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Contradictoriness

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Abstract

This article provides a fresh perspective on the phenomenon of contradictoriness, i.e. the observable fact that certain sentences *feel* contradictory. In the first part (§1-2), I present a series of empirical arguments aimed at showing that standard notions of contradiction—falsehood in every possible world, falsehood under all possible uniform substitutions of non-logical words—are of little use when it comes to characterising contradictoriness. In the second part (§3-5), I offer an account of this phenomenon; this account is stated in the form of a generalisation and has at its core a new theoretical notion—the notion of *predicate connection*.[*]

1 Introduction

Consider (1) below: (1)a *feels* contradictory or incoherent, i.e. it pits two incompatible things against each other, which results in a feeling of unresolvable conflict. I shall refer to this phenomenon with the term ‘contradictoriness’. (1)b, by contrast, doesn’t exhibit this distinct kind of deviance: it is just perceived as false. (Presence of contradictoriness is signalled with a ‘$^{\text{c}}$’, while its absence is signalled with a ‘$^{\not c}$’).

(1) a. $^{\text{c}}$ John was killed, and he wasn’t killed.
  b. $^{\not c}$ Donald Trump didn’t serve as US President.

A legitimate question to ask is therefore this: *what is it that makes a sentence feel contradictory* (why does (1)a, but not (1)b, feel contradictory?) This question is hardly ever raised let alone debated in the formal semantics community. The reason for this, I suspect, is that its answer is taken to be obvious: *a sentence feels contradictory when it’s a contradiction!* But what does ‘contradiction’ mean in this context? ‘Contradiction’ cannot mean ‘contextual contradiction’: (1)b is a contextual contradiction, yet it doesn’t *feel* contradictory. The natural choices are then these: ‘contradiction’ means ‘falsity under all possible uniform substitutions of non-logical words’, or, alternatively, ‘falsity in every possible world’. Two possible responses to the question raised can thus be generated:

[*] Acknowledgments to be added.

(2) The formalist's response: a sentence exhibits contradictoriness if and only if it is a *formal contradiction* (i.e. it is false under all possible uniform substitutions of non-logical words).

(3) The romantic's response: a sentence exhibits contradictoriness if and only if it is a *necessary falsehood* (i.e. it is false in every possible world).

The formalist's response is surely too restrictive: (4)a, just like (1)a and unlike (1)b/(4)b, exhibits contradictoriness; however, (4)a isn't a formal contradiction.

(4) a. [c] John was killed, and he didn't die.
b. [¢] Donald Trump didn't serve as US President.

The romantic's response, on the other hand, can be invoked to explain both the contrast in (1) and that one in (4): (4)a and (1)a, unlike (4)b/(1)b, are necessary falsehoods. It would seem—at least on first inspection—that the romantic got this one right.

✾

The structure of the present article is as follows. In §2, to begin with, I show that the romantic's response isn't right: there are necessary falsehoods that do not exhibit contradictoriness as well as contingent falsehoods that do. (By the end of §2, therefore, the question that I raised in the first paragraph will re-emerge—*what is it that makes a sentence feel contradictory?*). In §3, I offer an answer to this question, an answer that takes the form of a generalisation and has at its core a new theoretical notion—the notion of *predicate connection*. In §4, I make two refinements to this generalisation, refinements that further extend its empirical reach. In §5, I discuss a number of problems that the proposed generalisation faces and hint at possible solutions.

2 The romantic's response isn't right

The romantic response (*RR*) has it that a sentence exhibits contradictoriness if and only if it is false in every possible world. But is this true? Consider, for example, the sentence 'Every member of Linguae likes John, but Benjamin hates him': this sentence, quite clearly, is not a necessary falsehood—it is true in worlds in which every member of Linguae likes John, Benjamin isn't a member of Linguae, and Benjamin hates John. Let's now take a look at (5) and (6).

(5) [CONTEXT: it is common ground that Benjamin is a member of Linguae.]

^{c} Every member of Linguae likes John, but Benjamin hates him.

(6) [CONTEXT: it is common ground that no member of Linguae likes John and, furthermore, that Benjamin is a member of Parlare (not of Linguae).]

$^{\not c}$ Every member of Linguae likes John, but Benjamin hates him.

According to *RR*, a sentence like 'Every member of Linguae likes John, but Benjamin hates him' should never exhibit contradictoriness, irrespective of the context in which it is uttered (as established, 'Every member of Linguae likes John, but Benjamin hates him' is not a necessary falsehood). This sentence, however, does exhibit contradictoriness in (5)—in (6), by contrast, it is false (the first conjunct is false) but doesn't exhibit contradictoriness. *RR* cannot be right then: as (5) discloses, it is possible for a contingent falsehood to exhibit contradictoriness.

Here's another argument against *RR*.

(7) [CONTEXT: it is common ground that the city of Tajiff is in Cuba.]

a. ^{c} Benjamin is in Tajiff, and he isn't in Cuba.
b. $^{\not c}$ Benjamin is in Tajiff, and Tajiff isn't in Cuba.

(7)a and (7)b are true in exactly the same worlds—namely, in worlds in which Benjamin lives in Tajiff and Tajiff isn't in Cuba.[1] Despite having the same truth-conditions, (7)a and (7)b elicit different judgments in the stipulated context: (7)a exhibits contradictoriness; (7)a, by contrast, doesn't. This observation falsifies *RR*: according to *RR*, neither (7)a nor (7)b should exhibit contradictoriness (because neither (7)a nor (7)b are necessary falsehoods).[2]

[1] I could have made the same point with (i):

(i) a. ^{c} Benjamin is in Paris, and/but he isn't in France.
b. $^{\not c}$ Benjamin is in Paris, and/but Paris isn't in France.

The reason why I am using (7) and not (i) is purely methodological: (7) is like (5) and (6) in that the contextual information given is not, as a matter of fact, part of the common ground (I'm just asking the reader to assume that it is). (i) is different in this respect: the relevant contextual information (namely, that Paris is in France) is part of the common ground. As the parallelism between (7) and (i) discloses, this difference has little to no effect on the judgments that I am eliciting.

[2] The minimal pairs in (7) and (i) disprove yet another possible account of contradictoriness (cf. Schlenker 2009): a sentence exhibits contradictoriness iff it has a sub-constituent that contradicts its local context. Indeed, the second conjunct of (7)b and the second conjunct of (i)b contradict their respective local contexts, just like the second conjunct of (7)a and the second conjunct of (i)a; however, neither (7)b nor (i)b exhibit contradictoriness—for a very brief introduction to notion of local context, see section §4.1). (The example below can also be used to disprove the account just suggested:

RR can be refuted from the opposite direction: that is, it can be shown that not all necessary falsehoods feel contradictory. Consider (8), for example.

(8) a. ¢ Bachelors have wives.
b. ^{c} Bachelors have wives and aren't married.

Both (8)a and (8)b are necessary falsehoods: however, only (8)b exhibits contradictoriness—(8)a is simply perceived as false.[3] (8), therefore, should persuade one that *RR* is false; unless, of course, one wasn't persuaded that (8)a is a necessary falsehood, but, oddly enough, was persuaded that (8)b is one. To those in such a state, I offer this argument: if (8)a wasn't a necessary falsehood but a contingent one, it should be possible to imagine what it would take for it to be true. This doesn't seem to be possible, however, as the test below reveals.

(9) <u>The 'imagine if' test</u>

a. Bachelors have wives.
a'. ? Imagine if bachelors had wives.

b. Dogs don't bark.
b'. ✓ Imagine if dogs didn't bark.

c. Elephants have red stripes.
c'. ✓ Imagine if elephants had red stripes.

(ii) [CONTEXT: it's common ground that John studied at Oxbridge (either Oxford or Cambridge).]
¢ John didn't study at Oxford, and he didn't study at Cambridge (either).

In the stipulated context, (ii) is not perceived as contradictory/incoherent—it's just perceived as false; yet (ii)'s second conjunct contradicts its local context.)

[3] Contrasts such as (8) aren't difficult to generate; consider, for example, (iii) and (iv) below:

(iii) a. ¢ Bachelors are young married men. [plain false]
b. ^{c} Bachelors are single married men. [false + contradictory]

(iv) a. ¢ Triangles are four-sided polygons. [plain false]
b. ^{c} Triangles are four-sided polygons that have exactly three sides. [false + contradictory]

If these contrasts, including the contrast in (8), aren't immediately clear, the following thought experiment can help. Suppose *Quish* is a game that involves answering questions. Participants draw a question card from a pile, and provided that they answer it correctly, they get a point. Participants can expect questions of various degrees of difficulty, including completely trivial ones (questions that any competent speaker of English can answer). The best that can happen to a participant is, of course, to draw a card with a trivial question. Against this context, let's compare [(iii)a?]'Are bachelors young married men?' with [(iii)b?] 'Are bachelors single married men?'. [(iii)a?] is a fine question in following sense: there's nothing *pathological* about it, i.e. such a question could be one of the trivial questions of *Quish* (its answer is of course 'No.'). [(iii)b?], by contrast, is a pathological/incoherent question, which one wouldn't expect to appear in a game like *Quish*. The same point could be made using [(iv)a?]'Are triangles four-sided polygons?' vs. [(iv)b?] 'Are triangles four-sided polygons that have exactly three-sides?', or [(8)a?] 'Is it true that bachelors have wives?' vs. [(8)b?] 'Is it true that bachelors have wives and aren't married?'

Indeed, (9)a, when embedded under 'imagine if' (or under 'suppose'), reads as a non-sensical command: a bachelor *is* an unmarried man… so how could an unmarried man have a wife? (9)b and (9)c behave differently: these are generic sentences that, like (9)a, are known to be false but, unlike (9)a, can be felicitously embedded under 'imagine if'. To account for this contrast, one is compelled to recognise that (8)a is not a contingent but a necessary falsehood. *RR*, therefore, can't be right.

An additional argument can be given against *RR*: it entails that only false sentences can exhibit contradictoriness; this, however, isn't true. First, contradictoriness can be found in sentences whose truth value is unknown (e.g. (10)a) as well as in tautologies, either logical (e.g. (10)b) or contextual (e.g. (10)c).

(10) a. ^{c} Either John is an artist, or he isn't an artist and he is both single and married.
b. ^{c} Either John lives in Montmartre but doesn't live in Paris, or it's false that he lives in Montmartre but doesn't live in Paris.
c. ^{c} It's not true that John lives in Toulouse but doesn't live in France.[4]

In addition, contradictoriness can be found in sentences that aren't truth-bearers, such as questions, as shown below.

(11) a. ^{c} Is it true that Paul is both single and married?
b. ^{c} Is it true that John lives in Toulouse but doesn't live in France?

Once again, *RR* can't be right.

3 The nature of contradictoriness

It is clear that we lack an empirically adequate account of contradictoriness; in particular, we lack an account able to predict the following three contrasts:

[4] If the reader finds this judgment unclear, it may help to compare (10)c with (v), which, unlike (10)c, isn't odd.

(v) It can't be true that John lives in Toulouse but doesn't live in France.

In § 5.3, I'll have more to say about the contrast between (10)c and (v).

Table 1

CONTRADICTORINESS? YES.		CONTRADICTORINESS? NO.	
(5)	[It is common ground that Benjamin is a member of Linguae.] Every member of Linguae likes John, but Benjamin hates him.	**(6)**	[It is common ground that no member of Linguae likes John and, furthermore, that Benjamin is a member of Parlare (not of Linguae).] Every member of Linguae likes John, but Benjamin hates him.
(7)a	[It is common ground that the city of Tajiff is in Cuba.] Benjamin is in Tajiff, and he isn't in Cuba.	**(7)b**	[It is common ground that the city of Tajiff is in Cuba.] Benjamin is in Tajiff, and Tajiff isn't in Cuba.
(8)a	Bachelors have wives and aren't married.	**(8)b**	Bachelors have wives.

In this section, I put forward a generalisation that does predict these contrasts and, unlike the romantic's account, is compatible with the observation that a non-false sentence may give rise to contradictoriness.

3.1 Towards a generalisation

3.1.1 Predicate connection

The generalisation that I'll be formulating is grounded in the notion of *predicate connection*, which, being novel, does require a detailed introduction.[5] To begin with, consider the utterance in (12):

(12) [Context: Rodolphe is a member of Parlare, a linguistics research unit.]
Every member of Parlare <u>is French</u>, but Rodolphe <u>doesn't feel French</u>.

Let's suppose that (12) is compatible with C, (the set of worlds compatible with) the common ground. The first thing to note is that, in every world $w \in$ C in which (12) is true, there's an entity x (namely, the entity denoted by 'Rodolphe' in w) that is in the extension of 'is French' in w as well as in the extension of 'doesn't feel French' in w—or, equivalently, in every world $w \in$ C in which (12) is true, there's an entity x such that $[\![\text{is French}]\!]^{w}(x) = 1$ and $[\![\text{doesn't feel French}]\!]^{w}(x) = 1$. This follows from the meaning of 'and' and the fact that 'Every member of Parlare is French' contextually entails that Rodolphe is French.

The second thing to note, and the most important one, is that the observation just made doesn't depend on the meaning of 'is French' and 'doesn't feel French'; that is, were one to change the meaning of these constituents, it would still be the case that, in every world $w \in$ C in which (12) is true, there's an entity x (namely, the entity denoted by 'Rodolphe' in w) such that $[\![\text{is French}]\!]^{w}(x) = 1$ and $[\![\text{doesn't feel French}]\!]^{w}(x)$

[5] Beyond the terminological resemblance, this notion is unrelated to the notion of *connectedness* (e.g. Chemla, Buccola, and Dautriche 2019).

= 1. To visualise this, one may simply replace ‘is French’ and ‘doesn’t feel French’ by any other two predicates—for example, ‘is married’ and ‘doesn’t enjoy being married’, as in (13).

(13) [Context: Rodolphe is a member of Parlare, a linguistics research unit.]
Every member of Parlare is married, but Rodolphe doesn’t enjoy being married.

‘is married’ doesn’t mean the same as ‘is French’, and ‘doesn’t feel French’ doesn’t mean the same ‘doesn’t enjoy being married’; despite this, in every world $w \in$ C in which (13) is true, there’s an entity x (namely, the entity denoted by ‘Rodolphe’ in w) such that $[\![\text{is married}]\!]^{w}(x) = 1$ and $[\![\text{doesn't enjoy being married}]\!]^{w}(x) = 1$. It can thus be said that, in every world $w \in$ C in which (12) is true, there’s an entity x such that $[\![\text{is French}]\!]^{w}(x) = 1$ and $[\![\text{doesn't feel French}]\!]^{w}(x) = 1$ *no matter what ‘is French’ and ‘doesn’t feel French’ mean*. Because of this, I’ll say that the predicates ‘is French’ and ‘doesn’t feel French’ are (1,1)-connected in the matrix clause of (12) with respect to C: the entity that ‘Rodolphe’ denotes (the same at every world, if one assumes that names are rigid designators) is the entity that *connects* the two predicates; ‘(1,1)’ indicates that, in every world ∈ C, the connecting entity is in the (positive) extension of the predicates in question.

Just like two one-place predicates can be (1,1)-connected, they can also be (1,0)-connected, (0,1)-connected, or (0,0)-connected. Let’s take (12) again, repeated in (14) below.

(14) [Context: Rodolphe is a member of Parlare, a linguistics research unit.]
Every member of Parlare is French, but Rodolphe doesn’t feel French.

The underlined predicates, namely ‘is French’ and ‘feel French’, are (**1**,**0**)-connected in the matrix clause of (14) with respect to C. Why? Because, in every world $w \in$ C in which (14) is true, there’s an entity x (namely, the entity denoted by ‘Rodolphe’ in w) such that $[\![\text{is French}]\!]^{w}(x) = \mathbf{1}$ and $[\![\text{feel French}]\!]^{w}(x) = \mathbf{0}$ *no matter what ‘is French’ and ‘feel French’ mean*.

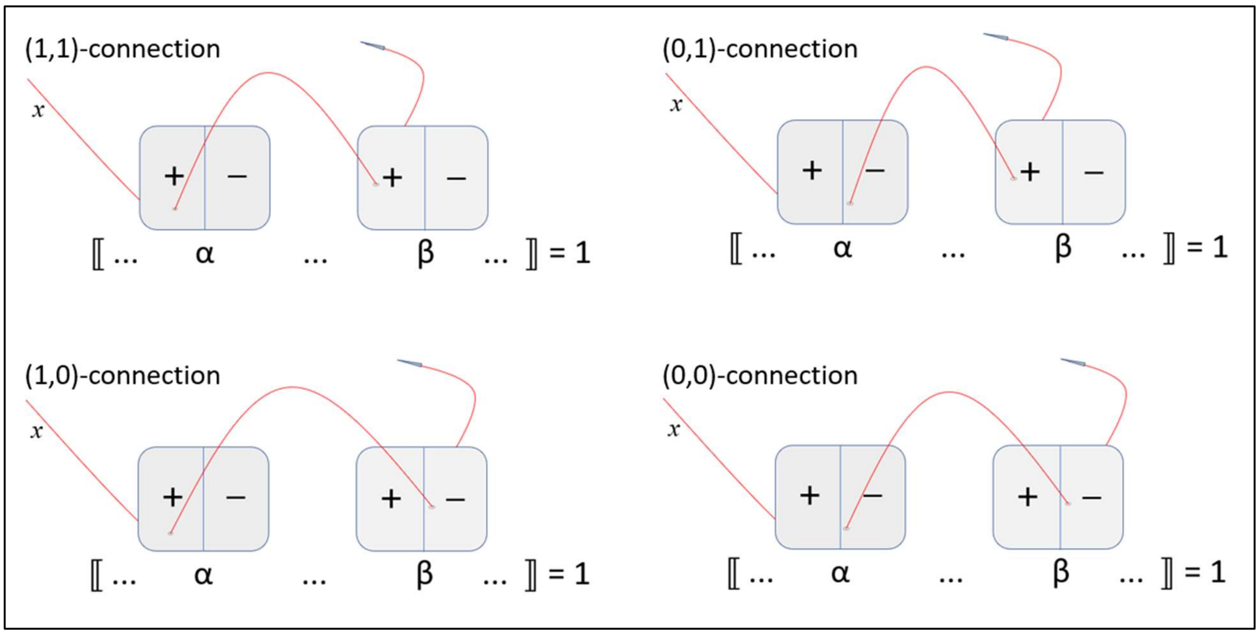
Consider (15) now:

(15) [Context: Rodolphe is a member of Parlare, a linguistics research unit.]
None of the members of Parlare is French, and Rodolphe isn’t English either.

The predicates 'is French' and 'isn't English' are (**0**,**1**)-connected in the matrix clause of (14) with respect to C. Why? Because, in every world $w \in$ C in which (15) is true, there's an entity x (namely, the entity denoted by 'Rodolphe' in w) such that $[\![\text{is French}]\!]^w(x) = \mathbf{0}$ and $[\![\text{isn't English}]\!]^w(x) = \mathbf{1}$ *no matter what 'is French' and 'isn't English' mean*. Likewise, the predicates 'is French' and 'English' are (**0**,**0**)-connected in the matrix clause of (14) with respect to C. Why? Because, in every world $w \in$ C in which (15) is true, there's an entity x (namely, the entity denoted by 'Rodolphe' in w) such that $[\![\text{is French}]\!]^w(x) = \mathbf{0}$ and $[\![\text{English}]\!]^w(x) = \mathbf{0}$ *no matter what 'is French' and 'English' mean*.

So, what is predicate connection? To a first approximation, it can be said that, for any $v_1, v_2 \in \{0,1\}$, two predicates α and β are (v_1,v_2)-connected in a clause μ with respect to context C iff, for every world $w \in$ C in which μ is true, there's an entity x such that $[\![\alpha]\!]^w(x) = v_1$ and $[\![\beta]\!]^w(x) = v_2$ *no matter what α and β mean* (Figure 1 below is intended as a visual aid).

Figure 1. Predicate connection (an artist's impression).



The basic idea being introduced, let's now proceed to give a formal definition of predicate connection.

(16) **Predicate Connection** (v.1, to be revised)

Let μ be a clause, α and β two one-place predicates, C the global context, and $\mathcal{D}_e$ the set of all entities. P and Q are two one-place predicate variables, and f a variable over assignment functions from $\{P, Q\}$ to $\mathcal{D}_{\langle s,\langle e,t\rangle\rangle}$. For any $v_1, v_2 \in \{0,1\}$,

α and β are (v_1,v_2)-connected in μ w.r.t. C iff...

(i) α and β are both constituents of μ,
(ii) α is not a constituent of β, nor is β a constituent of α, and
(iii) μ′—a clause just like μ except that α has been replaced by *P* and β by *Q*—satisfies (a) and (b):[6]

(a) $\exists f \exists w \in C(⟦\mu'⟧^{w,f} = 1)$
(b) $\forall f \forall w \in C(⟦\mu'⟧^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e$ s.t. $⟦P⟧^{w,f}(x) = v_1 \wedge ⟦Q⟧^{w,f}(x) = v_2)$.

(16) is straightforward; if turned into a recipe, it would go more or less like this: first, given a sentence S, identify a clause of S that has two constituents of predicative type (call one of these constituents α and the other β); second, replace α by *P* and β by *Q* (by so doing, one makes sure that the calculation of connection facts doesn't depend on the meaning of α and β)[7]; third, check whether the impoverished clause (the clause in which α has been replaced by *P* and β by *Q*) satisfies (16)iii. (Stripping away the technical details, (16)iii-a says: 'You can find a way of replacing α and β so that the resulting clause is consistent with the common ground'; (16)iii-b, in turn, says, 'For all replacements of α and β, the resulting clause contextually entails that there is an entity of which the replacement of α is v_1 and the replacement of β is v_2'.)

There are two elements of (16) that require an explanation—namely, (16)ii and (16)iii-a. Let's start with (16)ii. This condition makes sure that (16)iii is defined: if α was a constituent of β (or vice versa), it wouldn't be possible to replace both α by *P* and β by *Q* and, hence, it would not be possible to generate μ′. Let's now move to (16)iii-a; what is this condition for? The answer is straightforward: (16)iii-a's function is to prevent (16)iii-b from being satisfied trivially: indeed, if (16)iii-a wasn't there, (16)iii could be satisfied by virtue of (16)iii-b being vacuously true. (See §5, for some complications associated with the presence of (16)iii-a).

Having made these remarks, I must point out that there's something odd about (16); to see it, take the underlined predicates in (17) below and ask yourself: are these predicates (1,0)-connected or (0,1)-connected in the matrix clause of (17) w.r.t. C?

(17) John <u>blah</u>, but didn't <u>bleh</u>.

[6] I'm assuming the following (non-standard) intepretation rule: if γ is an element of {*P*, *Q*}, then, for any *w* and for any *f*, $⟦\gamma⟧^{w,f} = f(\gamma)(w)$; if γ is not an element of {*P*, *Q*}, then, for any *w* and for any *f*, $⟦\gamma⟧^{w,f} = ⟦\gamma⟧^{w}$. To avoid clutter, I am omitting *g*, the assignment function that deals with the 'real' (as opposed to the artificially introduced) variables. This omission is harmless.

[7] This step may remind the reader of Gajewski (2002). Indeed, to define his notion of L-analyticity, Gajewski generates the 'logical skeleton' of a sentence (and he does so by replacing each non-logical expression with a distinct variable of the appropriate type). Note that this is not what I am doing: I am not 'erasing' the meaning of each non-logical expression in the sentence but, rather, the meaning of just two one-place predicates. It is also worth noting that the question that Gajewski (2002) is trying to answer is why sentences such as 'there is every curious teacher' are perceived as ungrammatical. I'm trying to answer a different question—namely, why perfectly grammatical sentences such as 'every member of The Beatles smoked, but John Lennon didn't' are perceived as contradictory.

The answer is unexpectedly long: if α is instantiated as 'blah' and β as 'bleh', then then these predicates are (1,0)-connected in the matrix clause of (17) w.r.t. C; however, if α is instantiated as 'bleh' and β as 'blah', then these predicates are (0,1)-connected in the matrix clause of (17) w.r.t. C. To avoid 'conditional answers' such as this, instead of talking of two predicates α and β being (v_1,v_2)-connected, I shall talk about a(n ordered) pair of predicates (α, β) being (v_1,v_2)-connected, as in (18) below. Under this (revised) definition, it makes no sense to ask what the connection facts for two predicates are; according to (18), a 2-tuple of predicates is the thing of which connection facts hold—e.g. ('blah', 'bleh') is (1,0)-connected in the matrix clause of (17) w.r.t. C, while ('bleh', 'blah') is (0,1)-connected in the matrix clause of (17) w.r.t. $C_{(17)}$.

(18) **Predicate Connection** (*v*.2, to be revised)

Let μ be a clause, α and β two one-place predicates, C the global context, and $\mathcal{D}_e$ the set of all entities. *P* and *Q* are two one-place predicate variables, and *f* a variable over assignment functions from $\{P, Q\}$ to $\mathcal{D}_{\langle s,\langle e,t\rangle\rangle}$. For any $v_1, v_2 \in \{0,1\}$,

(α, β) is (v_1,v_2)-connected in μ w.r.t. C iff...

(i) α and β are both constituents of μ,
(ii) α is not a constituent of β, nor is β a constituent of α, and
(iii) μ′—a clause just like μ except that α has been replaced by *P* and β by *Q*—satisfies (a) and (b):[8]

(a) $\exists f \exists w \in C([\![\mu']\!]^{w,f} = 1)$
(b) $\forall f \forall w \in C([\![\mu']\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e \text{ s.t. } [\![P]\!]^{w,f}(x) = v_1 \wedge [\![Q]\!]^{w,f}(x) = v_2)$.

Notation: I'll say that (α, β) is *connected* in μ w.r.t. C (without further qualification) if, for some v_1, v_2 ∈ {0,1}, it is (v_1,v_2)-connected in μ w.r.t. C—that is, if it is (1,1)-connected in μ w.r.t. C, (1,0)-connected in μ w.r.t. C, (0,1)-connected in μ w.r.t. C, or (0,0)-connected in μ w.r.t. C.

Predicate connection is a novel theoretical notion and, as a result, it might take a while to absorb. To facilitate this process, let's put (18) to work: suppose one wanted to establish whether the pair ('is French', 'doesn't feel French') is connected in (19)'s matrix clause w.r.t. C.

(19) [Context: Rodolphe is a member of Parlare, a linguistics research unit.]

Every member of Parlare <u>is French</u>, but Rodolphe <u>doesn't feel French</u>.

First, one asks: are (18)i and (18)ii satisfied? In this case, they are: 'is French' and 'doesn't feel French' are both constituents of (19) and neither of them is a constituent of the other. Second, one generates an impoverished version of the clause in question—namely, 'Every member of Parlare *P*, but Rodolphe *Q*' (this clause is just like the original clause except for the fact that the underlined predicates have been replaced by variables); then one asks: does 'Every member of Parlare *P*, but Rodolphe *Q*' satisfy (18)iii-a

[8] See ftn. 6.

and (18)iii-b? It cannot not satisfy (18)iii-a (provided that C ≠ ∅); indeed, suppose $w_1 \in$ C, and that f_1 is the assignment that maps both P and Q to $[\lambda w \lambda x \,.\, x \in \mathcal{D}_e]$—then, there is an f and a w (namely, f_1 and w_1) such that ⟦Every member of Parlare P, but Rodolphe Q⟧^{w,f} = 1. What about (18)iii-b? As shown below, when v_1 and v_2 are instantiated as '1', 'Every member of Parlare P, but Rodolphe Q' does satisfy this condition too:

> for any f and for any world $w \in$ C, if ⟦Every member of Parlare P, but Rodolphe Q⟧^{w,f} = 1, then there is an $x \in \mathcal{D}_e$ (namely, the entity that 'Rodolphe' denotes in w) such that $[\![P]\!]^{w,f}(x) = 1$ and $[\![Q]\!]^{w,f}(x) = 1$

It can thus be concluded that ('is French', 'doesn't feel French') is (1,1)-connected in the matrix clause of (19) w.r.t. C. What if one had picked the pair ('is French', 'feel French') instead? This pair is also connected: however, unlike ('is French', 'doesn't feel French'), it is (1,0)-connected in the matrix clause of (19) w.r.t. C. Given how predicate connection is defined, if a pair of predicates (α, β) is connected, the application of predicate negation to α (or β, or to both α and β) won't have the effect of disconnecting it: it will just change the 'connection combination' (e.g. from (1,1) to (1,0), from (1,0) to (0,0), etc.).

Before concluding this section, I'd like to note two things. First, the fact that a pair of predicates may be connected in some way (say, (1,1)-connected) doesn't preclude it from being connected in another way (say, (1,0)-connected). Consider (20), for example.

(20) [CONTEXT: Parlare, a linguistics research unit, has three members, Rodolphe, Florence, and Aymeric.]

Every member of Parlare <u>is French</u>, but only Rodolphe <u>doesn't feel French</u>.

('is French', 'doesn't feel French') is (1,1)-connected in the matrix clause of (20) w.r.t. C: this is because, for any f and for any world $w \in$ C, if ⟦Every member of Parlare P, but only Rodolphe Q⟧^{w,f} = 1, then there is an $x \in \mathcal{D}_e$ (namely, the entity that 'Rodolphe' denotes in w) such that $[\![P]\!]^{w}(x) = 1$ and $[\![Q]\!]^{w}(x) = 1$. Likewise, ('is French', 'doesn't feel French') is (1,0)-connected in the matrix clause (20) w.r.t. C: this is because, for any f and for any world $w \in$ C, if ⟦Every member of Parlare P, but only Rodolphe Q⟧^{w,f} = 1, then there is an $x \in \mathcal{D}_e$ (namely, any of the other two members of Parlare in w) such that $[\![P]\!]^{w}(x) = 1$ and $[\![Q]\!]^{w}(x) = 0$.

The second thing that I'd like to note is this: predicates, when connected, are connected in a clause that may or may not be the matrix clause. Take, for example, (21), and assume that the first disjunct is consistent with C (i.e. there is at least one world $w \in$ C such that 'John is French' is true in w):

(21) Either John is French, or he <u>is English</u> and <u>very wealthy</u>.

The pair of predicates (‘is English’, ‘very wealthy’) isn’t connected in (21)’s matrix clause w.r.t. C: this is because ‘Either John is French or he is *P* and *Q*’, irrespective of how v_1 and v_2 are instantiated, doesn’t satisfy (18)iii-b.[9] (‘is English’, ‘very wealthy’), however, is (1,1)-connected in (21)’s *second disjunct* w.r.t. C—as can easily be checked, ‘(John) *P* and *Q*’ satisfies the two conditions in 16(iii) when v_1 and v_2 are instantiated as ‘1’.

3.1.2 Contradictoriness

With (18) on board, I am now in a position to put forward the generalisation in (22).

(22) **Contradictoriness** (*v*.1, to be revised)

Let S be a sentence, μ a clause of S, and C the global context (the context in which S is uttered).

(i) S is perceived as contradictory in C iff, for some one-place predicates α and β and some v_1 and v_2 $\in \{0,1\}$, (α, β) is (v_1,v_2)-connected in μ w.r.t. C and, furthermore, (v_1,v_2)-incompatible in C.
(ii) (α, β) is (v_1,v_2)-incompatible in C iff, for every $w \in$ C, $\{x \in \mathcal{D}_e : [\![\alpha]\!]^w(x) = v_1\} \cap \{x \in \mathcal{D}_e : [\![\beta]\!]^w(x) = v_2\} = \emptyset$.

I take (22) to be a *generalisation*, an attempt to describe the facts as opposed to a theory, which should explain the facts and not just describe them. That said, I think it is possible to glean from (22), if not a theory, the scaffolding of one. Indeed, it is natural to conceptualise (22) along the following lines: connection facts impose constraints on what predicates that co-occur in a clause can mean; contradictoriness kicks in when these constraints are unsatisfiable. In more precise terms, the idea is this: if a pair of predicates (α, β) is (v_1,v_2)-connected in μ w.r.t. C, then, at minimum, there must be a world $w \in$ C such that $\{x \in \mathcal{D}_e : [\![\alpha]\!]^w(x) = v_1\} \cap \{x \in \mathcal{D}_e : [\![\beta]\!]^w(x) = v_2\} \neq \emptyset$ (for example, if (α, β) is (1,1)-connected in μ w.r.t. C, then there

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[9] Let w_1 be a C-world in which ‘John is French’ is true, f_1 the assignment that maps both *P* and *Q* to $[\lambda w \lambda x \,.\, x \in \mathcal{D}_e]$ (the constant function that maps every possible world to the characteristic function of $\mathcal{D}_e$) and f_2 the assignment that maps both *P* and *Q* to $[\lambda w \lambda x \,.\, x \in \emptyset]$ (the constant function that maps every possible world to the characteristic function of ∅).

The following two statements are true:

(a) $[\![$Either John is French, or he is P and $Q]\!]^{w_1,f_1} = 1$ and, **for every $x \in \mathcal{D}_e$**, $[\![P]\!]^{w_1,f_1}(x) = [\![Q]\!]^{w_1,f_1}(x) = 1$.
(b) $[\![$Either John is French, or he is P and $Q]\!]^{w_1,f_2} = 1$ and, **for every $x \in \mathcal{D}_e$**, $[\![P]\!]^{w_1,f_2}(x) = [\![Q]\!]^{w_1,f_2}(x) = 0$.

And, if (a) and (b) are true, then none of the following statements can be true:

- $\forall f \forall w \in \mathrm{C}([\![$Either John is French, or he is P and $Q\,]\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e$ s.t. $[\![P]\!]^{w,f}(x) = 1 \wedge [\![Q]\!]^{w,f}(x) = 1)$
- $\forall f \forall w \in \mathrm{C}([\![$Either John is French, or he is P and $Q\,]\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e$ s.t. $[\![P]\!]^{w,f}(x) = 1 \wedge [\![Q]\!]^{w,f}(x) = 0)$
- $\forall f \forall w \in \mathrm{C}([\![$Either John is French, or he is P and $Q\,]\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e$ s.t. $[\![P]\!]^{w,f}(x) = 0 \wedge [\![Q]\!]^{w,f}(x) = 1)$
- $\forall f \forall w \in \mathrm{C}([\![$Either John is French, or he is P and $Q\,]\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e$ s.t. $[\![P]\!]^{w,f}(x) = 0 \wedge [\![Q]\!]^{w,f}(x) = 0)$

Hence, (‘is English’, ‘very wealthy’) isn’t connected in (21)’s matrix clause w.r.t. C.

must be a world $w \in C$ such that the intersection of $\{x \in \mathcal{D}_e : [\![\alpha]\!]^w(x) = 1\}$ and $\{x \in \mathcal{D}_e : [\![\beta]\!]^w(x) = 1\}$ isn't empty). Thus, if (α, β) is (v_1,v_2)-connected in μ w.r.t. C and (v_1,v_2)-incompatible in C, then this constraint can't be satisfied and contradictoriness thus follows. As research in this domain expands and matures, this conceptual framing of (22) may reveal itself as inadequate—for presentation purposes, however, I think it is helpful.

Let's see (22) in action; consider, for example, (23) below:

(23) a. John (both) took part in the fight and died in the fight.
b. ᶜ John (both) died in the fight and didn't die in the fight.

The pair ('took part in the fight', 'died in the fight') is (1,1)-connected in (23)a w.r.t. C,[10] and so is the pair ('died in the fight', 'took part in the fight'). These pairs, however, aren't (1,1)-incompatible in C; as a result, contradictoriness isn't expected under (22). The situation changes in (23)b: ('died in the fight', 'didn't die in the fight') is (1,1)-connected in (23)b w.r.t. C and, furthermore, (1,1)-incompatible in C (the same is of course true of ('didn't die in the fight', 'died in the fight')). (23)b is therefore expected to exhibit contradictoriness under the generalisation in (22): for some predicates α and β and some v_1 and $v_2 \in \{0,1\}$, (α, β) is (v_1,v_2)-connected in the matrix clause of (23)b w.r.t. C and, in addition, (v_1,v_2)-incompatible in C.

Or, for further illustration, consider (12)/(19) again—repeated in (24) below:

(24) [CONTEXT: Rodolphe is a member of Parlare, a linguistics research unit.]
Every member of Parlare is French, but Rodolphe doesn't feel French.

As discussed, ('is French', 'doesn't feel French') is (1,1)-connected in (24)a w.r.t. C—for any f and for any world $w \in C$, if $[\![\text{Every member of Parlare } P\text{, but Rodolphe } Q]\!]^{w,f} = 1$, then there is an $x \in \mathcal{D}_e$ (namely, the entity that 'Rodolphe' denotes in w) such that $[\![P]\!]^w(x) = 1$ and $[\![Q]\!]^w(x) = 1$. According to (22), ('is French', 'doesn't feel French') isn't expected to induce contradictoriness in (24)—this is because ('is French', 'doesn't feel French'), despite being (1,1)-connected in (24) w.r.t. C, isn't (1,1)-incompatible in C. This prediction is a good one.

[10] When I write '(α, β) is (v_1,v_2)-connected in [example number] w.r.t. C' what I mean is, of course, that (α, β) is (v_1,v_2)-connected in the matrix clause of [example number] w.r.t. the global context, viz. the context in which [example number] is uttered.

Now, were one to replace 'doesn't feel French' by 'isn't European' in (24), contradictoriness would be expected to kick in: this is because ('is French', 'isn't European') is (1,1)-incompatible in C. As shown in (25), this prediction is correct:

(25) [CONTEXT: Rodolphe is a member of Parlare, a linguistics research unit.]
ᶜ Every member of Parlare is French, but Rodolphe isn't European.

Though the examples just discussed involve conjunction, it's important to remember that the presence of conjunction isn't a pre-requisite for contradictoriness to arise—for example, the sentences in (26) are all expected to exhibit contradictoriness under (22):

(26) a. ᶜ There's a married bachelor that wants to meet Joe.
[('married', 'bachelor') is (1,1)-connected in (26)a w.r.t. C and (1,1)-incompatible in C.]
b. ᶜ Every bachelor in the room is married.
[('bachelor in the room', 'married') is (1,1)-connected in (26)b w.r.t. C[11] and (1,1)-incompatible in C.]
c. ᶜ John is neither married nor unmarried.
[('married', 'unmarried') is (0,0)-connected in (26)a w.r.t. C and (0,0)-incompatible in C.]

I take these to be good predictions. This isn't to say that there aren't subtle differences in the quality of the contradictoriness judgment across different types of sentences—for example, in (26)a, the feeling of contradictoriness is 'concentrated' in the restrictor, whereas in (26)b is more diffused and somewhat less immediate. This, I don't think, threatens (22): I think of (22) as telling us that the perceived defectiveness of (26)a-c and the other examples that I have marked with 'ᶜ', is of the same *nature*—in particular, that it arises as a result of a 'conflict' between two predicates. However, just like we don't expect the perceptual experience of a yellow brushstroke to be immune to the colour and texture of the canvas on which it is painted, we shouldn't expect contradictoriness to be immune to aspects of the construction where it manifests itself.

3.1.2.1 The promise

At the outset of this section, I made a promise: to put forward a generalisation able to account for the three contrasts that disprove the romantic's account (see Table 1). (22) is that generalisation.

Let's start with the first of these three contrasts; as discussed, 'Every member of Linguae likes John, but Benjamin hates him' exhibits contradictoriness in (5)—repeated in (27) below—but not in (6)—repeated in (28) below.

[11] This is true on the assumption that 'every' carries an existence presupposition that its restrictor isn't empty.

(27) [CONTEXT: it is common ground that Benjamin is a member of Linguae.]

^{c} Every member of Linguae likes John, but Benjamin hates him.

(28) [CONTEXT: it is common ground that no member of Linguae likes John and, furthermore, that Benjamin is a member of Parlare (not of Linguae).]

$^{\not c}$ Every member of Linguae likes John, but Benjamin hates him.

How does (22) account for this contrast? The first thing to note is that (27)'s global context, unlike (28)'s global context, entails that Benjamin is a member of Linguae; this difference alters the connection facts and, ultimately, the contradictoriness facts. Let's see this:

<u>Sentence</u>: 'Every member of Linguae likes John, but Benjamin hates him.'

$\boxed{\text{C}_{(27)}\text{, the context in which (27) is uttered, entails that Benjamin is a member of Linguae.}}$

('likes John', 'hates (John)') is (1,1)-connected in (27) w.r.t. $C_{(27)}$:

for any f and for any world $w \in C_{(27)}$, if $[\![\text{Every member of Linguae } P \text{ but Benjamin } Q]\!]^{w,f} = 1$, then $[\![P]\!]^{w,f}(\text{Benjamin}'_w) = 1$ and $[\![Q]\!]^{w,f}(\text{Benjamin}'_w) = 1$.

Contradictoriness is expected: ('likes John', 'hates (John)') is (1,1)-incompatible in $C_{(27)}$.

$\boxed{\text{C}_{(28)}\text{, the context in which (28) is uttered, entails that Benjamin is not a member of Linguae.}}$

('likes John', 'hates (John)') is not connected in (28) w.r.t. $C_{(28)}$.

Proof:

Let f_1 be the assignment that maps both P and Q to $[\lambda w \lambda x\ .\ x \in \mathcal{D}_e]$, f_2 the assignment that maps P to $[\lambda w \lambda x\ .\ x \neq \text{Benjamin}'_w]$ and Q to $[\lambda w \lambda x\ .\ x = \text{Benjamin}'_w]$, and w_1 an element of $C_{(28)}$.

The following statement is (obviously) true:

$[\![\text{Every member of Linguae } P \text{ but Benjamin } Q]\!]^{w_1,f_1} = 1$ and, for every $x \in \mathcal{D}_e$, $[\![P]\!]^{w_1,f_1}(x) = [\![Q]\!]^{w_1,f_1}(x) = 1$.

Since the above statement is true, none of the following statements can be true:

- $\forall f \forall w \in C_{(28)}([\![\text{Every member of Linguae } P \text{ but Benjamin } Q]\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e \text{ s.t. } [\![P]\!]^{w,f}(x) = 1 \wedge [\![Q]\!]^{w,f}(x) = 0)$
- $\forall f \forall w \in C_{(28)}(\ [\![\text{Every member of Linguae } P \text{ but Benjamin } Q]\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e \text{ s.t. } [\![P]\!]^{w,f}(x) = 0 \wedge [\![Q]\!]^{w,f}(x) = 1)$
- $\forall f \forall w \in C_{(28)}([\![\text{Every member of Linguae } P \text{ but Benjamin } Q]\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e \text{ s.t. } [\![P]\!]^{w,f}(x) = 0 \wedge [\![Q]\!]^{w,f}(x) = 0)$

Hence, ('likes John', 'hates (John)') isn't (1,0)-connected, (0,1)-connected, or (0,0)-connected in (28) w.r.t. $C_{(28)}$.

The following statement is also true:

⟦Every member of Linguae P but Benjamin Q⟧$^{w_1 f_2}$ = 1, and there's no $x \in \mathcal{D}_e$ s.t. ⟦P⟧$^{w_1 f_2}(x) = 1$ and ⟦Q⟧$^{w_1 f_2}(x) = 1$.

('likes John', 'hates (John)'), therefore, isn't (1,1)-connected in (28) w.r.t. $C_{(28)}$ either.

Hence, ('likes John', 'hates (John)') isn't connected in (28) w.r.t. $C_{(28)}$.
□

Let's now move to (7), the second contrast recorded in Table 1, repeated in (29) below.

(29) [CONTEXT: it is common ground that the city of Tajiff is in Cuba.]

a. ^{c} Benjamin is in Tajiff, and he isn't in Cuba.
b. $^{¢}$ Benjamin is in Tajiff, and Tajiff isn't in Cuba.

Though (29)a and (29)b are truth-conditionally equivalent, they are not equivalent when it comes to connection facts: indeed, ('is in Tajiff', 'isn't is Cuba') is (1,1)-connected in (29)a w.r.t C but not in (29)b w.r.t C. To see this, let's generate the relevant (impoverished) LFs.

(30) [CONTEXT: it is common ground that the city of Tajiff is in Cuba.]

a. Benjamin P and he Q. | 'is in Tajiff' has been replaced by P and 'isn't in Cuba' by Q.
b. Benjamin P and Tajiff Q. | 'is in Tajiff' has been replaced by P and 'isn't in Cuba' by Q.

Provided that 'Benjamin' and 'he' are co-referential, ('is in Tajiff', 'isn't is Cuba') is bound to be (1,1)-connected in (29)a w.r.t C: for any f and for any world $w \in$ C, if ⟦Benjamin P and he Q⟧^{w,f} = 1, then there is an $x \in \mathcal{D}_e$ (namely, the entity that 'Benjamin' denotes in w) such that ⟦P⟧$^{w,f}(x) = 1$ and ⟦Q⟧$^{w,f}(x) = 1$. ('is in Tajiff', 'isn't is Cuba'), by contrast, isn't connected in (29)b w.r.t C: it's not the case that, for any f and for any world $w \in$ C, if ⟦Benjamin P and Tajiff Q⟧^{w,f} = 1, then there is an $x \in \mathcal{D}_e$ such that ⟦P⟧$^{w,f}(x) = v_1$ and ⟦Q⟧$^{w,f}(x) = v_2$. The generalisation in (22) thus accounts for the contrast between (29)a and (29)b: ('is in Tajiff', 'isn't in Cuba') is (1,1)-connected in (29)a w.r.t. C and, furthermore, (1,1)-incompatible in C—contradictoriness is thus expected under (22); ('is in Tajiff', 'isn't in Cuba'), by contrast, isn't connected in (29)b w.r.t. C—and, according to (22), connection is a pre-requisite for contradictoriness to arise.

Finally, let's consider (8), the last contrast reported in Table 1, which is repeated in (31).

(31) a. $^{¢}$ Bachelors have wives.
b. ^{c} Bachelors have wives and aren't married.

The observation is that (31)b exhibits contradictoriness while (31)a doesn't (it just feels false). Provided that 'bachelors' is treated as a referential expression—a kind-denoting expression, as in Carlson (1977)[12]—(22) can be invoked to make sense of this contrast. Indeed, on such an analysis, there are just two constituents of predicative type in (31)a—namely, 'have wives' and 'wives'; because the latter predicate is a constituent of the former, ('have wives', 'wives') isn't a connected pair and, as a result, (31)a is not expected to exhibit contradictoriness. In (31)b, on the other hand, there are several constituents of predicative type—namely, 'have wives', 'wives', 'aren't married', and 'married'; contradictoriness is expected because ('have wives', 'aren't married') is (1,1)-connected in (31)b w.r.t. C—for any f and for any world $w \in \mathrm{C}$, if $[\![\text{Bachelors } P \text{ and } Q]\!]^{w,f} = 1$, then there is an $x \in \mathcal{D}_e$ (namely, the kind individual that 'Bachelors' denotes in w) such that $[\![P]\!]^{w,f}(x) = 1$ and $[\![Q]\!]^{w,f}(x) = 1$)—and, furthermore (1,1)-incompatible in C.[13]

For the same reason that it predicts contradictoriness in (31)b, (22) also predicts contradictoriness in (32)b.[14]

(32) a. $^{¢}$ Bachelors have wives.
b. ^{c} The bachelors in this room have wives.

Indeed, (bachelors in this room', 'have wives') is (1,1)-connected in (32)b w.r.t. C and, furthermore, (1,1)-incompatible in C.[15]

Another good feature of (22) is that it has no issues dealing with the sentences in (10) and (11)—collected in (33).

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[12] Remember that, on Carlson's (1977) influential account, individuals consist of two basic sorts: 'object' individuals and 'kind' individuals.

[13] This (good) prediction relies of course on a theoretical assumption—namely, that 'bachelors' in (31)a and (31)b denotes, or can denote, a kind. For (relatively) recent discussions on this issue, see Liebesman (2011) and Leslie (2015).

[14] If the contrast between (32)a and (32)b isn't immediately obvious to the reader, turning these declarative sentences into questions can help: indeed, compare 'Do bachelors have wives?' (trivial as a question, but not incoherent) with 'Do the bachelors in this room wives? (incoherent). It can also help to reflect on the following result:

(vi) A: Bachelors have wives.
B: No, they don't.

(vii) A: The bachelors in this room have wives.
B: ? No, they don't.

(vi)-B is a perfectly natural answer to (vi)-A; by contrast, (vii)-B, as an answer to (vii)-A, is somewhat off. The intuition is this: there's something wrong with (vii)-A that is left unchallenged if one replies as B does. In other words, (vii)-A is false, yes, but it has an *additional* problem—I take this problem to be contradictoriness.

[15] For any f and for any w, if $[\![\text{the } P\ Q]\!]^{w,f} = 1$, then there must be an x such that $[\![P]\!]^{w,f}(x) = 1$ and $[\![Q]\!]^{w,f}(x) = 1$. Hence, ('bachelors in this room', 'has a wife') is (1,1)-connected in (32)b w.r.t. C.

(33) QUESTIONS

a. ^{c} Is it true that Paul is both *single* and *married*?
b. ^{c} Is it true that John *lives in Toulouse* but *doesn't live in France*?

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c. ^{c} Either John *lives in Montmartre* but *doesn't live in Paris*, or it's false that he *lives in Montmartre* but *doesn't live in Paris*.
d. ^{c} It's not true that John *lives in Montmartre* but *doesn't live in Paris*.

UNKNOWN TRUTH VALUE

e. ^{c} Either John is an artist, or he isn't an artist and he is both *single* and *married*.

None of the sentences in (33) are false—(33)a-b are not even truth-bearers!—; nonetheless, all these sentences are expected to exhibit contradictoriness under (22). Indeed, these sentences have two predicates (highlighted in italics) whose corresponding pairs are (1,1)-connected in the underlined clause w.r.t. C and, in addition, (1,1)-incompatible in C.

The promise has been fulfilled.

3.1.3 Gradience in contradictoriness judgments

Consider the pair of sentences in (34).

(34) a. ^{c} John lives in Paris but doesn't live in France.
b. $^{c+}$ John was killed but didn't die.

These sentences differ from each other in an important respect: (34)a is not a necessary falsehood (there are possible worlds in which it is true), whereas (34)b is a necessary falsehood. This difference, though real, is orthogonal to (22): both sentences are predicted to exhibit contradictoriness (the pairs that can be generated on the basis of the underlined predicates are both (1,1)-connected in the respective matrix clauses w.r.t. C and (1,1)-incompatible in C.)

This is *prima facie* a good result: (34)a and (34)b do as a matter of fact exhibit contradictoriness. It could be argued, however, that (22), precisely because it isn't sensitive to whether the target sentence is (or isn't) a necessary falsehood, cannot make sense of the following observation (which I take to be uncontroversial): (34)b's contradictoriness is more pungent than that of (34)a (I've signalled this by adding a '$^{+}$' next to the '^{c}' in (34)b).

Though it is true that this contrast cannot be derived from (22), it can nonetheless be made sense of within the proposed framework. (‘lives in Paris’, ‘doesn’t live in France’) is (1,1)-incompatible in C but not in Logical Space; as a result, it is possible to ‘fix’ (34)a by revising C—namely, by mentally recruiting a context set C in which (‘living in Paris’, ‘not living in France’) isn’t (1,1)-incompatible (e.g. a context set according to which Paris is an independent republic and no longer belongs to France). Such a strategy isn’t available in (34)b: (‘was killed’, ‘didn’t die’) is not just (1,1)-incompatible in C but also in Logical Space; as result, it is not possible to ‘fix’ (34)b via context set revision: (‘was killed’, ‘didn’t die’) is (1,1)-incompatible in any set of worlds.

There’s also a contrast in (35): (35)b’s contradictoriness is more pungent than (35)a, something that doesn’t follow from (22)—indeed, the generalisation in (22) predicts contradictoriness in both sentences (and that’s all it predicts).

(35) a. ^{c} John was killed but didn’t die.
b. $^{c+}$ John lives in Paris but doesn’t live in Paris.

This contrast, just like the contrast noted in (34), doesn’t threat the generalisation in (22). Note that there is an important difference between (35)a and (35)b: even if one didn’t know what ‘live(s) in Paris’ means, one could still infer—just by looking ‘at the symbols’—that (‘live in Paris’, ‘ doesn’t live in Paris’) is (1,1)-incompatible in C and, as a result, that (35)b is a contradictoriness-exhibiting sentence; by contrast, in order to determine whether (‘was killed’, didn’t die) is (1,1)-incompatible in C, one needs to access the *meaning* of the relevant predicates. This difference alone, I believe, can be invoked to account for the reported contrast.

4 Two refinements

4.1 Adding in local contexts

A (generally) nice consequence of (22) is that it predicts ‘automatic projection’: a sentence (not matter what kind of sentence) exhibits contradictoriness in C iff it has a clause μ (a constituent of type *t*) such that, for two predicates α and β and for two truth-values v_1 and v_2, (α, β) is (v_1,v_2)-connected in μ w.r.t. C and (v_1,v_2)-incompatible in C. Because of this, (22) predicts all the sentences in (33) to exhibit contradictoriness. Sometimes, however, contradictoriness is not automatically inherited by the sentence. Consider, for example, (36).

(36) [CONTEXT: it is common ground between Alex and Sally that Paris is in France, and also that Jo, their 5-year-old son, believes that Paris is in Italy.]

a. [Alex tells Sally:] ^{c} Benjamin lives in Paris but doesn't live in France.
b. [Alex tells Sally:] $^{¢}$ Jo believes that <u>Benjamin lives in Paris but doesn't live in France.</u>

(22) makes a bad prediction here: it predicts (36)b to exhibit contradictoriness (and, as far as I can tell, it doesn't). This problem arises because, in (22), the notion of context that is in operation is global (i.e. C is the global context) while (36)b, at least intuitively, calls for a local notion of context: intuitively, what matters is not whether the proposition $\{w : \text{Paris is in France in } w\}$ is in the common ground, but rather whether Jo believes that proposition to be true.

Here I will not discuss local contexts in any great detail: suffice it to say that the local context of an expression *E* is typically identified with the information contributed by the preceding syntactic environment of *E* and the common ground. Local contexts are primarily invoked in theories of presupposition projection; consider, for example, the contrast in assertability between (37)a and (37)b:

(37) [CONTEXT: it is common ground between Alex and Sally that there is no king of France and also that Jo, their 5-year-old son, believes that France has a king.]

a. [Alex tells Sally:] # The king of France is rich.
b. [Alex tells Sally:] Jo believes that the king of France is rich.

The (arguably) most influential account of this contrast, which originates in Stalnaker (1974, 1978) and Karttunen (1974), goes as follows: (37)a is not assertable because the presupposition of the clause 'the king of France is rich' (i.e. there is a unique king of France) contradicts—and hence isn't satisfied—in its local context (the local context of 'The king of France is rich' is C, the global context, as there is no linguistic material that precedes the clause); (37)b, by contrast, is assertable because the presupposition of the clause 'the king of France is rich' is satisfied in its local context (in (37)b, the local context of 'the king of France is rich' isn't C but the set of worlds compatible with those beliefs that are attributed to Jo in C).[16]

Let's now return to (36)b; as discussed, according to (22), (36)b should exhibit contradictoriness: this is because ('lives in Paris', 'doesn't live in France') is both (1,1)-connected in the embedded (underlined)

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[16] This result (namely, that the local context of *p* in a sentence of the form 'X believes that *p*' is the set of worlds compatible with those beliefs that are attributed to X in C) follows from both dynamic (e.g. Karttunen 1974, Heim 1992) and non-dynamic theories of presupposition projection (e.g. Schlenker 2009).

clause w.r.t. C and (1,1)-incompatible in C.[17] Now, if what mattered was whether ('lives in Paris', 'doesn't live in France') is (1,1)-incompatible in the *local context* of the clause in which they are connected, the contrast between (36)a and (36)b would be accounted for: ('lives in Paris', 'doesn't live in France') is (1,1)-incompatible in the local context of 'Benjamin lives in Paris but doesn't live in France' in (36)a (namely, the global context, which entails that Paris is in France) but not in the local context of 'Benjamin lives in Paris but doesn't live in France' in (36)b (namely, the set of worlds compatible with those beliefs that are attributed to Jo in C), which does not entail that Paris is in France.

Thus, to deal with cases such as (36)b, it seems reasonable to modify (22) as follows:

(38) **Contradictoriness** (*v*.2, still to be revised)

Let S be a sentence, μ a clause of S, C the global context (the context in which S is uttered), and C_μ the local context of μ.

(i) S is perceived as contradictory in C iff, for some one-place predicates α and β and some v_1 and v_2 $\in \{0,1\}$, (α, β) is (v_1,v_2)-connected in μ w.r.t. C and, furthermore, (v_1,v_2)-incompatible **in $\mathbf{C_\mu}$**.

(ii) (α, β) is (v_1,v_2)-incompatible **in $\mathbf{C_\mu}$** iff, for every $w \in \mathbf{C_\mu}$, $\{x \in \mathcal{D}_e : [\![\alpha]\!]^w(x) = v_1\} \cap \{x \in \mathcal{D}_e : [\![\beta]\!]^w(x) = v_2\} = \varnothing$.

As the reader may have noticed, there is something odd about (38): on the one hand, connection facts, as established in (18), are calculated taking C into account; on the other hand, incompatibility facts are calculated taking Cμ into account. This leads to trouble; consider, for example, (39)b.

(39) [CONTEXT: it is common ground between Alex and Sally that Ringo Starr was a member of The Beatles, and also that Jo (mistakenly) thinks that Ringo Starr wasn't a member of The Beatles but the singer of Black Sabbath.]

a. [Alex tells Sally:] ^{c} Every member of The Beatles was British, but Ringo Starr wasn't (British).
b. [Alex tells Sally:] $^{¢}$ Jo believes that <u>every member of The Beatles was British but Ringo Starr wasn't (British).</u>

According to (18), the definition of predicate connection, ('was British', 'wasn't British') is (1,1)-connected in (39)b's underlined clause w.r.t. C: for every $w \in$ C and every f, if $[\![$every member of The Beatles P but Ringo Starr $Q]\!]^{w,f} = 1$, then there is an $x \in \mathcal{D}_e$ (namely, the entity that 'Ringo Starr' denotes in w) such that $[\![P]\!]^{w,f}(x) = 1$ and $[\![Q]\!]^{w,f}(x) = 1$. Since ('was British' and 'wasn't British') is (1,1)-incompatible in the local context of (39)b's underlined clause, the generalisation in (38) ends up (wrongly) predicting (39)b to exhibit

[17] Note that the embedded clause is the offending clause here: as it can be easily checked, ('lives in Paris', 'doesn't live in France') isn't connected in (36)b w.r.t. C.

contradictoriness. This problem is corrected in (40): according to this (revised) definition, the set of worlds that matters when calculating connection facts isn't the global context but the local context of the relevant clause.

(40) **Predicate Connection** (*v*.3, still to be revised)

Let α and β be two one-place predicates, μ a clause, Cμ the local context μ, and $\mathcal{D}_e$ the set of all entities. *P* and *Q* are two one-place predicate variables, and *f* a variable over assignment functions from $\{P, Q\}$ to $\mathcal{D}_{\langle s,\langle e,t\rangle\rangle}$. For any $v_1, v_2 \in \{0,1\}$,

(α, β) is (v_1,v_2)-connected in μ w.r.t. Cμ iff...

(i) α and β are both constituents of μ,
(ii) α is not a constituent of β, nor is β a constituent of α, and
(iii) μ′—a clause just like μ except that α has been replaced by *P* and β by *Q*—satisfies (a) and (b):

(a) $\exists f \exists w \in C\mu([\![\mu']\!]^{w,f} = 1)$
(b) $\forall f \forall w \in C\mu([\![\mu']\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e \text{ s.t. } [\![P]\!]^{w,f}(x) = v_1 \wedge [\![Q]\!]^{w,f}(x) = v_2)$.

With (40) defined, all that is left to do is to replace '(v_1,v_2)-connected in μ w.r.t. C' in (22) with '(v_1,v_2)-connected in μ w.r.t. Cμ', as in (41).

(41) **Contradictoriness** (*v*.3, still to be revised)

Let S be a sentence, μ a clause of S, C the global context (the context in which S is uttered), and Cμ the local context of μ.

(i) S is perceived as contradictory in C iff, for some one-place predicates α and β and some v_1 and v_2 $\in \{0,1\}$, (α, β) is **(v_1,v_2)-connected in μ w.r.t. Cμ** and, furthermore, (v_1,v_2)-incompatible in Cμ.
(ii) (α, β) is (v_1,v_2)-incompatible in Cμ iff, for every $w \in C\mu$, $\{x \in \mathcal{D}_e : [\![\alpha]\!]^w(x) = v_1\} \cap \{x \in \mathcal{D}_e : [\![\beta]\!]^w(x) = v_2\} = \varnothing$.

Under (40), ('was British', 'wasn't British') is no longer (1,1)-connected in (39)b's underlined clause w.r.t. to $C_{\text{(39)b's underlined clause}}$ (Ringo Starr does not longer '(1,1)-connects' these predicates):

μ: 'Every member of The Beatles was British, but Ringo Starr wasn't British.'
Cμ ⊨ Ringo Starr wasn't a member of The Beatles.
For any *f* and for any world $w \in C\mu$, if $[\![\text{Every member of The Beatles } P \text{ and Ringo Starr } Q]\!]^{w,f} = 1$, then it's not the case that $[\![P]\!]^{w,f}(\text{Ringo-Starr}'_w) = 1$ and $[\![Q]\!]^{w,f}(\text{Ringo-Starr}'_w) = 1$.

Though ('was British', 'wasn't British') is (1,1)-incompatible in $C_{\text{(39)b's underlined clause}}$ (it is (1,1)-incompatible in any set of worlds), it is not expected to induce contradictoriness; according to (41), in order for a pair of predicates to induce contradictoriness, it's not enough for it to be (1,1)-incompatible in Cμ: it also has to be (1,1)-connected in μ w.r.t. Cμ.

To conclude, it might be worth illustrating how (40)/(41) account for the following contrast:

(42) [CONTEXT: it is common ground between Alex and Sally that Ringo Starr was a member of The Beatles, and also that Jo (mistakenly) thinks that Ringo Starr wasn't a member of The Beatles but the singer of Black Sabbath]

a. ¢ Jo believes that <u>every member of The Beatles was British but Ringo Starr wasn't (British).</u>
b. c Jo knows that <u>every member of The Beatles was British but Ringo Starr wasn't (British).</u>

According to (40), ('was British', 'wasn't British') is neither (1,1)-connected in (42)a w.r.t. $C_{(42)a}$, nor is it (1,1)-connected in (42)a's underlined clause w.r.t. $C_{(42)a\text{'s underlined clause}}$. Thus, this pair is not expected to induce contradictoriness in (42)a. ('was British', 'wasn't British'), however, is (1,1)-connected in (42)b w.r.t. $C_{(42)b}$: this is because a sentence of the form 'X knows *p*', under standard assumptions, is defined only if '*p*' is true in every world that is compatible with the common ground. Thus, for any *f* and for any world *w* in $C_{(42)b}$ (the local, and global, context of (42)b), if $⟦$Jo knows that every member of The Beatles *P* but Ringo Starr *Q*$⟧^{wf} = 1$, then $⟦$every member of The Beatles *P* but Ringo Starr *Q*$⟧^{wf} = 1$; and, if $⟦$every member of The Beatles *P* and Ringo Starr *Q*$⟧^{wf} = 1$, then $⟦P⟧^{wf}(\text{Ringo-Starr}'_w) = 1$ and $⟦Q⟧^{wf}(\text{Ringo-Starr}'_w) = 1$. (41) then makes the correct prediction: it predicts (42)b to exhibit contradictoriness, i.e. ('was British', 'wasn't British') is (1,1)-connected in (42)b w.r.t. $C_{(42)b}$ and (1,1)-incompatible in $C_{(42)b}$.

4.2 *n*-way contradictoriness

Consider (43), for example.

(43) c John <u>married Jane</u>, then he <u>married Paula</u>, but he <u>married just once</u>.

This example exhibits contradictoriness; however, according to (41), it shouldn't. To see this, let's first identify the clauses of (43) that have at least two one-place predicates as constituents—on the assumption that 'he married Paula, but he married just once' acts as a constituent, there are two clauses that meet this criterion—namely, the matrix clause (which I refer to as 'μ_1') and μ_2 (which I refer to as 'μ_2'):

(44) $_{\mu1}$[John <u>married Jane</u>, then $_{\mu2}$[he <u>married Paula</u>, but he <u>married just once</u>.]]

Let's start with μ_1: any pair of predicates that can be constructed using the underlined constituents is bound to be (1,1)-connected in μ_1 w.r.t. C_{μ_1} (namely, the global context). However, none of these pairs is (1,1)-incompatible in C_{μ_1}—for example, ('married Jane', 'married just once') isn't (1,1)-incompatible in C_{μ_1} nor is ('married Jane', 'married Paula'). Let's now consider μ_2: here again, any pair of predicates that can be constructed using the underlined constituents—either ('married Paula', 'married just once') or ('married just once', 'married Paula') in this case—is bound to be (1,1)-connected in μ_2 w.r.t. to C_{μ_2}; however, neither of these pairs is (1,1)-incompatible in C_{μ_2}—the fact that John has married Jane doesn't preclude the possibility of another person having married Paula (and only Paula).

(43) appears to be a case in which *three* predicates conspire to induce contradictoriness.[18] To deal with casas such as this, our definitions need to be generalised as below, i.e. to any number of predicates greater than 1.

(45) **Predicate Connection** (*v*.4, final)

Let n be a positive integer greater than 1, $\alpha_1,\ldots,\alpha_n$ one-place predicates, μ a clause, C_μ the local context of μ, and $\mathcal{D}_e$ the set of all individuals. $P_1,\ldots,P_n$ are one-place predicate variables and f a variable over assignment functions from $\{P_1,\ldots,P_n\}$ to $\mathcal{D}_{\langle s,\langle e,t\rangle\rangle}$. For every $v_1,\ldots,v_n \in \{0,1\}$,

$(\alpha_1,\ldots,\alpha_n)$ is $(v_1,\ldots,v_n)$-connected in μ w.r.t $C\mu$ iff…

(i) $\alpha_1,\ldots,\alpha_n$ are all constituents of μ,
(ii) none of them is a constituent of the other, and
(iii) μ'—a clause just like μ except that, for every $i \in \{1,\ldots,n\}$, α_i has been substituted by P_i—satisfies (a) and (b):[19]

(a) $\exists f \exists w \in C\mu([\![\mu']\!]^{w,f} = 1)$
(b) $\forall f \forall w \in C\mu\big([\![\mu']\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e \text{ s.t. } \bigwedge_{i=1}^{n} ([\![P_i]\!]^{w,f}(x) = v_i)\big)$

Notation: I'll say that $(\alpha_1,\ldots,\alpha_n)$ is *connected* in μ w.r.t. $C\mu$ (without further qualification) if, for some $v_1,\ldots,v_n \in \{0,1\}$, it is $(v_1,\ldots,v_n)$-connected in μ w.r.t. $C\mu$.

(46) **Contradictoriness** (*v*.4, final)

Let S be a sentence, μ a clause of S, C the global context (the context in which S is uttered), C_μ the local context of μ, and n a positive integer greater than 1.

(i) S is perceived as contradictory in C iff, for some one-place predicates $\alpha_1,\ldots,\alpha_n$ and some $v_1,\ldots,v_n \in \{0,1\}$, $(\alpha_1,\ldots,\alpha_n)$ is $(v_1,\ldots,v_n)$-connected in μ w.r.t. C_μ and, furthermore, $(v_1,\ldots,v_n)$-incompatible in C_μ.
(ii) $(\alpha_1,\ldots,\alpha_n)$ is $(v_1,\ldots,v_n)$-incompatible in C_μ iff, for every $w \in C_\mu$, $\bigcap_{i\in\{1,\ldots,n\}}\{x \in \mathcal{D}_e : [\![\alpha_i]\!]^w(x) = v_i\} = \varnothing$.

[18] Thanks to Daniel Rothschild for drawing my attention to such cases.

[19] I'm assuming the following intepretation rule: if γ is an element of $\{P_i,\ldots,P_n\}$, then, for any w, $[\![\gamma]\!]^{w,f} = f(\gamma)(w)$; if γ is not an element of $\{P_i,\ldots,P_n\}$, then, for any w, $[\![\gamma]\!]^{w,f} = [\![\gamma]\!]^{w}$. To avoid clutter, as in the previous definitions, I am omitting g, the assignment function that deals with the 'real' (as opposed to the artificially introduced) variables. (As in the previous definitions, the omission is harmless.)

The definitions look more complex now but nothing of substance has changed: the difference is that our definitions can now deal with cases such as (43). Indeed, (45)+(46) predicts (43) to exhibit contradictoriness: for example, the triplet (‘married Jane’, ‘married Paula’, ‘married just once’) is (1,1,1)-connected in (43) w.r.t. $C_{(43)}$ and, furthermore, (1,1,1)-incompatible in $C_{(43)}$.

In the next section, I discuss some difficulties the ‘connection account’ faces; for the ease of exposition, I’ll refer to (45) and (46) by their names (as Predicate Connection and Contradictoriness, respectively).

5 Problems (and possible solutions)

5.1 The constituency requirement

According to Contradictoriness, if a sequence of predicates induces contradictoriness, then this sequence must be connected; and, according to Predicate Connection, only predicates that are constituents can be elements of a connected sequence. Hence, from Contradictoriness + Predicate Connection it follows that, if a given sequence of predicates induces contradictoriness, then the predicates that form the sequence must be constituents. But is this always the case? Consider (47), for example.

(47) a. ᶜ John <u>killed George</u>, but John <u>didn’t kill George</u>.
b. ᶜ John <u>killed George</u>, but George <u>didn’t die</u>.

(47)a is incoherent; this is expected under Contradictoriness: (‘killed George’, ‘didn’t kill George’) is (1,1)-connected in (47)a w.r.t. $C_{(47)a}$ and (1,1)-incompatible in $C_{(47)a}$. (47)b is also incoherent; this, however, is unexpected: (‘killed George’, ‘didn’t die’) isn’t connected in (47)b w.r.t. $C_{(47)b}$. For Contradictoriness to make the correct prediction here, the pair (‘John killed’, ‘didn’t die’) would need to come out (1,1)-connected in (47)b w.r.t. $C_{(47)b}$—(‘John killed’, ‘didn’t die’) is (1,1)-incompatible in $C_{(47)b}$; but, for that to be the case, ‘John killed’ would need to be treated as a constituent.

What does (47) teach us? Here’s a possible response: it tells us that Predicate Connection needs to be paired with a grammar that implements a notion of constituency that is more flexible than the generative one—in particular, a grammar in which ‘John killed’ can act as a constituent. Grammars of this sort do exist: in a categorial grammar, for example, both parses ‘[[John killed] [George]]’ and ‘[[John] [killed George]]’ are in principle possible.[20] Thus, one idea would be to adjust Predicate Connection so that μ stands for a set—

[20] The combinatory rules of a categorial grammar enable a transitive verb to combine with the subject first, an operation that yields a compound constituent that can then combine with the object. For an overview of categorical grammar, see Steedman (1993) and Steedman and Baldridge (2011). Categorial grammars were first proposed in Ajdukiewicz (1935) and Bar-Hillel (1953).

namely, the set of (truth-conditionally equivalent) parses that a clausal string can have in a categorial grammar. In (47)b, such a set would be {'[[[John killed] [George]] but [[George] [didn't die]]]', '[[[John] [killed George]] but [[George] [didn't die]]]'}. Predicate Connection could then be reformulated as follows: '(α_1,…, α_n) is (v_1,…, v_n)-connected in μ w.r.t. Cμ iff there is a clause ψ ∈ μ such that (...)'. On this syntactically more liberal formulation, ('John killed', 'didn't die') would come out (1,1)-connected in (47)a w.r.t. $C_{(47)b}$; contradictoriness would then be expected.

A different response should be considered though; indeed, (47) can also be interpreted as follows: the assumption on which Predicate Connection is built on—namely, that only sequences of predicates whose elements are constituents of μ can be connected in μ—is incorrect. Of course, the contradictoriness-inducing predicates need to be, in some sense, part of the contradictoriness-exhibiting sentence, but the relevant notion of parthood could be in principle silent as to whether these predicates are constituents (either in the generative-grammar sense or categorial-grammar sense). It is left for further research to determine whether the notion of connection can be defined without requiring the elements of connected sequences to be constituents.

To sum up, I don't think that contrasts such as (47) pose an existential threat to the proposed generalisation. However, it does suggest that its present formulation is not entirely adequate—in particular, it seems clear that there are one-place predicate meanings that, despite not being meanings of linguistic constituents (at least not in the generative-grammar sense), should be nonetheless considered when checking for contradictoriness.

5.2 Contextual contradictions

The condition in (45)iii-a prevents (45)iii-b from being satisfied by virtue of being vacuously true—if (45)iii were to be dropped, (45)iii-b would be vacuously true in cases in which the clause under consideration is a contextual contradiction. Let me illustrate this point with (48):

(48) ¢ Paris is in Norway, and Mary is either pregnant or she isn't (pregnant).

(48), quite clearly, is not a contradictoriness-exhibiting sentence: now, if the condition in (45)iii-a were to be dropped, (48) would be predicted to be one. Take, for example, the matrix clause of (48) and the predicates 'pregnant' and 'isn't pregnant'; ('pregnant', 'isn't pregnant'), if the condition in (45)iii-a were to be dropped, would come out (1,1)-connected in (48) w.r.t. $C_{(48)}$: to see this, it's enough to notice that there's no world in $C_{(48)}$

in which the antecedent of the material conditional in (49) below is true ('Paris is in Norway, and *blah*' is a contextual contradiction); as a result, the statement in (49) is vacuously true.

(49) $\forall f \forall w \in C_{(48)}\big([\![\underline{\text{Paris is in Norway}}, \text{and Mary is either } P_1 \text{ or she } P_2]\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e \text{ s.t. } [\![P_1]\!]^{w,f}(x) = [\![P_2]\!]^{w,f}(x) = 1\big)$.

Thus, if (45)iii-a hadn't been included, (48) would have wrongly been predicted to exhibit contradictoriness: ('pregnant', 'isn't pregnant') are (1,1)-incompatible in $C_{(48)}$. (45)iii-a, therefore, acts as a safeguard against cases such as this.

Now, (45)iii-a has an undesirable consequence: it doesn't allow (50) to be characterised as a contradictoriness-exhibiting sentence.

(50) ^{c} Paris is in Norway, and Mary is pregnant and she isn't (pregnant).

Indeed, 'Paris is in Norway, and Mary is P_1 and she P_2' cannot satisfy the condition in (45)iii-a (as mentioned, 'Paris is in Norway, and *blah*' is a contextual contradiction). If one takes the second conjunct (as opposed to the matrix clause), the problem persists: the local context of 'Mary is pregnant and she isn't (pregnant)' is the empty set; thus, 'Mary is P_1 and she P_2' cannot satisfy the condition in (45)iii-a. The upshot of this is that ('is pregnant', isn't (pregnant)') is not predicted to be a connected pair (and if it isn't a connected pair, it cannot induce contradictoriness).

In the light of these observation, I'm inclined to draw the following conclusion: to handle cases such as (48) and (50), an additional ingredient is needed—the assumption that speakers and listeners can *pretend* that a given (impoverished) clause is compatible with its local context under some f, even if as a matter of fact it is not. Indeed, let's pretend for a moment that 'Paris is in Norway, and Mary is P_1 and she P_2' and 'Paris is in Norway, and Mary is either P_1 or P_2' satisfied (45)iii-a (viz. were compatible with C under some f): then, ('pregnant', 'isn't pregnant') would be (1,1)-connected in (50) w.r.t. $C_{(50)}$ but wouldn't be (1,1)-connected in (48) w.r.t. $C_{(48)}$. Likewise, let's pretend that 'Mary is P_1 and she P_2' and 'Mary is either P_1 or P_2' satisfied (45)iii-a (viz. were compatible with $C \cap \{w : [\![\text{Paris is in Norway}]\!]^{w}\}$ under some f): then, ('pregnant', 'isn't pregnant') would be (1,1)-connected in (50)'s second conjunct w.r.t. $C_{(50)\text{'s second conjunct}}$ but wouldn't be (1,1)-connected in (48)'s second conjunct w.r.t. $C_{(48)\text{'s second conjunct}}$. Hence, *modulo* this kind of pretence, (50), but not (48), would be expected to exhibit contradictoriness. (Of course, as soon as one has pretence, there's no need for (45)iii-a: all impoverished clauses would be taken to satisfy (45)iii-a.)

Is this the right approach to take? That's a difficult question; at this point, it's not even clear whether such an approach can be taken. Indeed, incorporating pretence into the calculation of connection fact is a significant formal challenge; and, until it is shown to be viable, one has no choice but to remain sceptical.

5.3 Negated possibility modals

As Benjamin Spector pointed out to me, Contradictoriness fails to make sense of the contrasts reported in (51) and (52).

(51) a. ^{c} It is not true that Benjamin lives in Toulouse but not in France.
b. $^{\not c}$ It can't be true that Benjamin lives in Toulouse but not in France.
c. $^{\not c}$ It's (just) not possible that Benjamin lives in Toulouse but not in France.

(52) a. ^{c} It is not true that Benjamin is married and doesn't have a wife.
b. $^{\not c}$ It can't be true that Benjamin is married and doesn't have a wife.
c. $^{\not c}$ It's (just) not possible that Benjamin is married and doesn't have a wife.

For some reason, contradictoriness vanishes in the scope of a negated possibility modal such that 'it can't be true that' or 'it is not possible that' but not in the scope of sentential negation (e.g. 'it is not true that'). Why this is so, I do not know. The account presented here, as far as I can tell, has no resources to make sense of such contrasts.

Matthew Mandelkern (p.c.) has suggested to me that (51)b-c/(52)b-c, but not (51)a/(52)a, might have metalinguistic readings. This could explain why a sentence like (52)b 'escapes' contradictoriness: it escapes contradictoriness because it can be read as 'The sentence «Benjamin is married and doesn't have a wife» can't be true' (that is, it can be read as a statement about a sentence). For this to amount to an account of the contrasts reported in (51) and (52), one would need an explanation for why (51)b-c/(52)b-c, but not (51)a/(52)a, have metalinguistic readings. In the absence of this explanation, (51) and (52) do constitute a challenge to the generalisation given.

5.4 Higher-order predicate connection

The sentence in (53), due to Benjamin Spector, clearly exhibits contradictoriness; this, however, isn't expected under Contradictoriness.

(53) ^{c} None or all of the students speak French, and exactly half of them speak French.

Indeed, for the proposed generalisation to predict contradictoriness in this case, the pair (‘speak French’, ‘speak French’) would need to be either (1,0)-connected or (0,1)-connected in (53) w.r.t. $C_{(53)}$ (i.e. the pair (‘speak French’, ‘speak French’) is both (1,0)-incompatible and (0,1)-incompatible in $C_{(53)}$). This, however, isn’t the case, as shown below.[21]

> μ: ‘None or all of the students speak French and exactly half of them speak French.’
> μ′: ‘None or all of the students P_1 and exactly half of them P_2.’
> $C\mu = C_{(53)}$
>
> If (‘speak French’, ‘speak French’) were to be (0,1)-connected in (53) w.r.t. $C_{(53)}$, then (i) would be the case; likewise, if (‘speak French’, ‘speak French’) were to be (1,0)-connected in (53) w.r.t. $C_{(53)}$, then (ii) would be the case:
>
> (i) $\forall f \forall w \in C_{(53)}([\![\mu']\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e([\![P_1]\!]^{w,f}(x) = 0 \wedge [\![P_2]\!]^{w,f}(x) = 1)$
> (ii) $\forall f \forall w \in C_{(53)}([\![\mu']\!]^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e([\![P_1]\!]^{w,f}(x) = 1 \wedge [\![P_2]\!]^{w,f}(x) = 0)$
>
> It is trivial to find counterexamples to both (i) and (ii), however. Let’s suppose that the extension of ‘students’ is constant throughout $C_{(53)}$-worlds, e.g. for every $w \in C_{(53)}$, $\{x : [\![\text{students}]\!]^{w}(x) = 1\} = \{\text{John, Paul, Mary, Jo}\}$. Furthermore, let’s suppose that w_1 and f_1 are such that $w_1 \in C_{(53)}$, $\{x : [\![P_1]\!]^{f_1,w_1}(x) = 1\} = \{\text{John, Paul, Mary, Jo}\}$, and $\{x : [\![P_2]\!]^{f_1,w_1}(x) = 1\} = \{\text{John, Paul}\}$. This is a counterexample to (i): $[\![\mu']\!]^{f_1,w_1} = 1$, yet there is no $x \in \mathcal{D}_e$ such that $[\![P_1]\!]^{f_1,w_1}(x) = 0$ and $[\![P_2]\!]^{f_1,w_1}(x) = 1$. Let’s now suppose that $w_2 \in C_{(53)}$, $\{x : [\![P_1]\!]^{f_1,w_2}(x) = 1\} = \varnothing$, and $\{x : [\![P_2]\!]^{f_1,w_2}(x) = 1\} = \{\text{John, Paul}\}$. This is a counterexample to (ii): $[\![\mu']\!]^{f_1,w_2} = 1$, yet there is no $x \in \mathcal{D}_e$ such that $[\![P_1]\!]^{f_1,w_2}(x) = 1$ and $[\![P_2]\!]^{f_1,w_2}(x) = 0$.

Though the proposed generalisation fails here, it’s possible, as Benjamin Spector pointed out to me, to formulate an extension that does account for cases such as (53). Indeed, though according to Predicate connection only first-order predicates can be connected, this definition can (easily) be tweaked to also generate connection facts between generalised quantifiers (viewed, for this purpose, as second-order predicates). Indeed, let Q_1 and Q_2 be variables of type $\langle s,\langle\langle e,t\rangle,t\rangle\rangle$ and j a variable over assignment functions from $\{Q_1, Q_2\}$ to $\mathcal{D}_{\langle s,\langle\langle e,t\rangle,t\rangle\rangle}$; then, for any j and for any $w \in C_{(53)}$, if $[\![Q_1 \text{ speak French and } Q_2 \text{ speak French}]\!]^{w,j} = 1$, then $[\![Q_1]\!]^{w,j}([\![\text{speak French}]\!]^{w,j}) = 1$ and $[\![Q_2]\!]^{w,j}([\![\text{speak French}]\!]^{w,j}) = 1$ (this just follows from the meaning of ‘and’). (53)’s perceived contradictoriness would then be expected: (‘none or all of the students’, ‘exactly half of (the students))’ would be both (1,1)-connected in (53) w.r.t. $C_{(53)}$ and (1,1)-incompatible in $C_{(53)}$, i.e. there is no world $w \in C$ and no one-place predicate denotation X such that $[\![\text{exactly half of (the students)}]\!]^{w}(X) = 1$ and $[\![\text{none or all of the students}]\!]^{w}(X) = 1$.

[21] As a matter of fact, (‘speak French’, ‘speak French’) isn’t connected in any way.

To conclude, Contradictoriness fails to account for examples such as (53); one possible solution, as discussed, is to extend it to allow generalised quantifiers to also induce contradictoriness. It is left for future research to determine whether such a solution is general enough.

5.5 Conditionals

The parallelism between (54) and (55) suggests that, when it comes to contradictoriness, indicative conditionals behave just like conjunctions.

(54) a. ^{c} If John <u>was killed</u>, then he <u>didn't die</u>.
b. ^{c} If John <u>didn't die</u>, then he <u>was killed</u>.

(55) a. ^{c} John <u>was killed,</u> and he <u>didn't die.</u>
b. ^{c} John <u>didn't die,</u> and he <u>was killed</u>.

As discussed, the generalisation proposed predicts (55)a-b to exhibit contradictoriness. This generalisation, however, fails to predict contradictoriness in (54)a-b, at least under standard assumptions concerning the meaning of conditional sentences. Indeed, under standard assumptions, the indicative conditional 'If John *blah*, then he *bleh*' can be true in a world w despite the individual denoted by 'John' in w not being in the extension of 'blah' in w; in other words, under standard assumptions, the conditional 'If John *blah*, then he *bleh*' doesn't entail that its antecedent is true. For this reason, the pairs ('was killed', 'didn't die') and ('didn't die', 'was killed') are bound not to be (1,1)-connected in (54)a-b w.r.t $C_{(54)\text{a-b}}$.

This failure of the proposed generalisation suggests, at least *prima facie*, that Predicate Connection is stronger than it needs to be. Indeed, there is a weaker formulation of this notion, given in (56) below, that can help with conditional sentences such as (54)a-b.

(56) **Weak Predicate Connection**

Let $\alpha_1,\ldots, \alpha_n$ be one-place predicates, μ a clause, $C\mu$ the local context of μ, and $\mathcal{D}_e$ the set of all individuals. $P_1,\ldots, P_n$ are one-place predicate variables and f a variable over assignment functions from $\{P_1,\ldots, P_n\}$ to $\mathcal{D}_{\langle s,\langle e,t\rangle\rangle}$. For any $v_1,\ldots, v_n \in \{0, 1\}$,

$(\alpha_1,\ldots, \alpha_n)$ is $(v_1,\ldots, v_n)$-**weakly**-connected in μ w.r.t. $C\mu$ iff…

(i) $\alpha_1,\ldots, \alpha_n$ are all constituents of μ,
(ii) none of them is a constituent of the other, and
(iii) μ'—a clause just like μ except that, for every $i \in\{1,\ldots, n\}$, α_i has been substituted by P_i — satisfies (a) and (b):

(a) $\exists f \exists w([\![\mu']\!]^{w,f} = 1)$
(b) $\forall f \forall w \in C\mu\big([\![\mu']\!]^{w,f} = 1 \rightarrow \exists w' \in C\mu\ \exists x \in \mathcal{D}_e \text{ s.t. } \bigwedge_{i=1}^{n} ([\![P_i]\!]^{w',f}(x) = v_i)\big)$

Not much has changed—only the existential quantifier '$\exists w' \in C\mu$' has been appended right before '$\exists x \in \mathcal{D}$': for a sequence of predicates $(\alpha_1,\ldots, \alpha_n)$ to be $(\alpha_1,\ldots, \alpha_n)$-weakly-connected in μ w.r.t. $C\mu$, all that is required is that, for every f and for every $w \in C\mu$, if $[\![\mu']\!]^{w,f} = 1$, then $\exists w' \in C\mu\ \exists x \in \mathcal{D}_e$ s.t. $\bigwedge_{i=1}^{n} ([\![P_i]\!]^{w',f}(x) = v_i)$.

Weak Predicate Connection can help with (54)a-b, at least under certain assumptions. In what follows, I'm going assume just three things: (i) an (unembedded) indicative conditional is a modal statement that expresses the beliefs of the speaker; (ii) the speaker's belief state in a C-world is a subset of C; (iii) a 'strict' semantics for indicative conditionals: $[\![\text{if } p, \text{ then } q]\!]^{w}$ is defined only if there is a world $w' \in D_w^s$ such that $[\![p]\!]^{w'} = 1$ (where D_w^s is the speaker's belief state in w); whenever defined, $[\![\text{if } p, \text{ then } q]\!]^{w} = 1$ iff in every world $w' \in D_w^s$, $[\![p]\!]^{w'} = 1 \rightarrow [\![q]\!]^{w'} = 1$.

With these assumptions on board, Weak Predicate Connection delivers the right results for (55)a-b. Indeed, for any f and for any $w \in C$, if $[\![\text{if John } P_1, \text{ then John } P_2]\!]^{w,f} = 1$, then it must be the case that there is a world $w' \in D_w^s$(a subset of C) such that $[\![\text{John } P_1]\!]^{w',f} = 1$ (this is the definedness condition); in addition, it must be the case that in every world $w' \in D_w^s$, $[\![\text{John } P_1]\!]^{w',f} = 1 \rightarrow [\![\text{John } P_2]\!]^{w',f} = 1$. From this is follows that, for any f and for any $w \in C$, if $[\![\text{if John } P_1, \text{ then John } P_2]\!]^{w,f} = 1$, then there is at least one world $w' \in C$ and at least one entity $x \in \mathcal{D}_e$ (namely, the individual denoted by 'John' in w') such that $[\![P_1]\!]^{w',f}(x) = 1$ and $[\![P_2]\!]^{w',f}(x) = 1$. This means that ('killed', 'didn't die') is (1,1)-weakly-connected in (55)a w.r.t. $C_{(55)a}$ as well as in (55)b w.r.t. $C_{(55)b}$. Thus, if the notion of connection is weakened as in (56), 'was killed' and 'didn't die' would be expected to induce contradictoriness in (55)a-b—provided, of course, that (46) is minimally revised as follows:

(57) **Contradictoriness**

Let S be a sentence, μ a clause of S, C the global context (the context in which S is uttered), $C\mu$ the local context of μ, and n a positive integer greater than 1.

(i) S is perceived as contradictory in C iff, for some one-place predicates $\alpha_1,\ldots, \alpha_n$ and some $v_1,\ldots, v_n \in \{0,1\}$, $(\alpha_1,\ldots, \alpha_n)$ is $(v_1,\ldots, v_n)$-**weakly**-connected in μ w.r.t. C_μ and, furthermore, $(v_1,\ldots,v_n)$-incompatible in C_μ.

(ii) $(\alpha_1,\ldots, \alpha_n)$ is $(v_1,\ldots, v_n)$- incompatible in C_μ iff, for every $w \in C_\mu$, $\bigcap_{i\in\{1,\ldots,n\}} \{x \in \mathcal{D}_e : [\![\alpha_i]\!]^{w}(x) = v_i\} = \varnothing$.

Weak Predicate Connection, I believe, is an attractive modification of Predicate Connection: if a pair of predicates is connected, it will also be weakly-connected (hence, none of the good predictions discussed would be threatened by this modification); furthermore, Weak Predicate Connection has the advantage of delivering, at least under some assumptions, the connection facts that one needs to predict contradictoriness in indicative conditionals. Caution is needed, however: although Weak Predicate Connection helps with (54)a-b, it does not help with (58), which also exhibit contradictoriness.

(58) ^{c} If John had been killed, then he wouldn't have died.

Indeed, a counterfactual conditional does not presuppose that, as far as the speaker knows, the antecedent may be true (rather, it presupposes that, as far as the speaker knows, the antecedent is false); as a result, in (58), connection between the relevant predicates cannot be established via Weak Predicate Connection. A challenge for future research would be to determine whether it is possible to weaken Weak Predicate Connection even further so that it can also handle counterfactuals.

5.6 Moore's paradox

The sentence below is a Moore's-paradox sentence ('MP sentence' henceforth):

(59) [CONTEXT: it's common ground that Toulouse is in France.]
John lives in Toulouse, but I believe that he doesn't live in France.

MP sentences are odd, that much is clear. Now, is the oddness that (59) exhibit *contradictoriness* (namely, the same kind of oddness that (60) exhibits)?

(60) [CONTEXT: it's common ground that Toulouse is in France.]
^{c} John lives in Toulouse but doesn't live in France.

According to Contradictoriness, both the (standard) version [in (46)] and the revised version [in (57)], the answer seems to be 'no'. To see this, take (59) in its original form (without performing any replacements): 'John <u>lives in Toulouse</u>, but I believe that he <u>doesn't live in France</u>' can be true in a C-world (e.g. a world in which John lives in Toulouse and the speaker of (59) (falsely) believes that John lives in Helsinki, for example): however, there is no $w \in$ C and no $x \in \mathcal{D}_e$ such that $[\![$lives in Toulouse$]\!]^{w}(x) = 1$ and $[\![$doesn't live in France$]\!]^{w}(x) = 1$ (because, given what is known, no one can live in Toulouse and not live in France). From this it follows that ('lives in Toulouse', 'doesn't live in France') isn't (1,1)-weakly-connected in (59) w.r.t. $C_{(59)}$; and if it isn't (1,1)-weakly-connected, then it isn't (1,1)-connected either.

This isn't an obviously bad result—MP sentences do behave differently from sentences such as (60)—in particular, as shown below, the oddness of MP sentences—but not the oddness of contradictoriness-exhibiting sentences—vanishes when embedded under 'suppose':

(61) [CONTEXT: it's common ground that Toulouse is in France.]
a. # John lives in Toulouse, and/but I believe that he doesn't live in France.
b. Suppose that John lived in Toulouse and/but I believed that he didn't live in France.

(62) [CONTEXT: it's common ground that Toulouse is in France.]
a. c John lives in Toulouse and/but doesn't live in France.
b. c Suppose that John lived in Toulouse and/but didn't live in France.
c. Suppose that John lived in Toulouse and/but Toulouse wasn't in France.

(61)a is odd/paradoxical, whereas (61)b is oddness-free. The situation changes in (62): (62)a exhibits contradictoriness, and (62)b, at least on a first reading, does exhibit contradictoriness too (if this judgment isn't immediately clear, compare (62)b with (62)c). Thus, given the contrast between (61)b and (62)b, it seems reasonable to conclude that the characteristic oddness of MP sentences is distinct from the oddness that sentences such as (60) exhibit (it constitutes a different phenomenon).

Though reasonable, this conclusion may be wrong. In what follows, I'm going to show that unification is in principle possible—i.e. I'm going to show that MP sentences can be characterised as contradictoriness-exhibiting sentences, at least under certain assumptions. To begin with, let me state these assumptions:

(i) Following Meyer (2013), I'll assume that an assertively used declarative sentence has a covert doxastic operator K_s adjoined at the matrix level at LF ('s', which stands for the speaker of the sentence, is the doxastic source).[22] (59), therefore, has the form 'K_s (John lives in Toulouse, but I believe that he doesn't live in France).' (This assumption is often referred to as the 'Matrix *K* Axiom'.)

(ii) I'll also assume that 'K_s' and the expression 'the speaker believes (that)' have the same meaning (both universally quantify over the speaker's belief worlds).

(iii) Following Hintikka (1962), I'll assume that the accessibility relation for the attitude verb 'believe' (and, given (ii), for Meyer's K_s covert operator) is *transitive*, i.e. if the speaker believes that *p*, then she believes that she believes that *p*.

(iv) Furthermore, I'll assume that the speaker's doxastic state in a C-world is a subset of C.

Because of (i), (59) has the following structure:

(63) K_s(John lives in Toulouse & I believe that he doesn't live in France).

[22] In epistemic logic, '*K*' is often identified with a *knowledge* (as opposed to a *belief*) operator. I'm deviating from this reasonable convention to remain consistent with the semantics tradition.

Let's now generate an informationally impoverished version of (63) by replacing the predicates of interest—namely, 'lives in Toulouse' and 'doesn't live in France', by variables:

(64) $K_s\big($John P_1 & I believe John $P_2\big)$.

Let w be a C-world (an element of C) and f an assignment from $\{P_1, P_2\}$ to $\mathcal{D}_{\langle s,\langle e,t\rangle\rangle}$ s.t. $[\![(64)]\!]^{w,f} = 1$. Then,

(a) because of (ii), there must be a doxastic alternative v for S (the speaker) in w s.t. $[\![$John P_1 & I believe John $P_2]\!]^{v,f} = 1$;
(b) because of (ii) and the second conjunct of 'John P_1 & I believe John P_2', there must be a doxastic alternative u for S in v s.t. $[\![\textbf{John } \boldsymbol{P_2}]\!]^{\boldsymbol{u,f}} \mathbf{= 1}$;
(c) because of (iii), u must also be a doxastic alternative for S in w;
(d) since $[\![(64)]\!]^{w,f} = 1$, it must be the case that $[\![$John P_1 & I believe John $P_2]\!]^{u,f} = 1$ (because of (ii) and (c)); and if $[\![$John P_1 & I believe John $P_2]\!]^{u,f} = 1$, it must be the case that $[\![\textbf{John } \boldsymbol{P_1}]\!]^{\boldsymbol{u,f}} \mathbf{= 1}$;
(e) finally, it must be the case that $\boldsymbol{u} \in \mathbf{C}$, because of (c) and (iv).

From this it follows that (65) is true:

(65) For every w in C and for every f, if $[\![K_s\big($John P_1 & I believe John $P_2\big)]\!]^{w,f} = 1$, then there is $w' \in$ C (namely, u) and an $x \in \mathcal{D}_e$ (namely, the individual that 'John' denotes in w') such that $[\![P_1]\!]^{w',f}(x) = 1$ and $[\![P_2]\!]^{w',f}(x) = 1$).

In other words, it can be concluded that ('lives in Toulouse', 'doesn't live in France') is (1,1)-**weakly-**connected in (59) w.r.t. $C_{(59)}$.[23] Then, to predict contradictoriness, just as with indicative conditionals, one simply needs to replace the version of Contradictoriness given in (46) for the one given in (57). It is important to note that, on this analysis, (61)b *is not* expected to exhibit contradictoriness: this is because (i) doesn't apply to (61)b—(61)b isn't a declarative but an imperative sentence ('I believe that suppose that...' is a non-sensical construction).

To sum up, the original generalisation that I've formulated fails to predict contradictoriness for (59)/(61)a, However, if one uses Weak Predicate Connection (as opposed to Predicate Connection), the revised generalisation—provided that one makes the Matrix K Axiom assumption—does succeed in predicting contradictoriness for (59)/(61)a. The Matrix K Axiom, it should be noted, is a non-trivial assumption, one that may be wrong. Even if wrong, there would be some hope for the account I've just put forward: the inference from 'ψ' to 'I believe that ψ' (where 'ψ' is an assertion) does follow from standard Gricean assumptions; thus, it might be possible to predict contradictoriness in Moorean sentences without relying on

[23] I emphasise 'weakly': this pair is (1,1)-weakly-connected in (59) w.r.t. $C_{(59)}$ but it isn't (1,1)-connected in (59) w.r.t. $C_{(59)}$. To see this, it's enough to notice that 'K_s(John P_1 & I believe John P_2)' doesn't contextually entail 'John P_1'.

the Matrix *K* Axiom—in order for this to happen, however, the definition of (weak) predicate connection would need to be revised: in its current form, it is only sensitive to the *literal* meaning of clauses.

6 Conclusion

Contradiction and contradictoriness should be distinguished from one another. Contradiction is a theoretical notion—e.g. falsehood in every possible world, falsehood under all possible uniform substitutions of non-logical words. Contradictoriness, by contrast, is a phenomenon. In this paper, I have shown that standard notions of contradiction are of little use when it comes to describing the phenomenon of contradictoriness. I have also developed the notion of predicate connection—and put forward a generalisation that makes use of this notion—in an attempt to provide an adequate characterisation of this phenomenon.

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