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Kripkean Counterpart Theory

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Abstract. David Lewis's counterpart-theoretic semantics for quantified modal logic is motivated originally by worries about identifying objects across possible worlds; the counterpart relation is grounded more cautiously on *comparative similarity*. The possibility of *contingent identity* is an unsought—and in some eyes, unwelcome—consequence of this approach. In this paper I motivate a *Kripkean* counterpart theory by way of defending the *prior*, pre-theoretical, coherence of *contingent distinctness*. Contingent identity follows for free. The theory is Kripkean in that the counterpart relation is in a sense *stipulated* rather than grounded on *similarity*, and is such that no object has more than one counterpart at a world. This avoids a number of objections Fara and Williamson have recently levelled against counterpart theory generally; their other objections are addressed by enriching the theory with special quantifiers and actuality operators.

1. Counterpart theory as we know it

This paper motivates and develops a distinctive counterpart-theoretic semantics (CT-semantics) for quantified modal logic (QML). Its distinctiveness is best brought out by comparison with earlier theories. Here are some of the significant features common to the CT-semantics of Lewis (1968), Forbes (1982, 1985), and Ramachandran (1989)—henceforth, LCT, FCT and RCT, respectively:

(CT1) CT-semantics is meant to provide an interpretation of modal claims; formally, this amounts to providing a scheme for translating sentences of QML into an enhanced version of predicate logic—a predicate logic with some special predicates, including a counterpart relation, and some special postulates. A QML-sentence counts as valid (or satisfiable) just in case its CT-translation is valid (satisfiable) in classical first order logic.

(CT2) The leading idea in CT-semantics is that a modal statement concerning an object, *a*, is true (or false) in virtue of how things stand with *counterparts of a* (not necessarily *a* itself) in certain worlds. So e.g. in LCT, '◊Fa' (*a* might have been *F*) is taken to affirm that there is a possible world where some *counterpart* of *a* is *F*.

(CT3) CT-semantics is motivated by worries about 'transworld identity': the notion that an object at one world can be identical with an object in another, or, equivalently, that an object can exist in more than one world (see Lewis 1968; Forbes 1985, ch. 3).

(CT4) The counterpart relation is grounded on *comparative similarity*: some object *x* in a possible world *w* is a counterpart of me in virtue of how similar *x* is to me in comparison with the other objects in *w*. On this understanding of counterparthood, there is no reason why the counterpart relation should be symmetric or transitive, why an object should not have more than one counterpart in a world, or why two objects at one world should not have a common counterpart at another.

(CT5) Given the un-identity like nature of counterparthood, it is no wonder that counterpart-theoretic semantics yield surprising—or downright counterintuitive—verdicts on modal claims concerning identity. The following QML-sentences, for instance, come out satisfiable on one or other of the earlier schemes:

(=1) $\exists x \exists y((x \neq y) \& \Diamond(x = y))$.....................................satisfiable in LCT, FCT, RCT
(Some distinct objects might have been identical.)
(=2) $\exists x \exists y((x = y) \& \Diamond(x \neq y))$.. satisfiable in LCT, FCT
(Some identical objects might have been distinct.)
(=3) $\exists x \forall y((x = y) \rightarrow \Diamond(x \neq y))$... satisfiable in LCT, FCT
(Some object might have been distinct from *any* object it is actually identical with.)
(=4) $\exists x \Diamond(x \neq x)$ ....satisfiable in FCT
(Some object might have been distinct from itself!)
(=5) $\Diamond \exists x \Diamond \exists y(\Diamond(x = y) \& \Diamond(x \neq y))$..............................satisfiable in LCT, FCT, RCT

(=5) affirms the possibility of objects being identical at one world but distinct at another. CT-theorists are thereby committed to the coherence of both *contingent identity* and *contingent distinctness*. Some CT-theorists regard this as a price one has to pay for interpreting *de re* modality in terms of counterparts, rather than as a positive feature, a selling point, of the corresponding semantics (see e.g. Forbes 1985, p. 66 ff.).

(CT6) CT-theorists have difficulties accommodating an *actuality* operator. Indeed, Fara and Williamson (2005) have recently argued against counterpart theory—“as a means of interpreting modal discourse” (p. 2)—precisely on the grounds that such difficulties are inevitable. The need for an actuality operator is evident when we consider plausible claims such as (1):

(1) There might have been tigers that do not actually exist.

With an actuality operator, ‘@’,[1] (1) is easily translated:

(1a) $\Diamond \exists x(Tx \ \& \ @\neg \exists y(x = y))$.

Whereas, without it, the closest QML-translation would be the inconsistent formula:

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[1] I prefer to use ‘@’ for the actuality operator rather than ‘*ACT*’ as Fara and Williamson do, and in this paper I paraphrase their formulae accordingly.

(1b) $\Diamond\exists x(Tx \,\&\, \neg\exists y(x = y))$

However, there is no obvious way of incoroprating the operator into LCT, Lewis's scheme, without rendering (@1) or (@2) satisfiable:[2]

(@1) $\Diamond\exists x(@\exists y(x = y) \,\&\, {\sim}(@Fx \vee @{\sim}Fx))$
(There might have been an object that actually exists but is neither actually F nor actually not F)

(@2) $\Diamond\exists x(@\exists y(x = y) \,\&\, (@Fx \,\&\, @{\sim}Fx))$
(There might have been an object that actually exists, is actually F and is actually not F.)

FCT and RCT also deliver counterintuitive verdicts:

(@3) $\Diamond\exists x@(\exists y(x = y) \,\&\, Fx \,\&\, Gx \,\&\, \neg\exists y(Fy \vee Gy))$ ....FCT-satisfiable
(There might have been an object that exists in the actual world, and is both F and G there, even though nothing in that world is F or G.)

(@4) $\Diamond\exists x@(Ex \,\&\, \neg(Fx \vee Gx) \,\&\, \forall y(Fy \vee Gy))$ .... RCT-satisfiable
(There might have been an object that exists in the actual world but is neither F nor G there, even though every actual object is either F or G.)[3]

Again, such results are accepted by CT-theorists simply because they fall out of the corresponding semantics: they are not taken to be independently plausible.

(CT1)–(CT6) give a fair idea of how counterpart theory is generally perceived at present. I wish to promote a radically different conception of counterpart theory. *Kripkean counterpart theory* (KCT), as I shall call it (for reasons that will become clearer later), complies with (CT1) and (CT2): it is intended to provide a CT-interpretation of modal discourse; so, e.g. '$\Diamond Fa$' is taken to be true if there is a world in which a counterpart of *a*—which could, but need not be, *a*—is *F*. But, KCT is *not* motivated by worries about transworld identity: it in fact allows that objects can exist in more than one possible world. It is motivated, rather, by the prior intelligibility (or intuitive coherence) of contingent distinctness, as affirmed by (=1) for example. (=1) is not satisfiable on standard Kripke QML-semantics, and it is difficult to see how it can be accommodated without resorting to something like a CT-interpretation. So, I do not consider the satisfiability of (=1) an *unsolicited* consequence of CT-semantics as some CT-theorists do: I see it as the *raison d'être* for such semantics.[4]

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[2] This point is made in Hazen (1979); see Fara and Williamson (2005) for a deeper discussion of the problem actuality poses for LCT.

[3] 'E' is a special existence predicate; 'Ea' is translated by RCT as '$\exists xCxa$'.

[4] Ramachandran (2003) introduces the idea of a Kripkean counterpart theory; this paper provides a fuller motivation, a modifed translation scheme, and develops the account to handle certain worries about actuality from Fara and Williamson (2005).

Contingent distinctness requires contingent identity: no objects can be contingently distinct at a world unless they are contingently identical at another. But, as we shall see, there are three quite different conceptions of contingent identity on the market. (=1) commits us to only one variety, and it is only this one I wish to defend here. Part of my defence consists in contrasting it with contingent *self-identity*, which I take Kripke (1971) to have repudiated. A CT-semantics can accommodate (=1) by allowing distinct possible objects to have a common counterpart at some world; but, once we reject the possibility of contingent self-identity, there is no need, and no independent motivation, for allowing a possible object to have more than one counterpart at a world. KCT constrains the counterpart relation accordingly.[5] As a result, while (=1) is KCT-satisfiable, none of (=2)–(=4) are; and neither, it turns out, are any of (@1)–(@4).

In addition to the divergent motivation and verdicts of KCT in comparison with earlier CT-semantics, it has a distinctive conception of the counterpart relation itself. The standard picture, outlined under the label CT4, understands counterparthood solely in terms of comparative (and perhaps sufficient-) *similarity*. Yet, as we have noted, on that understanding there is no reason why an object should not have many counterparts at a world, a possibility explicitly precluded in KCT. We will consider the question of what underpins KCT's counterpart relation later.

The plan of this essay is as follows. §2 proposes enriching QML with *indexed* quantifiers and modal and actuality operators as a means of increasing its expressive power; this handles a problem case that Fara and Williamson (2005) present against standard QML. §3 defends the coherence of contingent distinctness (and identity) in the face of Kripke's influential arguments for the necessity of identity. As I have telegraphed, I will argue that Kripke's considerations tell against one variety of contingent identity (and accompanying notion of contingent distinctness), but not against another. §4 provides the formal specification of KCT and illustrates how the system works.

2. Actuality and quantification

We have seen the need for introducing an actuality operator in QML—e.g. the content of (1) can then be captured by (1a):

(1) There might have been tigers that do not actually exist.
(1a) $\Diamond\exists x(Tx \;\&\; @\neg\exists y(x = y))$

However, Fara and Williamson (henceforth, F&W) make their case with a more problematic example:

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[5] Stalnaker (1994) floats—floats rather than defends—a CT-semantics with the same restriction on the counterpart relation. But he presents no positive motivation for such an approach, and he treats objects as world-bound entities: a possible object exists in exactly one world. Graff Fara (forthcoming) takes such a restriction on *sortal-counterpart* relations to be motivated by the idea that an object is identical with the matter composing it. I am sympathetic to her project, but offer a different motivation that applies even to unrelativized counterpart relations.

(2) It might have been that everyone who is in fact rich was poor.

We might try to express (2) as

(2a) $\Diamond\forall x(@Rx \rightarrow Px)$

But, as F&W point out, (2a) is not quite right on the standard Kripke (1963) semantics. It comes out true, for example, if there are worlds with no individuals who are *actually* rich, i.e. individuals who both exist in the actual world and are rich in it: (2a) does not require, as (2) does, that all actually rich people might have co-existed and been poor.

So, just adding an actuality operator to QML, however it is evaluated, is not enough to capture the likes of (2): one must modify or enhance QML further. F&W suggest taking the range of quantifiers to remain invariant whether inside or outside the scope of modal operators (F&W 2005, pp. 5–6). For example, we may take every possible object to necessarily exist, or—the *possibilist* approach—take the domain of any quantifier to be the set of all possible objects.[6] An initial difficulty with this suggestion is that (1a) would then come out inconsistent; for, on such a semantics (3) comes out valid:

(3) $\forall x\Box\exists y(x = y)$

However, the possibilist has a simple remedy: they can introduce a special existence predicate 'E' whose extension at a world is the set of things in the domain of that world; (1) is then captured by:

(1c) $\Diamond\exists x(Tx \,\&\, @\neg Ex)$.

CT-theorists may be sympathetic to the possibilist approach since the quantifiers in their CT-semantics also range over all possible objects. But, for the purposes of this paper, let us see how one may accommodate (2) in QML without enforcing (3)—my aim is to provide a KCT-semantics for this enhanced version of QML. F&W themselves point to devices proposed by Forbes (1989) and Hazen (1990) for handling the problem. I will adopt a simple *indexing* strategy to capture Forbes' and Hazen's insights.

Let QML* be the result of supplementing QML with modal and actuality operators and quantifiers with numerical indices.

- The purpose of indexing a modal operator is to allow actuality operators and quantifiers within their scope to refer back to the worlds invoked by them.
  — A modal operator can only be indexed with a non-zero natural number.
  — No two modal operator tokens in a sentence can have the same index.

[6] Davies (1981) floats, though does not fully endorse, precisely such a solution to the same problem (pp. 220-222). See also Linsky and Zalta (1994).

- Any quantifier or actuality operator with a non-zero index must occur within the scope of a modal operator with that index.
- An indexed quantifier, $\exists_k$ or $\forall_k$, *shifts the domain of quantification*: it ranges over the objects in the world(s) invoked by the modal operator with the same index.
  — We reserve the index 0 when we wish the quantifier to range over the objects in the actual world.
  — An un-indexed quantifier ranges over the objects in the world(s) invoked by the modal operator that it is immediately governed by; if there is no governing modal operator, the quantifier ranges over the objects in the actual world.
- An indexed actuality operator, $@_k$, *shifts the world of evaluation*. Thus, $@_k\alpha$ is true at a world if α is true at the world(s) invoked by the modal operator with index *k*.
  — A sentence of the form $@\alpha$, where there is no index, is true at a world if it is true at the actual world.

Expressing the likes of (2) in QML* is straightforward:

(2b) $\Diamond\forall_0 x(@Rx \rightarrow Px)$

(5) and (6) are other modal claims that cannot be captured in QML but can in QML*—as (5a) and (6a), respectively:

(5) I might have lived in a neighbourhood where it was possible for me to respect everyone (in that neighbourhood).

(5a) $\Diamond_1(Nm \ \& \ \Diamond\forall_1 x(@_1 Nx \rightarrow Rmx))$

(6) There might have been an individual who was capable of creating anything that might have existed.

(6a) $\Diamond_1\exists x\Box\forall y @_1 Cxy$

The semantics for QML* follows Lewis's (1963) strategy of translating QML-sentences into sentences of predicate logic with identity and some special predicates and postulates (PL). A QML*-sentence is valid (i.e. a theorem) in QML* if and only if its translation is valid in PL (PL-valid). Our version of PL has just one special predicate: *Ixw* (*x* is in world *w*); there is no counterpart relation. The domain of quantification contains all possible individuals, including all possible worlds. Following Fara and Williamson (2005, p. 2), we use 'u', 'v' and 'w' (sometimes with numerical subscripts) as sorted variables ranging over possible worlds, and 'x', 'y' and 'z' as sorted variables ranging over individuals other than worlds; and we will use 'w*' for the actual world. PL has just one special postulate:

P1. $\forall x\exists wIxw$ (Everything other than a world is in a world)

Unlike Lewis's counterpart theory, objects can exist in many worlds. So, since an object may have a property at one world but not at another, our translation scheme differs from Lewis's in translating *n*-adic predicates (other than identity) into *n*+1-adic predicates, where the *n*+1'th slot is for terms designating worlds.

<u>QML*–PL Translation Scheme</u>

- The PL-translation of a QML*-sentence α is α^{w^*} (informally: α holds at the actual world).
- α^{w^*} then gets translated according to the following recursive rules:

(PLA) φ^w, where φ is an atomic QML*-sentence, $Ft_1...t_n$, though *not* an identity sentence (i.e. of the form 'x = y'), is $Ft_1...t_nw$.
(PL =) φ^w, where φ is an identity sentence, is φ.
(PL¬) $(\neg\varphi)^w$ is $\neg\varphi^w$.
(PL&) $(\varphi \,\&\, \psi)^w$ is $\varphi^w \,\&\, \psi^w$.
(PL∀) $(\forall x\varphi)^w$ is $\forall x(Ixw \rightarrow \varphi^w)$
(PL$\forall_i$) $(\forall_i x\varphi)^w$ is $\forall x(Ixu \rightarrow \varphi^u)$, where 'u' is the world-variable introduced by the modal operator with index *i*.
(PL∃) $(\exists x\varphi)^w$ is $\exists x(Ixw \,\&\, \varphi^w)$
(PL$\exists_i$) $(\exists_i x\varphi)^w$ is $\exists x(Ixu \,\&\, \varphi^u)$, where 'u' is the world-variable introduced by the modal operator with index *i*.
(PL□) $(\Box\varphi)^w$ is $\forall u(\varphi)^u$, where 'u' is a world-variable that does not appear in φ.
(PL◊) $(\Diamond\varphi)^w$ is $\exists u(\varphi)^u$, where 'u' is a world-variable that does not appear in φ.
(PL@) $(@\varphi)^w$ is φ^{w^*}
(PL$@_i$) $(@_i\varphi)^w$ is φ^u where 'u' is the world-variable introduced by the modal operator with index *i*.

Indexed modal operators get translated exactly as un-indexed ones. We can also add names (constants); these are simply treated as unbound individual-variables. By these rules, (1a), (2b), (5a) and (6a) get translated as follows:

$(1a)_{PL}$ $\exists w_1\exists x(Ixw_1 \,\&\, (Txw_1 \,\&\, \neg\exists y(Iyw^* \,\&\, x = y))$
$(2b)_{PL}$ $\exists w\forall x(Ixw^* \rightarrow (Rxw^* \rightarrow Pxw))$
$(5a)_{PL}$ $\exists w_1(Nmw_1 \,\&\, \exists w_2\forall x(Ixw_1 \rightarrow (Nxw_1 \rightarrow Rmxw_2)))$
$(6a)_{PL}$ $\exists w_1\exists x(Ixw_1 \,\&\, \forall w_2\forall y(Iyw_2 \rightarrow Cxyw_1))$

These interpretations appear to capture the intended contents. The following argument from Cresswell (2004, p. 32), for example, comes out valid, as we require:

(7) It is possible that every actual logician attend.
Arabella is (actually) a logician.
Therefore, it is possible that Arabella attend.
(7a) $\Diamond\forall_0 x(@Lx \rightarrow Ax), @La \models \Diamond Aa$
$(7a)_{PL}$ $\exists w_1\forall x(Ixw^* \rightarrow (Lxw^* \rightarrow Axw_1)), Law^* \models \exists w_2 Aaw_2$

(7) comes out valid because its PL-interpretation, $(7a)_{PL}$, is valid in classical first order logic.

So, in QML* we have a quantified modal logic with actuality operators that is able to capture the intended content of (2) without rendering (3) valid. Let us turn now to the motivation for a counterpart-theoretic semantics.

3. *Contingent distinctness: the case for a CT-semantics*
As is well known, Kripke and Lewis have very different conceptions of *de re* necessity (possibility). Briefly, Lewis is a realist about possible worlds and takes individuals to exist in exactly one possible world. Thus, for him a modal statement such as

(8) Jones might have been a spy.

implicitly affirms—is *made true* by—the fact that there is a possible world in which a *counterpart* of Jones is a spy. And what makes an individual x at a world w a counterpart of Jones concerns x's *comparative similarity* to Jones: of all the objects in w, x will be the most similar object to Jones. On this understanding of the counterpart relation, there is no reason why it should be symmetric or transitive. There is also no reason why two individuals at a world cannot have a common counterpart; nor, why there shouldn't be two (or more) individuals at a world which are counterparts of a single individual—Jones, say. Understanding *de re* modality (or identity across worlds) in terms of the counterpart relation, and taking the latter to be grounded merely on comparative similarity, thus leads Lewis to countenance the coherence of *contingent identity* and *contingent distinctness*; i.e. the coherence of modal statements like (9)-(11):

(9) Hesperus is identical with Phosphorus but they might have existed and been distinct.[7]
(10) I and my body are identical but might have not have been.[8]
(11) Smith and Jones are distinct but might have been identical.

(9) would come out true, for example, if Venus had two counterparts at some possible world; and (11) would come out true if Smith and Jones had a common counterpart at some world.

Kripke (1971, 1980), by stark contrast with Lewis, takes possible-worlds talk to merely abbreviate and sharpen natural-language modal discourse. (8) is *not* 'made true' by the existence of a possible world where Jones (or some counterpart) is a spy; if anything, there is such a world *because* (8) is true (or taken to be true). It is misguided, on this picture, to ask what *makes* an object at another world Jones. There is no question of *identifying* an

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[7] Lewis (1968) only presents his theory (LCT) as a means of interpreting *closed* QML-sentences without names (constants). But, open sentences are given an interpretation *in the process of translation*; and his discussion of *de re* modal statements (1968, 1986) suggests names should be treated in the same way that the translation scheme treats unbound individual-variables . So, this is what I am going to assume throughout the paper.
[8] Actually, Lewis (1971) reckons that we need to introduce a multiplicity of *sortal-sensitive* counterpart relations in order to capture the intended content of (10). But the central point remains: because these counterpart relations are founded on *similarity*, many objects at a world may have a common counterpart at another, and one object may have many counterparts at some world.

individual at another world with or *as* Jones; rather, the fact we are talking about Jones, about the *very same individual*, is *given*—in a sense, *stipulated*. This idea is captured in Kripke's *rigid designation thesis* (RDT), which affirms that names are *rigid designators*, i.e. terms whose reference remains the same when we use them in the course of talking about counterfactual situations. Kripke takes RDT to entail his famous *necessity of identity thesis* (NEC): an identity statement involving names is *necessarily true* if true, and—what is evident from his discussion of the issue—*necessarily false* if false. So, Kripke takes the semantics of names, the rules for their correct use in language, to simply preclude the satisfiability of the likes of (9) and (11), and this is reflected in his semantics for quantified modal logic.

There is an important difference between (9) and (11), however, that makes room for an intermediate position. We can approach the difference by considering a dialectical challenge Kripke puts to those who affirm (9), that Hesperus and Phosphorus, though identical, might have existed and not been identical. What, he asks, would a possible world have to be like for Hesperus *not* to be Phosphorus? It is true that if Hesperus had not been visible in the morning it would not have ended up being named 'Phosphorus' ('the Morning Star'): but that would merely be a situation in which Hesperus was not *called* 'Phosphorus'; it would not be a situation in which Hesperus was not in fact identical with the planet we are calling Phosphorus in the actual world, i.e. the planet Venus. On reflection, we *cannot* envisage or describe a situation where Hesperus was not Phosphorus: for, that would have to be a situation in which Venus existed but was distinct from itself. The idea of an object being distinct from, of not being identical to, *itself* is surely incomprehensible. So, I am entirely persuaded by these remarks of Kripke against the coherence of (9).

But, (11) is not incoherent in that sense: for, affirming the *contingent distinctness* of objects does not commit one to the contingency of *self-identity*. In a *Star Trek*: *Voyager* episode, for example, a tele-transporter malfunction results in two individuals, Neelix and Tuvok, temporarily being one, Tuvix. So, as the story has it, at some time *t1* before the malfunction, Neelix is distinct from Tuvok, but at some time *t2* after the malfunction, Neelix and Tuvok are identical. While there may be *metaphysical* considerations—concerning e.g. *persistence conditions*, the *necessity of origin* thesis, or the very nature of tele-transportation—which render this scenario untenable, it is not *logically incoherent* in the way that positing Hesperus being distinct from Phosphorus is. We are not required to envisage a situation where one individual is distinct from *itself* ($a \neq a$), or, equivalently, where one individual is identical with two distinct individuals ($a = b$ & $a = c$ & $b \neq c$).

This difference between the Neelix–Tuvok case and the Hesperus–Phosphorus case stems from the fact that the names 'Neelix' and 'Tuvok' are names of *distinct possible individuals*, whereas 'Hesperus' and 'Phosphorus' are names of *one and the same possible object*. Intuitively, a necessary condition for an expression τ to *name* (or be a *name* of) a possible individual x is that τ *rigidly* designate x. Here are three conceptions of temporal rigidity:

(Rig1) A term τ is temporally rigid *iff* there is a possible object *x* such that τ designates *x* at every time in which τ designates something. (So τ designates *y* at some time *t only if x* exists at *t* and *x* = *y* at *t*.)
(Rig2) A term τ is temporally rigid *iff* there is a possible object *x* such that τ designates *x* at every time in which *x* exists and designates nothing else at any other time.
(Rig3) A term τ is temporally rigid *iff* there is a possible object *x* such that τ designates *x* at all times, period.

I claim that in maintaining that the statement "Tuvok is distinct from Neelix" is true at *t1* but not true at *t2* we are not compelled to deny that the names 'Neelix' and 'Tuvok' are temporally rigid. The name 'Neelix', for example, designates Neelix at *t1 and at t2*; it is true that at *t2* it also designates Tuvok and Tuvix, by virtue of the fact that at *t2*: Neelix = Tuvok = Tuvix; but it designates Tuvok and Tuvix only *non-rigidly*, for, it does not designate them at time *t1*. Crucially, there is no time at which 'Neelix' designates something *but fails to designate Neelix*; and it designates Neelix at any time Neelix exists. Indeed, we are not even compelled to deny that 'Neelix' designates Neelix *at all times*, period.

So, the rigidity of the names 'Neelix' and 'Tuvok' is not jeopardised by our stance. None of the above conceptions of rigidity rule out a term τ rigidly designating an object *x* but also *non-rigidly* designating an object *y* at a time *t*—so long as *y* identical with *x* at that time. This idea is not new—see Chandler (1975, p. 368)—but it is an option that has been largely overlooked in the central literature.

If one grants the (temporary) identity of Neelix and Tuvok after the tele-transporter malfunction, then, arguably, one should also grant the logical coherence of (11), the proposition that Smith and Jones, although presently distinct, might have been identical. For, they *might have had* the sort of tele-transporter mishap just described and been identical, albeit temporarily. At the world(s), and during the time(s), they are identical, 'Smith' still designates Smith; it also designates Jones by virtue of Smith being identical with Jones at that time; but at no time at any world does 'Smith' designate something but fail to designate Smith. Hence, one may affirm (11) and still maintain that the names involved are rigid designators. And, if one grants the coherence of (11)—or any case of contingent distinctness—one thereby grants the coherence of *contingent identity*. For, if two objects are contingently distinct at one world, they *ipso facto* are contingently identical at another. But, crucially, this brand of contingent identity—that one is committed to if one accepts contingent distinctness—does not commit one to contingent *self-identity* as (9) does.

So, Kripke's considerations concerning Hesperus and Phosphorus do not rule out contingent identity *tout court*. Of course, it may turn out that a more detailed consideration of these sorts of examples will reveal some incoherent presumption or other. For example, there remain awkward questions about the name 'Tuvix': Is it a genuine name? Is it rigid? If so, who or what does it rigidly designate? A *third* individual (not simply Neelix, nor simply Tuvok)? Does it designate anyone at *t1*, if so, *who*? But, these questions cannot be answered without settling difficult *metaphysical* issues, issues that are not determined by our semantic theory alone.[9] I suggest our modal logic should not foreclose the coherence of contingent identity either: if contingent distinctness (identity) is to be disallowed, it should be disallowed by way of explicit axioms or principles that *explain* its incoherence.[10]

However, both brands of contingent identity are precluded by Kripke's (1963) semantics for quantified modal logic. My motivation for the following Kripkean counterpart theory is that it renders (11) satisfiable while retaining much of Kripke's conception of necessity and identity across possible worlds. In particular, the counterpart relation is determined *stipulatively* rather than by virtue of *similarity*. The contingent distinctness of Smith and Jones is not explained by their having a common counterpart at some world; rather, their having a common counterpart at some world is explained by its being true that they might have been identical. And an object's having no more than one counterpart at a world is explained by the fact that no object is such that it might have been distinct from itself.

A final remark concerning *transworld identity*—identity *across* worlds—before we specify the formal modal semantics. Consider the following scenario:

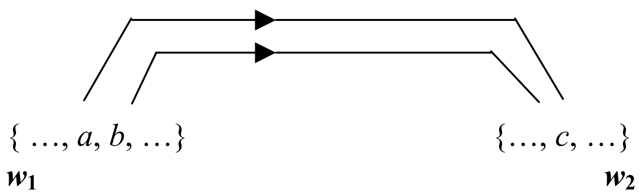

Figure 1

The arrows from *a* and *b* in world w_1 to *c* in world w_2 signify that in $a = c$ and $b = c$ in w_2. But, as I have suggested in the foregoing discussion, one may hold these identities in w_2 but deny—at any rate, not affirm—that *c* is identical with something in w_1. Clearly, in such cases it would be quite inappropriate to affirm $a = c$ or $b = c$ *simpliciter*: these 'transworld' identifications only make sense if one makes the identifications in both 'home' worlds, as it were—in this case, *both* w_1 and w_2. Thus, on the position I am recommending, *identity-at-a-world* is more basic than *identity-across-worlds*, the latter is *derivative* on the former.

[9] One who takes persons to be *four-dimensional* objects, for example (e.g. Lewis 1976; Hawley 2001, Sider 2001), could hold that all the example commits us to (as things stand) is the existence of *two* persisting objects, *Neelix* and *Tuvok*, who have a common *temporal part* (or *stage*) at *t1*. A *three-dimensionalist* view of persons, on the other hand, may recommend the view that Tuvix is indeed a third individual in the story, one who exists when, and only when, Neelix and Tuvok both exist and are identical (Gallois 1998 floats such a view, and something like this view is found in Isaac Asimov's classic sci-fi novel, *The Gods Themselves* (1972)).

[10] We could, for example, disallow contingent distinctness by imposing a strict version of Leibniz's law: if *a* and *b could have* differed in any way, then *a* is distinct from *b*. But, this needs an argument, as a defender of contingent distinctness may feel entitled to deny that any objects that *could have* differed must *actually* differ. They might settle instead for weaker versions of Leibniz's law, e.g.: (i) if *a* and *b could have* differed in any way, then *a* is *could have been* (or *would in such situations be*) distinct from *b*; and (ii) if *a* and *b do* differ in any way, then *a* is distinct from *b*.

4. Kripkean counterpart theory

Kripkean counterpart theory (KCT) builds on PL from §2 as follows. In addition to '*Ixy*' it has as a special (primitive) predicate '*Cxy*' (*x* is a counterpart of *y*), and it has the following three postulates:

P1. $\forall x \exists w Ixw$ (Everything other than world is in a world).

P2. $\forall x Cxx$ (Everything is a counterpart of itself).

P3. $\forall x \forall y \forall z \forall w(((Iyw \ \& \ Izw) \ \& \ (Cyx \ \& \ Czx)) \rightarrow y = z)$
(Everything has at most one counterpart in any world).

The *atomic constituents* of a sentence are the atomic sub-sentences occurring in that sentence—different *tokens* of an atomic sentence counting as different atomic constituents. A token of a term in a QML-sentence is *modally-free* if and only if *either* it is not bound by a quantifier, *or* it is bound by a quantifier, but occurs within the scope of modal or actuality operator that has narrower scope than the quantifier in question.

QML–KCT Translation Scheme

- **Preliminary translation**
  To translate a QML-sentence, α, first replace every atomic constituent, β, of α that contains modally-free occurrences of term-tokens $t_1, ..., t_n$, with $\exists x_1 C x_1 t_1 \ \& \ ... \ \& \ \exists x_n C x_n t_n \ \& \ \beta[x_k/t_k]$ (where '$\beta[x_k/t_k]$' is the result of replacing each occurrence of t_i in β with x_i (for each i). Call the result of this preliminary translation '$[\alpha]$'.
- The KCT-translation of a QML-sentence α is $[\alpha]^{w^*}$ ($[\alpha]$ holds at the actual world).
- $[\alpha]^{w^*}$ then gets translated according to the following recursive rules (treating $[\alpha]$ as a QML-sentence):

(KA) φ^w, where φ is an atomic QML-sentence, $Ft_1 \ldots t_n$, though *not* an identity sentence ($x = y$) or counterpart sentence (Cxy), is $Ft_1 \ldots t_n w$.[11]
(K =) φ^w, where φ is an identity sentence or a counterpart sentence, is φ.
(K¬) $(\neg\varphi)^w$ is $\neg\varphi^w$
(K&) $(\varphi \ \& \ \psi)^w$ is $\varphi^w \ \& \ \psi^w$
(K∀) $(\forall x\varphi)^w$ is $\forall x(Ixw \rightarrow \varphi^w)$
(K∃) $(\exists x\varphi)^w$ is $\exists x(Ixw \ \& \ \varphi^w)$
(K□) $(\Box\varphi)^w$ is $\forall u \varphi^u$
(K◊) $(\Diamond\varphi)^w$ is $\exists u \varphi^u$
(K@) $(@\varphi)^w$ is φ^{w^*} (φ holds at the actual world)

This translation scheme differs significantly from Lewis's (1968) scheme (LCT), as can be seen by considering the corresponding translations of QML-sentences (12)-(14) below (these translations are not strictly correct—I have simplified them for ease of digestion):

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[11] (KA) has the effect of enforcing what Graeme Forbes (1985) calls the *Falsehood Principle*, the principle that an atomic sentence is true at a world only if the objects mentioned therein exist (or have counterparts) in that world.

(12) Fa
$(12)_L$ Fa (on Lewis's scheme)
$(12)_K$ $\exists x(Ixw^* \,\&\, Cxa \,\&\, Fxw^*)$ (on KCT's scheme)

(13) $\exists x\Diamond\neg Fx$
$(13)_L$ $\exists x\exists w\exists y(Iyw \,\&\, Cyx \,\&\, \neg Fy)$
$(13)_K$ $\exists x\exists w\neg\exists y(Iyw \,\&\, Cyx \,\&\, Fyw)$

(14) $\Diamond\Diamond Fb$
$(14)_L$ $\exists u\exists x(Ixu \,\&\, Cxb \,\&\, \exists v\exists y(Iyv \,\&\, Cyx \,\&\, Fy))$
$(14)_K$ $\exists u\exists v\exists x(Ixv \,\&\, Cxb \,\&\, Fxv)$

As $(12)_K$ reveals, even non-modal QML-sentences introduce counterpart quantifiers (CQs) in KCT (for each modally free term-token); the CQs are introduced in the *preliminary* translation. The translations of (13) reveal that the CQs introduced by Lewis's counterpart theory (LCT) take wider scope than those introduced by KCT; the scope of a CQ introduced by KCT will always be just an atomic sentence. As for (14), the difference between LCT and KCT, in a nutshell, is this: LCT takes (14) to be true if *a counterpart of a counterpart of* b is F, whereas by KCT (14) is true if a counterpart of b at some world is F at that world. Note the redundancy of '$\exists u$' in $(14)_K$; thus, adding a modal operator in front of a QML-sentence of the form '$\Diamond\alpha$' or '$\Box\alpha$', has no effect whatsoever in KCT, and, the following S5-axiom comes out trivially valid:

(15) $\Diamond\Diamond\alpha \rightarrow \Diamond\alpha$ (or, equivalently: $\Box\alpha \rightarrow \Box\Box\alpha$)

But, (15) is *invalid* in LCT (if open sentences are permitted); e.g.

(16) $\Diamond\Diamond Fb \rightarrow \Diamond Fb$

can come out false because a counterpart of a counterpart of b need not be a counterpart of b: in other words, because the counterpart relation is not transitive.

For further illustration of KCT's translation scheme, consider (2a):

(2a) $\Diamond\forall x(@Rx \rightarrow Px)$

(2a) has two atomic constituents, 'Rx' and 'Px', but it is only in the first that 'x' is modally-free; so, the preliminary translation of (2a) is:

[(2a)] $\Diamond\forall x(@\exists y(Cyx \,\&\, Ry) \rightarrow Px)$

The remaining rules yield:

$(2a)_K$ $\exists w \forall x(Ixw \rightarrow (@\exists y(Iyw^* \& (Cyx \& Ryw^*)) \rightarrow Pxw))$
(In some world, all the individuals with rich counterparts in the actual world are poor.)

I have claimed that KCT allows for contingent identity—by allowing contingent distinctness—without allowing contingent self-identity. The preliminary translation of (11a) shows why it is KCT-satisfiable:

(11) Smith and Jones are distinct but might have been identical.
(11a) $a \neq b \ \& \ \Diamond(a = b)$
[(11a)] $\neg\exists x \exists y(Cxa \ \& \ Cyb \ \& \ x = y) \ \& \ \Diamond\exists x_1 \exists y_1(Cx_1a \ \& \ Cy_1b \ \& \ x_1 = y_1)$
(*a* and *b* do not have a common counterpart in the actual world but do in some possible world.)

Contingent self-identity—required, for example, by (18) and (19) below—is ruled out because this would require a single possible object to have distinct counterparts (i.e. more than one) in some world, which is precluded by postulate P3:

(18) $(a = a) \ \& \ \Diamond\exists x \exists y(x = a \ \& \ y = a \ \& \ x \neq y)$

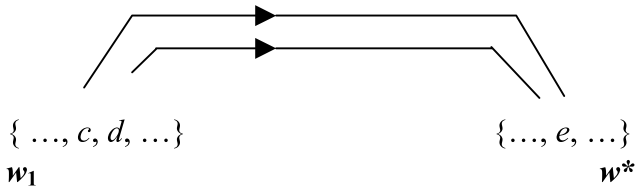
(19) $\Diamond\exists x \exists y(x = y \ \& \ \Diamond\exists x_1 \exists y_1(x_1 = x \ \& \ y_1 = y \ \& \ x_1 \neq y_1))$

And actuality raises no special problems. None of (@1)-(@4), for instance, are KCT-satisfiable.

A word about Leibniz's law is in order. In KCT, the following version of Leibniz's law is invalid:

(L) $(a = b) \rightarrow (\varphi(a) \rightarrow \varphi(b))$

(where '$\varphi(t)$' is any KCT-sentence containing constant 't'). Figure 2 below depicts a counterexample model:



w^* is the actual world
Ref(*a*) = *c*
Ref(*b*) = *d*
Ext(F) = {<*c*, w_1>}
Figure 2

On this model, 'a = b' is true, since Ref(a) and Ref(b) have a common counterpart in the actual world, w^*; '◊Fa' is also true, since Ref(a) has a counterpart at world w_1 (itself) which is F; but '◊Fb' is not true: Ref(b) does not have counterpart in any world which is F. So, this model is a counterexample model for '(a = b) → (◊Fa → ◊Fb)', an instance of (L). This is as it should be in my opinion: why should merely contingently identical objects have *modal* properties in common? KCT allows that what is a necessary (possible) property of one individual need not be a necessary (possible) property of a contingently identical individual. But where the 'φ(a)' in (L) is a non-modal sentence, a sentence without any modal or actuality operators, (L) does hold. Of course, *necessarily* identical objects do come out as having *all* properties, including modal ones, in common—i.e. (L)* is KCT-valid:

(L)* $\Box(a = b) \rightarrow (\varphi(a) \rightarrow \varphi(b))$

Finally, it is a simple matter to extend the scheme so as to provide a counterpart-theoretic semantics for our enriched quantified modal logic, QML*. Just add the following to KCT's recursive translation rules:

(K$\forall_i$) $(\forall_i x\varphi)^w$ is $\forall x(Ixu \rightarrow \varphi^u)$
(K$\exists_i$) $(\exists_i x\varphi)^w$ is $\exists x(Ixu \;\&\; \varphi^u)$
(K$@_i$) $(@_i\varphi)^w$ is φ^u

where (in each case) 'u' is the world-variable introduced by the modal operator with index *i*.

The resulting system, call it KCT*, can capture the content of (2):

(2) It might have been that everyone who is in fact rich was poor.
(2b) $\Diamond\forall_0 x(@Rx \rightarrow Px)$ [the QML*-translation]
[(2b)] $\Diamond\forall_0 x(@\exists y(Cyx \;\&\; Ry) \rightarrow Px)$ [the *preliminary* KCT*-translation]
$(2b)_C$ $\exists w_1\forall x(Ixw^* \rightarrow (\exists y(Iyw^* \;\&\; Cyx \;\&\; Ryw^*) \rightarrow Pxw_1)$
[the final KCT*-translation]

And the QML*-valid argument (7a) comes out valid by KCT* as required:

(7a) $\Diamond\forall_0 x(@Lx \rightarrow Ax), @La \models \Diamond Aa$
$(7a)_C$ $\exists w_1\forall x(Ixw^* \rightarrow (\exists y(Iyw^* \;\&\; Cyx \;\&\; Lyw^*) \rightarrow Axw_1)$,
$\exists x(Ixw^* \;\&\; Cxa \;\&\; Lxw^*) \models \exists w_2\exists x(Ixw_2 \;\&\; Cxa \;\&\; Axw_2)$

Hence, Kripkean counterpart theory avoids Fara and Williamson's objections to its ancestors. Importantly, its motivation is not *ad hoc*—its restriction on the counterpart relation is motivated by the intuitive coherence (albeit pending further investigation) of contingent distinctness. As things stand, I contend, it better respects our modal intuitions than more familiar quantified modal logics—and counterpart theories. [12]

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