle))$' which, on a descriptivist understanding, is not. If both these sentences are available as translations of (1), we get the incorrect prediction that (1) is semantically ambiguous.

Therefore, translation into $L + \mathcal{A}$ must be restricted, for instance by the rule that a proper name N must be translated into $\ulcorner\mathcal{A}(N)\urcorner$ when occurring within the scope of a modal expression. This does work, but only as long as other intensional expressions such as the belief operator are not present. If the belief operator is present, such a rule yields wrong results once we consider so-called mixed contexts (see the appendix). For example, if N occurs within the scope of a belief operator, which in turn is within the scope of a modal operator, the translation of N should be N, not $\ulcorner\mathcal{A}(N)\urcorner$. To obtain the correct result, we would need an exception clause, and in fact an infinite number of exception clauses, for the translation should again be $\ulcorner\mathcal{A}(N)\urcorner$ if N is within the scope of a modal operator within the scope of the belief operator. And so on.

This particular problem could be solved by means of the simple rule that the translation come back, however, to the difference over simple sentences (see below, subsection 4.3).

4.2 Everyday language and ordinary modal reasoning

We agree with Kripke that ordinary modal reasoning is *de re*; when we consider alternative possibilities in ordinary modal reasoning, we are interested in alternative scenarios involving the objects we refer to. We are interested in these very objects, regardless of how the names of them are evaluated with respect to those scenarios. This seems to us the very heart of the intuitive notion of *de re* modality. And interestingly enough, all the evidence Kripke originally marshals for his account fits ours at least equally well; we fully agree when he repeatedly insists that when asking what is necessary or possible concerning some individual, we are asking the intuitive question whether in some counterfactual circumstances *this very individual* would have had such and such a property. Here is how he originally makes this point concerning Nixon: "When you ask whether it is necessary or contingent that Nixon won the election, you are asking the intuitive question whether in some counterfactual situation, *this man* would in fact have lost the election" (Kripke 1980, 41; cf. also 49, 62).

However, it would not only seem gratuitous to assume that it depends on its being a name (or other rigid designator) that this question can be asked, it seems simply false. The very same question can be asked by means of a (non-rigid) definite description. In that case, the description is to be construed as having wide scope with respect to the modal operator. Whether a definite description is to be given wide or small scope, it seems to us, depends on the kind of modal question asked; if we are interested in *de re* modality, it should be given a *de re* reading. However, given their explicit descriptive nature, descriptions naturally lend themselves more easily to asking questions concerning *de dicto* modality. And the other way around with names. Thus the natural tendency to consider (1) as true but (2) as false.

Thus, it seems to us that the phenomena to be explained, that is, the modal intuitions, are essentially due to the *de re* nature of ordinary modal thinking and, therefore, better explained in terms of a *de re* semantics for modal expressions. It's the kind of modal question asked that explains the observed behavior

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of N is $\ulcorner \mathcal{A}(N) \urcorner$ just in case the *closest* intensional operator is modal. However, this rule is still ad hoc, for it could give incorrect results if yet other intensional operators were added to the fragment of English, creating new contexts, for then it might not depend only on the closest intensional operator which translation is the right one. Therefore, the problem is better dealt with by having two different translation functions, say H and G, such that $H(N) = N$ and $G(N) = \ulcorner \mathcal{A}(N) \urcorner$, and H is partly defined by the clause H('it might have been the case that'$^\frown p$) = '$\Diamond$'$^\frown G(p)$. This solution is indeed equivalent with our semantics, and can be said to bring out the same ideas about modal thinking as opposed to rigidity.

The only reason for preferring the relational modality solution to the operator solution is that we would ultimately want to dispense with the intermediate step of translation into a logical language (or rather into a proper fragment of the logical language, for a sentence like '$\Diamond(\neg P(Aristotle))$' will not translate anything in object-level English). The relational modality semantics is precisely what results from the operator alternative when the semantics is given directly for (a regimented version of the fragment of) English.

of names. But this, of course, does not mean that this is the only kind of modal question that *can* be asked; we just think that it *in fact* is the kind of question usually asked in ordinary modal reasoning. However, if what we are interested in is *de dicto* modality, modal expressions should not be understood relationally; as pointed out above (section 3), there always is a corresponding interpretation on which modal expressions take names opaquely. Which interpretation is the correct one for any given modal utterance is an empirical question; it depends on the way a speaker treats names in modal contexts. There is, thus, no commitment to any particular concept of modality on our account.

If names are rigid, on the other hand, the *only* kind of modal reasoning you can engage in with them is *de re*. Confronted with a speaker that seems to use names in modal contexts in a way different from our ordinary use, the rigidity theorist would have to conclude that these are not really names. That, however, would amount to making rigidity part of the definition of what a name is. It would no longer be the case that we can identify names pre-theoretically and then find out what their semantics is. On the rigidity account, that is, you cannot consider it an empirical question what kind of modal reasoning a speaker using a name is engaging in. It seems to us, however, that our language is better described as one where this is an empirical question. So, for the reasons given, it seems to us that, all in all, the intuitions concerning ordinary modal reasoning actually are better accounted for as depending on the ordinary concept of *de re* modality than on the intensions of names.[16]

[16]Simon Blackburn posed the following question to us: What about the behavior of names vs. definite descriptions in combination with temporal expressions? Compare the following two sentences:

(i) Amartya Sen used to be a theologian.

(ii) The master of Trinity College used to be a theologian.

Intuitively, (i) is false while (ii) is true. ((ii) clearly has a false (wide scope) reading, though). How would our proposal explain these intuitions? Wouldn't it be better to explain both these and the modal ones by the same mechanism, namely rigidity? Neither the doctrine of rigidity nor our proposal, by themselves, give any predictions for such contexts. The doctrine of (modal) rigidity needs to be supplemented by that of temporal rigidity, i.e. by the claim that proper names designate the same individual with respect to different times. Our proposal, if used instead of rigidity, could make use of a relational semantics for evaluating temporal contexts containing names in a fashion analogous to the relational semantics for modal operators. Again, if names are held to have descriptive contents, a completely opaque evaluation (analogous to *de dicto* modality) would also be conceivable. And again, which semantics to use depends on the interests of the speaker: Is she interested in what is true of a certain object, no matter how described, at different times? Or is she interested in what is true of the object fulfilling a certain description at certain times at those same times? It does not seem to us that speakers of English ever use names in connection with temporal expressions in this second way (they use descriptions), but it's not very difficult to imagine what they would hold true if they did (the first sentence would be held true iff the second would be (in the small scope reading). However, Blackburn's objection continues, even if the analogous suggestion is plausible for modal expressions, would it not be much less convincing to say that temporal expressions have these two interpretations? If that is an observation about how the temporal expressions of English are in fact used, it does not seem as if there is any need for two interpretations (as we just said). If it is an observation about possible ways

4.3 More intuitions

In his discussion of Dummett's wide scope conventionalism,[17] Kripke marshals some further intuitions over and above our basic modal ones to support the rigidity account. As observed above, the relational account clashes with Kripke's on the question of names in simple sentences (on the assumption that not all names are rigid). If you combine it with some version of descriptivism, it will not predict any difference in possible worlds truth conditions between sentences like

(13) Aristotle did not go into pedagogy

(14) The teacher of Alexander did not go into pedagogy

Neither does Dummett's account, and it is precisely on that Kripke takes him to task. According to Kripke, these differences are not merely theoretical in nature; these are empirically testable predictions. First of all, he claims that we do have "direct" intuitions regarding the truth values of simple sentences in counterfactual situations (cf. Kripke 1980, 12, 14). That is, with respect to a counterfactual situation where the individual we call 'Aristotle' did not go into pedagogy, we think that (13) is true while (14) is false.

This is to claim that we have intuitions about what truth values simple sentences have at other possible worlds, i.e. intuitions as to the assignment of the values true-in-$\boldsymbol{w}$ or false-in-$\boldsymbol{w}$ to such sentences. We think that it is far from evident that there are such pre-theoretic intuitions, and if there are, how widespread and especially how robust they would be once they were questioned.[18] We, for instance, do not find ourselves having any such intuitions; we do not find anything counter-intuitive in thinking that (13) and (14) have the same possible worlds truth conditions. Kripke does admit that his claim raises questions like the following: "How did Russell, for one, propose a theory plainly incompatible with our direct intuitions of rigidity?" (Kripke 1980, 14). One reason is, according to Kripke, that "he did not consider modal questions" (ibid.). We think that this gives a hint as to why it would indeed seem very natural, once you have started to think in terms of possible worlds, to assign possible worlds truth values as Kripke suggests. It is because we use evaluations with respect to other possible worlds while doing modal reasoning that this seems natural. And if we are interested in ordinary *de re* modality, we simply have no reason to consider any other than what we call actualist evaluations. We are not interested in what the name might refer to in the counterfactual situation under consideration. It's irrelevant to the modal question.

However, it not only seems perfectly possible to ask that question; it seems to us that it *has* to be asked when we ask the plain and unadulterated question

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of evaluating sentences with respect to different times, these two different ways are certainly already available when it comes to descriptions interacting with temporal expressions. So why shouldn't it be possible for names with descriptive contents?

[17] See above, fn. 9

[18] Dummett goes even further; he flatly denies that there are any such intuitions. Cf. Dummett 1981b, 582.

whether a simple sentence is true in counterfactual circumstances. Then, both the name and the predicate need to be evaluated according to those circumstances, and the answer does *not* seem to be given by what happens in *de re* modal reasoning. Once one realizes the possibility of separating this purely semantic question from the *de re* modal questions, the evidence from considering truth values in counterfactual situations to rigidity does not seem direct anymore. Rather, considering *de re* modal questions gives us evidence about how sentences are evaluated with respect to counterfactual situations when we do exactly that: consider such modal questions, but nothing more. Therefore, we do not think that it should count against our proposal that it is compatible with possible worlds truth value assignments that do not coincide with Kripke's.

Kripke does have a comeback to this. For there are sentences using ordinary modal expressions that would seem to provide evidence for rigidity and against our proposal.[19] Consider the following pairs

(16) a. (13) might have been true
b. (14) might have been true

(17) a. Aristotle did not go into pedagogy. That might have been the case.
b. The teacher of Alexander did not go into pedagogy. That might have been the case.

(Cf. Kripke 1980, 13f). According to Kripke, our intuitions are that (16a) and (17a) are true while (16b) and (17b) are false. Let's call these sentences and Kripke's intuitions regarding them 'metalinguistic'. The relational account does not (necessarily) predict these intuitive differences.[20]

[19] Officially, this is evidence used in the controversy with Dummett again. In conversation, however, Kripke has brought it up against our proposal too.

[20] Nor does wide scope conventionalism. The relational account parts company with the wide scope analysis, however, when it comes to a third type of example Kripke brings up. He argues that the wide scope analysis cannot handle our intuitions regarding sentences like the following:

(i) It might have been the case that: Aristotle did not go into pedagogy

(ii) It might have been the case that: the teacher of Alexander did not go into pedagogy.

These are intended as sentences that make their own scope explicit. With respect to such sentences, Kripke claims that "the contrast [between names and descriptions] would hold if all the sentences involved were explicitly construed with small scopes (perhaps by inserting a colon after 'that')" (Kripke 1980: 13). That is, one would regard (i) as true even though here the name has small scope. We agree.

It's a bit tricky to assess the options the wide scope theorist has in response. His claim, remember, is that there is a convention according to which names take wide scope in modal contexts. To see just how scope-explicit sentences are to make trouble for this analysis, we need to know how exactly this convention is supposed to do its work: on the level of syntax or on that of semantics. That is, are small scope readings taken to be syntactically specifiable but without interpretation? Or are they not even syntactically specifiable? Let's go through the possibilities. What the wide scoper cannot do is agree that in (i), the name does have small scope but claim that the sentence is nevertheless false. That would amount to contradicting his own convention. The next option would be to agree that (i) has the syntactical form

In line with what we have already said about simple sentences, we also do not think that it should count against our proposal that it is compatible with truth value assignments to metalinguistic sentences like (16a)–(17b) that do not coincide with Kripke's. If people really do have such metalinguistic intuitions, we can give an excellent pragmatic explanation as to why that is the case. In fact, we can give the same explanation as for the alleged direct intuitions: People simply consider the sentences referred to in (16a)–(17b) as they would in modal reasoning. They use such sentences like in the wider context of modal reasoning, and, therefore, treat (16a) as if it were synonymous with (1).

Such things are rather common and it would seem wrong to us to place heavy semantic emphasis on them. After all, it does take quite some reflection to realize that such metalinguistic exportation from the original modal sentences (1) and (2) might simply be illegitimate.[21]

4.4 Attitude contexts, mixed contexts, and identity

As developed so far, our proposal does not have any consequences for the behavior of names in other intensional contexts, such as propositional attitude contexts. As it stands, that is, there simply is no prediction about, for instance, belief contexts. Nor is there any prediction about so-called mixed contexts, that is, contexts involving both modal and doxastic expressions like the following:

(18) Alfred believes that Twain might not have been a writer.

(19) Alfred might have believed that Twain is not a writer.

This in itself is clearly an advantage of the proposed account over the rigidity account, for on the rigidity account names are rigid no matter what else is contained in a given context. Thus, if belief ascriptions relate believers to propositions expressed by the embedded sentences, and propositions are possible

of a small scope sentence, but lacks interpretation. It is semantically meaningless. This is extremely implausible, especially since (ii), according to the wide scoper's own account, results from a meaningful sentence ((ii)) by inter-change of synonymous expressions. The remaining option would be to deny that (i) is syntactically unambiguous. Thus, the wide scoper might claim that (i) itself does have a wide scope reading, and that that reading confirms the intuition. What about its small scope reading, however? Again, the wide scoper would have to claim that on that reading (i) is meaningless. Otherwise, he would endow small scope readings with a strange elusiveness; he would have to claim that, somehow, no matter how hard we try to refer to them, they slip away and the name takes wide scope. This clearly would be an unhappy position to take for someone who thinks that the modal intuitions to be explained depend on what is the case on one reading as opposed to what would happen on the other. Scope-explicit sentences therefore do seem to present rather strong evidence against the wide scope analysis.

The relational account, on the other hand, has, of course, no difficulty at all with scope-explicit sentences.

[21]The metalinguistic intuitions could be given a semantic explanation if one used the actualist evaluation across the board, not only for modal sentences. Such a semantics would still be compatible with a description theory; however, the intensions of names it works with would simply play no semantic role whatsoever. The same, however, might be (and has been) said for the semantics of rigidity.

worlds intensions, then from rigidity there is a prediction that the following two sentences express the same proposition (given that Twain is Clemens):

(20) Alfred believes that Twain is a writer.

(21) Alfred believes that Clemens is a writer.

This prediction is intuitively false. There is, of course, a similar difficulty with accounting for the intuitive difference in information content between identity statements like the following:

(22) Twain is Twain.

(23) Twain is Clemens.

Just by itself, rigidity would not seem to have anything on offer to explain these intuitions. An additional element, something over and above rigidity, is required if the semantics of names is to account for them. And this element would in a certain sense be required exactly to undo the effects of rigidity in certain contexts. Rigidity gives you substitutivity (*salva veritate* in attitude contexts, *salva intensione* in identity statements), and the additional element would need to effect substitutivity failure in connection with certain operators. The relational modality account, on the other hand, does not have any detrimental effects on attitude contexts (or on identities) that would need to be undone. Moreover, it can be combined with a descriptivist semantics for names, thus offering a potential explanation for substitutivity failures. For a full explanation, however, the account would, of course, need to be extended to attitude contexts.

What about mixed contexts, then? It has been argued, especially by Scott Soames, that wide scope conventionalism runs into trouble here, having to characterize inferences as invalid that intuitively are valid and vice versa.[22] Would we not run into essentially the same trouble, once we introduced a belief operator and tried to combine it with our modal operator? What the question comes down to is whether in contexts like (18) and (19) the name 'Twain' occurs referentially or not, and the problem is that neither answer appears satisfactory. If it does not, inferences like the following would, counter-intuitively, be rendered invalid:[23]

(24) Twain might not have been a writer.

(18) Alfred believes that Twain might not have been a writer.

So,

(25) Alfred believes something true.

[22]See Soames 1998 and Soames 2002, chapter 2.

[23]The reason is the following: Alfred is belief-related to a proposition. If substitutivity fails in (18), then substitution of co-referring names can exchange one proposition for another. But the proposition expressed by (24) is a proposition that is not changed by substitution, provided the proposition expressed is given by the set of worlds where (24) is true.

If it does, however, inferences like the following would, again counter-intuitively, be rendered valid:

(18) Alfred believes that Twain might not have been a writer.

(23) Twain is Clemens.

So,

(26) Alfred believes that Clemens might not have been a writer.[24]

What this suggests is that in mixed contexts, you sometimes can substitute, while at other times you cannot. This seems plausible given that we are concerned with belief reports; whether or not substitution goes through can, we submit, be plausibly regarded as depending on the intentions of the speaker (that is, the reporter of the attitude).[25] In our terms, the desired result would, therefore, be that in mixed contexts, names sometimes occur referentially and sometimes not. Sentences like (18) and (19) would, in other words, have two possible, non-equivalent readings, and this can in fact be straightforwardly achieved. Suppose we supplement our semantics by a classical possible worlds account of propositional attitude contexts.[26] Whether or not substitution fails then depends on which of two readings a sentence is given, that is, on whether the name in, for instance, (18) is given small or intermediate scope. If you read it as having small scope, substitution will go through, for then the name is within the scope of the modal operator. If, however, you give it intermediate scope, it is within the scope of the belief operator only. Thus, substitutivity failure results. And if you mix the other way around, as in (19), these results are reversed (For details, see the appendix).

The ease with which the relational modality account lends itself to such extension would seem a clear advantage of this account. Moreover, what all of this ultimately suggests is that substitutivity or its failure is better accounted for as depending on the context in which a name occurs — the operator that governs it. This ultimately comes down to what we, as speakers, are interested in: the object itself, no matter how it is designated, or the object as conceived, or described by the user of a name. In ordinary modal reasoning, or so we claim, we are interested in the object regardless of how it is described, but in belief reporting we often are not. It might well be possible to do something equivalent with a semantics that starts from rigidity and, so to speak, undoes

[24]This has been suggested to us by Jennifer Saul in her comments at the Rutgers Semantics Workshop. She here explicitly adapts Soames' criticism of wide-scope descriptivism as developed in Soames 1998 and Soames 2002, Chapter 2, to our account. On the same occasion, Scott Soames pressed the issue of mixing the other way around.

[25]This, in our opinion, holds for non-mixed belief contexts as well; some of them should be construed as non-substitutable while others should be construed, as Quine has it, relationally.

[26]As classically suggested in Hintikka 1962. We are, of course, aware of the problems connected with such accounts; we are aware, for example, that a standard possible worlds account of belief has the consequence that the subject believes all logical truths. We do not here endorse such an account; we only use it to illustrate how an extension to attitude contexts would allow us to deal with mixed contexts.

its effects in the right contexts. That, however, remains to be seen. Moreover, given substitutivity failure in identities, it certainly would seem more plausible to start with a descriptivist semantics for names and effect substitutivity by means of the relevant operators, than to do it the other way around.

5 Meaning and two-dimensionalism

On our semantics, (non-rigid) definite descriptions and proper names make *different* semantic contributions to modal contexts. At the same time, our semantics allows for their making *the same* semantic contribution to simple sentences, and, when combined with a possible worlds account of attitude contexts, even to doxastic contexts. As noted above (notes 1, 7), this means that on our semantics, there is no simple equation between intension and linguistic meaning. Rather, as we shall proceed to explain, linguistic meaning can be identified with an *ordered pair of intensions*.

Our semantics works with two different kinds of evaluation of expressions: standard possible worlds evaluation and actualist evaluation (as given for atomic formulas by (P) and (A+), page 7, in section 3). Now, the difference in linguistic meaning between, for instance, 'Aristotle' and 'the teacher of Alexander' is induced by their different contributions actualist evaluations, while they contribute the same in standard evaluations. What we suggest is, in effect, to work with *two* possible worlds intensions, i.e. functions from worlds to extensions. The first is an expression's standard possible worlds intension; it goes from possible worlds, via standard evaluation, to standard extensions. Let's call this its ***I**-intension* ('**I**' for the standard interpretation function **I** (see above, ibid.)). The assumption that 'Aristotle' has the same descriptive content as 'the teacher of Alexander' then amounts to the assumption that these two expressions have the same **I**-intension. The second evaluation function we work with goes from possible worlds, via actualist evaluation, to actualist extensions. Let's call this an expression's ***V**-intension* ('**V**' for the interpretation function **V** employed in actualist evaluation (see above, page 7).[27] The **V**-intension of 'Aristotle' is a constant function from worlds to Aristotle, but for 'the teacher of Alexander', the **V**-intension is a function that takes us from a world $\boldsymbol{w}$ to whoever is the teacher of Alexander in $\boldsymbol{w}$, if anyone (since the **V**-intension of 'Alexander' is again a constant function from worlds to Alexander).

What we suggest, then, is to identify an expression's linguistic meaning with the ordered pair of its **I**-intension and its **V**-intension. An expression's **V**-intension is determined by its **I**-intension together with its syntax, provided we make type-distinctions within the syntactic category of singular terms. From this perspective, what the modal operators do is trigger a shift from evaluating an expression's **I**-intension to evaluating its **V**-intension. And doxastic operators

[27] For singular terms, the **V**-intension is given by definition (V) itself. For atomic formulas, it is given by definition (A+): a function from possible world (and variable assignment) to truth value, according to whether the condition stated in (A+) is fulfilled. See above, page 7. This is then extended to complex formulas in the natural way.

trigger the opposite shift. Epistemic operators, for instance 'it is a priori true that', could be easily incorporated into this picture; like doxastic operators, they would trigger evaluation of an expression's **I**-intension. Indeed, from this perspective, intensional operators in general are *evaluation shifters*.

Taking this perspective on linguistic meaning brings out certain similarities between our semantics and two-dimensionalism, currently popular amongst philosophers with descriptivist leanings.[28] In fact, since it is a hallmark of current two-dimensionalism to work with pairs of intensions (such as primary and secondary intension), one might wonder whether we aren't just two-dimensionalists in disguise. Now, it should be clear that just identifying an expression's linguistic meaning with an ordered pair of intensions does *not* make us two-dimensionalists. For the very idea of two-dimensionalism is to employ *binary evaluation functions*, i.e. functions from *pairs of worlds* to extensions. All our evaluations are strictly one-dimensional. Nevertheless, there are deeper structural similarities between our proposal and two-dimensionalism; on both accounts, intensional operators are evaluation shifters. To bring this out, we are first going to set out the basic ideas of two-dimensionalist semantics in a slightly more formal way than usual in the literature and then extend it to object language intensional operators. Despite this similarity, the accounts are by no means equivalent; in fact, as Scott Soames has argued (Soames 2005), two-dimensionalism engenders counter-intuitive consequences when it comes to certain mixed contexts, consequences that do not ensue on the relational modality account.

As a way of saving descriptivism about proper names, two-dimensionalism takes off from the idea of appealing to descriptions that are *rigidified* by means of the actuality operator.[29] For instance, let's say that the name 'Aristotle' is synonymous with the definite description 'the *actual* teacher of Alexander' rather than simply with 'the teacher of Alexander'. As a result, we should compare, not (1) and (2), but

(1) Aristotle might not have gone into pedagogy

(27) The *actual* teacher of Alexander might not have gone into pedagogy

And now our intuitions favor an evaluation that makes both these sentences come out true.

The main problem with this suggestion is that as long as we equate linguistic meaning with standard possible worlds intension, the synonymy, i.e. sameness of meaning, of 'Aristotle' and 'the actual teacher of Alexander' does not consist in anything more than their both having the constant function from worlds

[28]The earliest suggestions for two-dimensionalism seems to be ideas in Kamp 1971. Robert Stalnaker made us of it for pragmatics in Stalnaker 1978. Early work by Martin Davies and Lloyd Humberstone was presented in Davies 1981. More recently, two-dimensionalist ideas have been exploited by David Chalmers, e.g. in Chalmers 1996, and Frank Jackson, e.g. in Jackson 1998. A more comprehensive history and discussion of two-dimensionalism is given in Soames 2005.

[29]The earliest suggestion for rigidifying descriptions was David Kaplan's 'Dthat'-operator. See Kaplan 1979.

to Aristotle as intension. But then, 'the actual teacher of Alexander' is also synonymous with 'the actual most prominent pupil of Plato' as well as with 'the actual author of *De Interpretatione*'. As long as we take content to be standard intension, the descriptive contents of the original non-rigid descriptions are simply lost when they are rigidified: Rigidifying is collapsing contents. For saving the description theory, a more elaborate idea of linguistic meaning is needed.

At this point, two-dimensionalist semantics helps. In a two-dimensionalist framework, each sentence is evaluated at a *pair* of possible worlds $\langle \boldsymbol{w}_i, \boldsymbol{w}_j \rangle$, rather than at a single world.[30] The first world is intuitively treated as the world of *utterance* of a sentence, and the second as the world of *evaluation*. The idea is that the possible worlds *intension* of an expression is fixed in the world of utterance, and this intension is then what is relevant for determining the truth value of the sentence relative to the world of evaluation.

For proper names and descriptions, this framework can be employed as follows. The actuality operator here acts like an indexical, selecting the world of utterance as the actual world. Now, suppose the expression 'the actual teacher of Alexander' is used in $\boldsymbol{w}_i$. As used there it will refer to the unique person $\boldsymbol{o}$ (assume there is one) that teaches Alexander in $\boldsymbol{w}_i$. $\boldsymbol{o}$ will therefore be the evaluation of the expression with respect to *any* world $\boldsymbol{w}_j$. Compare the use of the expression 'the teacher of Alexander' in the same world $\boldsymbol{w}_i$: its reference is again $\boldsymbol{o}$. But this time the evaluation with respect to an arbitrary world $\boldsymbol{w}_j$ is the person that teaches Alexander in $\boldsymbol{w}_j$, if any, and that will be $\boldsymbol{o}$ in some worlds but not in others.

The descriptive content of the rigidified description can then be captured by means of a distinction between two kinds of intension. In Chalmer's terminology, they are the *primary* and the *secondary* intensions. 'The teacher of Alexander' and 'the actual teacher of Alexander' have the same primary intension but differ in secondary intension. 'The actual teacher of Alexander' and 'the actual author of *De Interpretatione*' have the same secondary intension (as uttered in the actual world), but differ in primary intension. Rigidifying thus collapses descriptive content into the secondary intension, but preserves it as the primary intension.

Formally, with $\mathbf{I}(e)$ as a binary function from pairs of worlds $\langle \boldsymbol{w}_i, \boldsymbol{w}_j \rangle$ to extensions, and with $\mathbf{I}^1(e)$ as the primary intension of expression e and $\mathbf{I}^2_{\boldsymbol{w}}(e)$ as the secondary intension of e at world $\boldsymbol{w}$, we have

(28) a. $\mathbf{I}^1(e) = \lambda \boldsymbol{w}((\mathbf{I}(e))(\boldsymbol{w}, \boldsymbol{w}))$

b. $\mathbf{I}^2_{\boldsymbol{w}_i}(e) = \lambda \boldsymbol{w}((\mathbf{I}(e))(\boldsymbol{w}_i, \boldsymbol{w}))$,

as usual with 'λ' as functional abstraction operator. Now we can say that the (actual) linguistic *meaning* of an expression e is the pair of its primary intension and its secondary intension in the actual world, i.e. $\langle \mathbf{I}^1(e), \mathbf{I}^2_{\boldsymbol{a}}(e) \rangle$. We can then

[30]More elaborately, one can take the first member to be a pair of a world and a context of utterance (where the context of utterance can be identified with a pair of speaker and time), but we shall ignore this addition, since we are not dealing with context sensitive expressions.

see that the meaning of 'the actual teacher of Alexander' is different from both the meaning of 'the teacher of Alexander' (differing in the second element) and from the meaning of 'the actual author of *De Interpretatione*' (differing in the first element), as desired.

These intensions are then put to use in intensional contexts. The idea is that the secondary intension is what is relevant in *modal* contexts, while the primary intension is relevant in *attitude* contexts. As a first shot,

(29) Necessarily, p

is true at a world $\boldsymbol{w}$ just if the proposition that constitutes the secondary intension of $\ulcorner p \urcorner$ is true at all worlds accessible from $\boldsymbol{w}$. Correspondingly,

(30) Alfred believes that p

is true just if Alfred stands in the belief relation to the proposition that constitutes the primary intension of $\ulcorner p \urcorner$. This can then be elaborated with a possible worlds account of belief sentences. And in the same vein for what might be called 'epistemic contexts', for instance

(31) It is *a priori* true that p

is true just if the primary intension of $\ulcorner p \urcorner$ is true at *all* (relevantly) accessible worlds. This allows $\ulcorner p \urcorner$ being a priori true but not necessary, and vice versa.

This is promising. Note, however, that so far only *one-dimensional* truth conditions for intensional contexts are given. To have a two-dimensional semantics for the intensional operators, we need the primary and secondary intensions *of the intensional contexts themselves.* Only then is it possible to iterate them. What needs to be done, is this: given the truth conditions for intensional contexts specified above, we need to work out their binary intensions. And these need to be given in terms of evaluation of sub-sentences rather than in terms of the evaluation of the intensions of the sub-sentences.

For instance, to say that the secondary intension at $\boldsymbol{w}_i$ of $\ulcorner p \urcorner$ is true at a world $\boldsymbol{w}_j$ is to say that $\ulcorner p \urcorner$, as uttered in $\boldsymbol{w}_i$, is true at $\boldsymbol{w}_j$. To say that the secondary intension of $\ulcorner p \urcorner$ at $\boldsymbol{w}_i$ is true at all worlds accessible from world $\boldsymbol{w}_j$ is to say that $\ulcorner p \urcorner$, as uttered in $\boldsymbol{w}_i$ is true at all worlds accessible from $\boldsymbol{w}_j$. And so on. Applying (28), we get the following for the necessity operator:

(32) The primary intension of $\ulcorner \Box p \urcorner$ at $\boldsymbol{w}_i$ is true at $\boldsymbol{w}_j$ just if, for all worlds $\boldsymbol{w}$ accessible from $\boldsymbol{w}_j$, $\ulcorner p \urcorner$, as uttered in $\boldsymbol{w}_j$, is true at $\boldsymbol{w}$.

(33) The secondary intension of $\ulcorner \Box p \urcorner$ at $\boldsymbol{w}_i$ is true at $\boldsymbol{w}_j$ just if, for all worlds $\boldsymbol{w}$ accessible from $\boldsymbol{w}_j$, $\ulcorner p \urcorner$, as uttered in $\boldsymbol{w}_i$, is true at $\boldsymbol{w}$.

Analogously, with '$\boxdot$' as any primary intension operator (doxastic or epistemic), and 'dot-accessible' for the corresponding accessibility relation:

(34) The primary intension of $\ulcorner \boxdot p \urcorner$ at $\boldsymbol{w}_i$ is true at $\boldsymbol{w}_j$ just if, for all worlds $\boldsymbol{w}$ dot-accessible from $\boldsymbol{w}_j$, $\ulcorner p \urcorner$, as uttered in $\boldsymbol{w}$, is true at $\boldsymbol{w}$.

(35) The secondary intension of $\ulcorner \boxdot p \urcorner$ at $\boldsymbol{w}_i$ is true at $\boldsymbol{w}_j$ just if, for all worlds $\boldsymbol{w}$ dot-accessible from $\boldsymbol{w}_j$, $\ulcorner p \urcorner$, as uttered in $\boldsymbol{w}$, is true at $\boldsymbol{w}$.

Note that here, primary and secondary intension coincide.

Now, we can put things together for interpreting 'Necessarily, Alfred believes that', at the actual world and with respect to the actual world. If we take 'Alfred believes that' as an operator without bothering about the reference issues of 'Alfred' (and dropping the corners), we get

(36) a) $\mathbf{I}(\Box(\boxdot p), \boldsymbol{a}, \boldsymbol{a}) = \mathrm{T}$ *iff*
b) for all worlds $\boldsymbol{w}$ accessible from $\boldsymbol{a}$, $\mathbf{I}^2_{\mathbf{a}}(\boxdot p, \boldsymbol{w}) = \mathrm{T}$ *iff*
c) for all worlds $\boldsymbol{w}$ accessible from $\boldsymbol{a}$, $\mathbf{I}(\boxdot p, \boldsymbol{a}, \boldsymbol{w}) = \mathrm{T}$ *iff*
d) for all worlds $\boldsymbol{w}$ accessible from $\boldsymbol{a}$, and all worlds $\boldsymbol{w}'$ dot-accessible from $\boldsymbol{w}$, $\mathbf{I}^1(p, \boldsymbol{w}') = \mathrm{T}$ *iff*
e) for all worlds $\boldsymbol{w}$ accessible from $\boldsymbol{a}$, and all worlds $\boldsymbol{w}'$ dot-accessible from $\boldsymbol{w}$, $\mathbf{I}(p, \boldsymbol{w}', \boldsymbol{w}') = \mathrm{T}$

And analogously for mixing the other way around. What we can see from the derivation in (36) is that when two-dimensionalism is articulated in a proper recursive truth definition, it makes use of two different evaluation functions, $\mathbf{I}^1(\ldots,\ldots) = \mathrm{T}$ and $\mathbf{I}^2_{(\ldots)}(\ldots,\ldots) = \mathrm{T}$ – just like the relational modality semantics. Moreover, and again just like in the relational modality semantics, the modal operators trigger one of them (the $\mathbf{I}^2$ evaluation), while the doxastic and epistemic operators trigger the other (the $\mathbf{I}^1$ evaluation).[31] To be sure, the evaluation functions two-dimensionalism uses are very different from those we use, but there nevertheless is an intriguing structural similarity between the proposals; on both, intensional operators function as *evaluation shifters*.

Nevertheless, there are significant differences. To repeat, relational modality is a one-dimensional theory, making use of more than one evaluation (and thus more than one intension), but using only individual worlds, not pairs of worlds. Moreover, the distinction between necessity and *a priority* drawn in two-dimensionalism is not reproduced on the level of truth at a possible world. For a sentence like

(37) The teacher of Alexander is the actual teacher of Alexander

has a primary intension true at all worlds in two-dimensionalist semantics, but is not true at all worlds in the relational framework.[32]

A sentence like (37) is a priori true according to two-dimensionalism be-

[31] Primary and secondary intensions are derivable from these evaluations by abstraction.

[32] However, the corresponding result is that (37) is relationally *valid*, i.e. true in the actual world of all models. Also, recall that if 'Aristotle' and 'the teacher of Alexander' have the same **I**-intension in the relational modality framework, then

(i) Aristotle is the teacher of Alexander

is true in all worlds having a unique teacher of Alexander, even though its necessitation is false.

cause 'the teacher of Alexander' and 'the actual teacher of Alexander', as pointed out above, have the same primary intension. More generally, in the two-dimensionalist framework, adding the actuality operator to any expression does not change that expression's primary intension. Consequently, with $\mathcal{A}$ as the actuality operator, $\boxdot(\mathcal{A}\,p)$ and $\boxdot\,p$ are equivalent, for

(38) $\quad \mathbf{I}(\boxdot(\mathcal{A}\,p), \boldsymbol{w}, \boldsymbol{w}') = \mathbf{I}(\boxdot\,p, \boldsymbol{w}, \boldsymbol{w}')$

since

(39) $\quad$ for all $\boldsymbol{w}$, $\mathbf{I}(\mathcal{A}\,p, \boldsymbol{w}, \boldsymbol{w}) = \mathbf{I}(p, \boldsymbol{w}, \boldsymbol{w})$.

This means that, for instance, according to two-dimensionalism, the following pair of sentences *have the same meaning*, that is, the same primary as well as secondary intensions:[33]

(40) Mary believes that the husband of Stephanie Lewis was the author of *Counterfactuals*.

(41) Mary believes that the actual husband of Stephanie Lewis was the actual author of *Counterfactuals*.

This is a very counter-intuitive result. Intuitively, the actuality operator rigidifies descriptions even in belief-contexts. On the relational modality account, no such counter-intuitive equivalence holds; a standard semantics for the actuality operator can easily be incorporated into this account, and since the belief operator here triggers standard evaluation, the rigidifying effect of the actuality operator is preserved.

In his critique of two-dimensionalism, Soames makes use of this two-dimensionalist equivalence between $\boxdot(\mathcal{A}\,p)$ and $\boxdot\,p$. He in effect argues that it leads to clearly counter-intuitive truth-value assignments in certain mixed contexts. Here is his example in full:

(42) a. It is a necessary truth that [if the actual husband of Stephanie Lewis was the actual author of *Counterfactuals* and Mary believes that the actual husband of Stephanie Lewis was the actual author of *Counterfactuals*, then Mary believes something true].

b. It is a necessary truth that [if the actual husband of Stephanie Lewis was the actual author of *Counterfactuals* and Mary believes that the husband of Stephanie Lewis was the author of *Counterfactuals*, then Mary believes something true].

(2005, 272-3.) Intuitively, (42a) is true, while (42b) is false. But by two-dimensionalist principles (42a) and (42b) are equivalent. We agree with the intuitive evaluation. And the two-dimensionalist equivalence now is obvious: since $\boxdot(\mathcal{A}\,p)$ and $\boxdot\,p$ have the same two-dimensionalist meaning, the following are equivalent as well

[33] The example is adapted from Soames, cf. 2005, 272-3.

(43) a. $\Box(\text{if } \mathcal{A}\,p \text{ and } \boxdot\,(\mathcal{A}\,p),\ \text{then } \exists q(\boxdot\,q \text{ and } q)).$

b. $\Box(\text{if } \mathcal{A}\,p \text{ and } \boxdot\,p,\ \text{then } \exists q(\boxdot\,q \text{ and } q))$

(where '$\boxdot$' is interpreted as *Mary believes that* and $\exists q(\boxdot\,q$ and $q)$ as *Mary believes something true*).[34,35]

Summing this up, we can say that despite the similar construal of intensional operators as evaluation shifters, we are by no means two-dimensionalists in disguise. The relational modality semantics can do everything two-dimensionalism does, but it can do it one-dimensionally. Moreover, no counter-intuitive equivalences threaten its extension to mixed intensional contexts.

6 Conclusion

The relational modality account proposed in this paper accounts at least as well for the main body of our modal intuitions as its main contender, the rigidity account. In capturing the nature of ordinary modal reasoning, it does even better than rigidity. It is comparatively free from controvertible semantic commitments, which we think is a further advantage.

Our account is compatible with possible worlds truth value assignments to simple sentences that diverge from the rigidity account's. It also allows for divergence concerning the metalinguistic intuitions on which Kripke has come to place heavy weight. Being compatible with divergent possible worlds truth value assignments to simple sentences actually is another advantage of our proposal; it allows for considering modal questions and purely semantic questions separately. Once this possibility is in play, the evidence for rigidity that would be provided by the alleged metalinguistic intuitions is considerably weakened; if there are in fact such intuitions, they might prove unstable in reaction to this challenge. Moreover, since there is on our account a plausible psychological explanation for these metalinguistic intuitions, such intuitions should not count against it.[36]

[34] Whether (43a) and (43b) are both true or both false depends, then, on whether the quantification is interpreted substitutionally or not.

[35] Note that the scope variations that do the work in the relational modality treatment of mixed contexts cannot be used against it here. (42b) cannot be made true by giving the two descriptions large scope with respect to the belief operator.

[36] Of course, accounting for our modal intuitions is only a partial defense of descriptivism against Kripke's arguments in *Naming and Necessity*. Both Timothy Williamson and Frank Jackson have urged that "the real killer" is by no means the modal argument, but the so-called epistemic argument. We of course agree that a full defense of descriptivism would require addressing this argument as well. A full defense of descriptivism, however, would certainly be beyond the scope of a single paper, and, anyway, was not quite the project undertaken in this one. What we do not agree with is that the epistemic argument is the real killer. Therefore, a short note seems in order:

According to a descriptivist semantics for proper names, a name is associated with a description, or set of descriptions, that (in a way to be specified) determine its referent. Two main versions of descriptivism can be distinguished depending on whether it is a single description or a set of descriptions that determine the referent. As far as we can see, it is only in the latter form, as a so-called cluster-theory (as first suggested in Searle 1958), that descriptivism is worth defending.

As directed against a single description version, the epistemic argument points out that we

Our account does not have any consequences for names in other intensional contexts, such as propositional attitude contexts, where the rigidity account clearly is at its weakest. This in itself is an advantage. It gives semantic substance to the distinction between assertoric content and ingredient sense by employing different semantic evaluations and construing linguistic meaning as an ordered pair of intensions. This in turn opens possibilities of straightforwardly combining our account with a semantics for attitude contexts in a way that allows for handling mixed modal/doxastic contexts. In the light of such an extension, intensional operators in general can be characterized as evaluation shifters. Only two-dimensional semantics would seem to hold similar promise; however, despite its very similar view of intensional operators, two-dimensionalism falls short when it comes to handling mixed contexts.[37]

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Appendix: Mixing modality and belief

The relational modality account may be used together with a possible worlds account of propositional attitude contexts (the classical treatment is Hintikka 1962). Since it allows proper names to be non-rigid, the **I**-intensions of two co-referring names may be different, which in turn may be used to account for

have strong intuitions to the effect that most such descriptions do not provide us with *a priori* knowledge. For instance, our belief that Aristotle was the teacher of Alexander could turn out to be false; we could discover that, in fact, he wasn't (cf. Kripke 1980, 30). However, even if that would hold for any particular description associated with a name, it would not yet amount to a good argument against a cluster theory. To have such an argument, you also need to hold that all (or, depending on the principle according to which a cluster determines reference, at least some sort of weighted majority of) the beliefs in the cluster could turn out to be false simultaneously. And this seems much less plausible, if at all.

Take Kripke's own case: Assume that it turns out that Gödel did not discover the incompleteness of arithmetic. Schmidt did (cf. Kripke 1980, 83f). Kripke tries to convince us that this could be a case in which "most" of what a speaker believes about Gödel has turned out to be false. But why should we accept that? Even as Kripke describes the case, this surely is not the only thing the speaker believes about Gödel. It would be rather strange, for instance, if he did not believe that Gödel was a logician, that he published something about the incompleteness of arithmetic, that he got rather famous for that, and so on and so forth. But now imagine all of this turned out to be false as well. What reason would there be to think that these were beliefs about Gödel in the first place? Or, to put matters slightly differently, imagine a speaker that did not believe any of these things about Gödel. How much reason would there be to think he was talking about Gödel? Not enough, if any, we submit, to make intuitions here into a killer-argument against descriptivism.

[37]Earlier versions of this paper have been presented at the Stockholm University philosophy of language seminar, the Rutgers Workshop in Semantics, the European Congress of Analytic Philosophy, the Uppsala University Autumn Festival of Philosophical Logic, and at the Moral Sciences Club in Cambridge. We are grateful to very many of the participants in those seminars for comments that have helped shape the final versions. We are especially grateful to Joseph Almog, Simon Blackburn, Max Cresswell, Anandi Hattiangadi, Sören Häggqvist, Frank Jackson, Jeffrey King, Ernie Lepore, Sten Lindström, Dag Prawitz, Krister Segerberg, Scott Soames, Åsa Wikforss and Tim Williamson. We also want to give special thanks to Jennifer Saul, who prepared very inspiring comments for the Rutgers workshop.

the (apparent) substitutivity failure in belief contexts. It can also be used for an optimal treatment of mixed doxastic and modal contexts. For these purposes, we add two clauses to the truth definitions. Particular instances of these clauses are given by:

(B) True(Alfred believes that $\phi, \boldsymbol{w}$) iff True($\phi, \boldsymbol{w}'$), at any world $\boldsymbol{w}'$ that is an Alfred-belief-alternative to $\boldsymbol{w}$.

(BA) Actua-true(Alfred believes that $\phi, \boldsymbol{w}$) iff True($\phi, \boldsymbol{w}'$), at any world $\boldsymbol{w}'$ that is an Alfred-belief-alternative to $\boldsymbol{w}$

Clause (B) is a standard clause for the belief operator in a possible worlds framework. Clause (BA) is peculiar to the present framework. Note that the clauses for belief in a sense are mirror images of the clauses for necessity. The necessity clauses lead from truth to actua-truth and from actua-truth to actua-truth. The belief clauses lead from actua-truth to truth and from truth to truth. Because of this, a belief operator within the scope of a modal operator *re-introduces* a fully opaque context, i.e. a context where co-referring simple singular terms need not be interchangeable. This will be briefly exemplified below.

Suppose that for Alfred, 'Twain' means the author of Tom Sawyer (and that 'Tom Sawyer' is rigid for Alfred), and that 'Clemens' means the man who lives next door. Then we have

(44) True('Alfred believes that Twain is a writer', $\boldsymbol{a}$), iff the author of Tom Sawyer (if any) in $\boldsymbol{w}'$ is a writer in $\boldsymbol{w}'$, at any world $\boldsymbol{w}'$ that is an Alfred-belief-alternative to $\boldsymbol{a}$.

(45) True('Alfred believes that Clemens is a writer', $\boldsymbol{a}$), iff the man who lives next door in $\boldsymbol{w}'$ (if any) is a writer in $\boldsymbol{w}'$, at any world $\boldsymbol{w}'$ that is an Alfred-belief-alternative to $\boldsymbol{a}$.

This accounts for the substitutivity failure of 'Twain' and 'Clemens' in the context of 'Alfred believes that ...'.

For the *mixed contexts* we will have different readings depending on whether the proper name in question is given small scope or intermediate scope (the wide-scope reading being presently uninteresting). Substitutivity will fail on the one reading and be sustained on the other (reverse the order between the two operators and these results are reversed as well; see below).

Thus take

(18) Alfred believes that Twain might not have been a writer.

'Twain' can be given small scope:

(46) Alfred believes that possibly (Twain is not a writer)

and intermediate scope

(47) Alfred believes that $\exists x(x =$Twain & possibly (x is not a writer))

Evaluation of the small scope reading (46):

> True('Alfred believes that possibly (Twain is not a writer)', $\boldsymbol{a}$) iff, for any world $\boldsymbol{w'}$ that is an Alfred-belief-alternative to $\boldsymbol{a}$, there is a world $\boldsymbol{w''}$ accessible from $\boldsymbol{w'}$, such that Twain is not a writer in $\boldsymbol{w''}$.

Here 'Clemens' may be substituted for 'Twain'.

Evaluation of the intermediate scope reading (47):

> True('Alfred believes that $\exists x(x =$Twain & possibly(x is not a writer))', $\boldsymbol{a}$) iff, for any world $\boldsymbol{w'}$ that is an Alfred-belief-alternative to $\boldsymbol{a}$, there is a world $\boldsymbol{w''}$ accessible from $\boldsymbol{w'}$ such that the author of Tom Sawyer in $\boldsymbol{w'}$ (if any) is not a writer in $\boldsymbol{w''}$

Hence 'Clemens' may not be substituted for 'Twain'. Then consider an example of the opposite scope order:

(19) Alfred might have believed that Twain is not a writer

The small scope reading is given by

(48) Possibly(Alfred believes that Twain is not a writer)

and the intermediate scope reading is given by

(49) Possibly($\exists x(x{=}$Twain and Alfred believes that x is not a writer)).

Evaluation of the small scope reading (48):

> True(Possibly Alfred believes that Twain is not a writer', $\boldsymbol{a}$) iff there is a world $\boldsymbol{w'}$ accessible from $\boldsymbol{a}$ such that in any world $\boldsymbol{w''}$ that is an Alfred-belief-alternative to $\boldsymbol{w'}$, the author of Tom Sawyer (if any) in $\boldsymbol{w''}$ is not a writer in $\boldsymbol{w''}$.

Hence 'Clemens' may not be substituted for 'Twain'. Here actua-truth is introduced in the first step of the evaluation (applying the derived clause for 'possibly'), and then simple truth is re-introduced in the second step (applying (BA)), making the reference of 'Twain' in $\boldsymbol{w''}$ matter to the outcome.

Evaluation of the intermediate scope reading (49)):

> True('Possibly $\exists x(x{=}$Twain and Alfred believes that x is not a writer)', $\boldsymbol{a}$) iff, there is a world $\boldsymbol{w'}$ accessible from a where Twain is such in any world $\boldsymbol{w''}$ that is an Alfred-belief-alternative to $\boldsymbol{w'}$, he is not a writer in $\boldsymbol{w''}$.

Here 'Clemens' may be substituted for 'Twain'.

In both examples, whether the small scope or the intermediate scope reading is correct would depend on the intentions of the speaker (of (18) and (19), respectively). This is an optimal result in the sense that neither of the substitutivity outcomes should be permanently blocked.

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