Predicate Connection and Informational Oddness

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Abstract

In this short paper, I present a set of minimal pairs that calls into question all current accounts of contradictoriness and redundancy. In addition, I present two generalisations—grounded in the novel notion of *predicate connection* (Feinmann 2022)—that provide a fresh perspective on these phenomena.*

1 The Data

The following minimal pairs are interesting:

(1)	a. The Eiffel Tower is in Paris, and it isn't in France.	[FALSE + Contradictory]
	b. The Eiffel Tower is in Paris, and Paris isn't in France.	[Just FALSE]
(2)	a. The Eiffel Tower is in Paris, and it is in France.	[TRUE + Redundant]
	b. The Eiffel Tower is in Paris, and Paris is in France.	[Just TRUE]

The pair in (1) is interesting because it exposes the fact that we do not understand what it is that makes a sentence *feel* contradictory. Indeed, (1)a and (1)b are truth-conditionally equivalent; thus, no global notion of contradiction (e.g. falsity in every possible world) can tell them apart. If local contexts are brought into the picture, (1)a and (1)b are also equivalent: in both cases, the second conjunct contradicts its local context (cf. Schlenker 2009: 34).[1]

The pair in (2) is interesting because it calls into question all existing accounts of redundancy. According to non-incremental accounts (e.g. Meyer 2013; Katzir and Singh 2014), both (2)a and (2)b are predicted to be redundant; however, only (2)a feels redundant. Incremental accounts (e.g. Stalnaker 1974, 1978; van der Sandt 1992; Schlenker 2009; a.o.) cannot distinguish between (2)a

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[1] Note that, in all the sentences in (1) and (2), the local context of the second conjunct entails that Paris is in France; and it does because the global context entails that Paris is in France (it's common ground that Paris is in France).

and (2)b either: in both sentences, the second conjunct is entailed by its local context; as a result, both sentences are predicted to be redundant.

2 Predicate Connection

Here I will propose an account of both (1) and (2) that has at its core a novel theoretical notion—namely, the notion of *predicate connection* (Feinmann 2022).[2] To a first approximation, it can be said that two predicates α and β are connected (in a clause) iff their meanings are entangled (in the said clause) in such a way that, even if α and β didn't mean what they in fact mean but something else, this entanglement would nonetheless persist. This (admittedly vague) formulation is made precise in (3).

(3) **Predicate Connection**[3]

Let α and β be two one-place predicates, μ a clause, C_μ the local context of 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 and β are (v_1,v_2)-connected in μ with respect to C_μ ('in μ/C_μ' for short)[4] iff...

(i) α and β are both constituents of μ,
(ii) α isn't dominated by β nor is β dominated by α,[5] 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. $\exists f \exists w \in C_\mu(\llbracket \mu' \rrbracket^{w,f} = 1)$[7]
b. $\forall f \forall w \in C_\mu(\llbracket \mu' \rrbracket^{w,f} = 1 \rightarrow \exists x \in \mathcal{D}_e \text{ s.t. } \llbracket P \rrbracket^{w,f}(x) = v_1 \wedge \llbracket Q \rrbracket^{w,f}(x) = v_2)$.

Notation: I'll say that two predicates α and β are *connected* in μ/C_μ (without further qualification) if, for some $v_1, v_2 \in \{0,1\}$, they are (v_1,v_2)-connected in μ/C_μ—that is, if they are (1,1)-connected in μ/C_μ, (1,0)-connected in μ/C_μ, (0,1)-connected in μ/C_μ, or (0,0)-connected in μ/C_μ).

If turned into a recipe, (3) would go more or less like this: first, identify a clause 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); third, check whether the impoverished clause (the clause in which α has been replaced by *P* and β by *Q*) satisfies (iii)a and (iii)b. (Stripping away the technical details, (iii)a says: 'You can find a way of replacing α and β so that the resulting clause is consistent with its local context'; (iii)b, in turn, says, 'For all replacements of α and β, the resulting clause entails [in its local context] that there is an entity of which the replacement of α is v_1 and the replacement of β is v_2'.)

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[2] Beyond the terminological resemblance, this notion is unrelated to the notion of *connectedness* (e.g. Chemla, Buccola, and Dautriche 2019).
[3] I thank Emmanuel Chemla for suggesting this manner of presentation.
[4] The empirical arguments for why C_μ (the local context of μ), as opposed to C (the global context), ought to be used for calculating connection facts are given in Feinmann (2022: § 4.1). In the examples discussed in this paper, all the relevant connection facts occur in matrix clauses; thus, for these examples, it doesn't matter whether C_μ or C is used (i.e. C_μ = C when μ is the matrix clause).
[5] This condition is needed in order for (iii) to be applicable.
[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*, $\llbracket \gamma \rrbracket^{w,f} = f(\gamma)(w)$; if γ is not an element of {*P*, *Q*}, then, for any *w* and for any *f*, $\llbracket \gamma \rrbracket^{w,f} = \llbracket \gamma \rrbracket^{w}$. 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] (iii)a's function is to prevent (iii)b from being satisfied trivially.

Take (1)a, for example. The predicates 'is in Paris' and 'isn't in France' are (1,1)-connected in (1)a/$C_{(1)a}$, viz. in the matrix clause of (1)a with respect to (1)a's local context (which is of course the global context): indeed, these predicates are constituents of (1)a and neither of them dominates the other—hence (i) and (ii) are satisfied; furthermore, 'The Eiffel Tower P, and it Q' satisfies (iii)a—i.e. there is an f and a w in $C_{(1)a}$ s.t. $[\![\text{The Eiffel Tower } P\text{, and it } Q]\!]^{w,f} = 1$ (consider, for example, 'The Eiffel Tower *is in Paris* and it *isn't made of wood*'); and it also satisfies (iii)b—i.e. for any f and for any w in $C_{(1)a}$, if $[\![\text{The Eiffel Tower } P\text{, and it } Q]\!]^{w,f} = 1$, then there is an x in $\mathcal{D}_e$ s.t. $[\![P]\!]^{w,f}(x) = 1$ and $[\![Q]\!]^{w,f}(x) = 1$ (namely, the object denoted by 'the Eiffel Tower'). Note that, according to (3), the predicates 'is in Paris' and 'in France' are also connected in (1)a/$C_{(1)a}$: the difference is that, while 'is in Paris' and 'isn't in France' are (1,1)-connected in (1)a/$C_{(1)a}$, 'is in Paris' and 'in France' are (1,0)-connected in (1)a/$C_{(1)a}$.

I am now in a position to put forward the generalisation in (4)a, which predicts the contrast in (1), and the generalisation in (4)b, which predicts the contrast in (2).

(4) 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.

(a) **Contradictoriness**

i. S is perceived as contradictory in C iff, for some $v_1, v_2 \in \{0,1\}$, there are two predicates that are (v_1,v_2)-connected in μ/C_μ and these two predicates are (v_1,v_2)-incompatible in C_μ.

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

(b) **Redundancy**

i. S is perceived as redundant in C iff, for some $v_1, v_2 \in \{0,1\}$, there are two predicates that are (v_1,v_2)-connected in μ/C_μ and these two predicates are (v_1,v_2)-trivial in C_μ.

ii. Two predicates α and β are (v_1,v_2)-trivial in C_μ iff, for every $w \in C_\mu$, $\{x \in \mathcal{D}_e : [\![\alpha]\!]^w(x) = v_1\} \subseteq \{x \in \mathcal{D}_e : [\![\beta]\!]^w(x) = v_2\}$ or, for every $w \in C_\mu$, $\{x \in \mathcal{D}_e : [\![\beta]\!]^w(x) = v_2\} \subseteq \{x \in \mathcal{D}_e : [\![\alpha]\!]^w(x) = v_1\}$.

(1)a is expected to exhibit contradictoriness under (4)a: it has a clause that has two (1,1)-connected predicates that are (1,1)-incompatible, viz. 'is in Paris' and 'isn't in France'. (1)b, on the other hand, isn't expected to exhibit contradictoriness: this is because no clause of (1)b has two predicates that are connected; and, according to (4)a, having two connected predicates is a pre-requisite for contradictoriness. Likewise, (2)a is expected to exhibit redundancy under (4)b: it has a clause that has two (1,1)-connected predicates that are (1,1)-trivial, viz. 'is in Paris' and 'is in France'. (2)b, by contrast, is not expected to exhibit redundancy—for the same reason as (1)b is not expected to exhibit contradictoriness.

As explicitly stated, I take (4) to be generalisations, descriptions of the facts, and not theories, which should explain the facts and not just describe them. That said, I think it is possible to glean from (4), if not a theory, the scaffolding of one. Indeed, it is natural to conceptualise (4) along the following lines: connection facts impose constraints on what pairs of predicates that co-occur in a clause can mean; contradictoriness kicks in when these constraints are unsatisfiable; redundancy, in turn, kicks in when these constraints cannot not be satisfied.

3 Context and Informational Oddness

According to (4), context is expected to modulate our judgments of contradictoriness and redundancy; for example, a sentence may exhibit contradictoriness/redundancy in C_1, but not in C_2, because the connection facts that hold in C_1 do not hold in C_2. Consider, for example, (5) and (6): in the context in (5), the a-sentence exhibits contradictoriness (signalled with '^{c}') and the b-sentence redundancy (signalled with ‘r’); in the context in (6), by contrast, the sentences in question are oddness-free.

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

a. c Every member of Linguae likes John, but Benjamin hates him.
b. r Every member of Linguae likes John, and Benjamin likes him too.

(6) [CONTEXT: it is common ground that Benjamin is a member of Parlare (not of Linguae).]

a. Every member of Linguae likes John, but Benjamin hates him.
b. Every member of Linguae likes John, and Benjamin likes him too.

The thing to note is that in (5), but not in (6), the global context entails that Benjamin is a member of Linguae: this difference alters the connection facts and, ultimately, the contradictoriness/ redundancy facts. Let’s see this with (5)a/(6)a (‘Every member of Linguae likes John, but Benjamin hates him’):

(5)a || $C_{(5)a}$ entails that Benjamin is a member of Linguae.

For any *f* and for any world $w \in C_{(5)a}$, if ⟦Every member of Linguae *P*, but Benjamin *Q*⟧^{w,f} = 1, then $[\![P]\!]^{w,f}(\text{Benjamin}'_w) = 1$ and $[\![Q]\!]^{w,f}(\text{Benjamin}'_w) = 1$.

‘likes John’ and ‘hates (John)’ are thus (1,1)-connected in (5)a/$C_{(5)a}$ (via Benjamin); contradictoriness is expected because ‘likes John’ and ‘hates (John)’ are (1,1)-incompatible in $C_{(5)a}$.

(6)a || $C_{(6)a}$ entails that Benjamin *is not* a member of Linguae.

It’s not the case that, for any *f* and for any world $w \in C_{(6)a}$, if ⟦Every member of Linguae *P*, but Benjamin *Q*⟧^{w,f} = 1, then one of the following obtains:

- $[\![P]\!]^{w,f}(\text{Benjamin}'_w) = 1$ and $[\![Q]\!]^{w,f}(\text{Benjamin}'_w) = 1$
- $[\![P]\!]^{w,f}(\text{Benjamin}'_w) = 0$ and $[\![Q]\!]^{w,f}(\text{Benjamin}'_w) = 0$
- $[\![P]\!]^{w,f}(\text{Benjamin}'_w) = 1$ and $[\![Q]\!]^{w,f}(\text{Benjamin}'_w) = 0$
- $[\![P]\!]^{w,f}(\text{Benjamin}'_w) = 0$ and $[\![Q]\!]^{w,f}(\text{Benjamin}'_w) = 1$

‘likes John’ and ‘hates (John)’, therefore, are not connected in (6)a/$C_{(6)a}$ via Benjamin (nor are they connected in any other way); hence, these predicates aren’t expected to induce contradictoriness.

According to (4), it’s also possible that a sentence may exhibit contradictoriness/redundancy in C_1, but not in C_2, despite the connection facts in C_2 being the same as in C_1: this can happen when the incompatibility/triviality facts that hold in C_1 do not hold in C_2. Consider, for example, (7) and (8).

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

a. c John visited Tajiff, but didn’t visit Cuba.
b. r John visited Tajiff, and he visited Cuba.

(8) [CONTEXT: it’s common ground that the city of Tajiff is in Ecuador.]

a. John visited Tajiff, but didn’t visit Cuba.
b. John visited Tajiff, and he visited Cuba.

In (7), but not in (8), the global context entails that the city of Tajiff is in Cuba. This difference has no impact on the connection facts: ‘visited Tajiff’ and ‘didn’t visit Cuba’ are (1,1)-connected in both (7)a/$C_{(7)a}$ and (8)a/$C_{(8)a}$; and ‘visited Tajiff’ and ‘visited Cuba’ are (1,1)-connected in both (7)b/$C_{(7)b}$ and (8)b/$C_{(8)b}$. It does, however, have an impact on the incompatibility/triviality facts:

‘visited Tajiff’ and ‘didn’t visit Cuba’ are (1,1)-incompatible in $C_{(7)a}$ but not in $C_{(8)a}$; ‘visited Tajiff’ and ‘visited Cuba’, in turn, are (1,1)-trivial in $C_{(7)b}$ but not in $C_{(8)b}$.

4 Mayr and Romoli’s (2016) Datum

An attractive feature of (4)b is that, unlike previous theories, it is not threatened by (9), due to Mayr and Romoli (2016). Indeed, the sentence in (9) poses a serious challenge to both incremental and non-incremental accounts of redundancy: all these accounts predict (9) to be redundant, contrary to fact—see Mayr and Romoli (2016) for discussion.

(9) Either Mary isn’t pregnant, or she is pregnant and it doesn’t show.

(4)b fares better in this respect: it doesn’t predict (9) to be redundant. Indeed, the predicates ‘isn’t pregnant’ and ‘(is) pregnant’, although they are (0,1)-trivial and (1,0)-trivial in $C_{(9)}$, are neither (0,1)-connected nor (1,0)-connected in (9)/$C_{(9)}$ (as a matter of fact, they aren’t connected in any way); likewise, the predicates ‘pregnant’ and ‘(is) pregnant’, although they are (1,1)-trivial and (0,0)-trivial in $C_{(9)}$, are neither (1,1)-connected nor (0,0)-connected in (9)/$C_{(9)}$.

Let’s see this: To determine, for example, whether ‘isn’t pregnant’ and ‘(is) pregnant’ are (0,1)-connected in (9)/$C_{(9)}$, the following impoverished LF needs to be generated: ‘Either Mary P, or she Q and it doesn’t show’. If ‘isn’t pregnant’ and ‘(is) pregnant’ were to be (0,1)-connected in (9)/$C_{(9)}$, it would mean that, for any f and for any world $w \in C_{(9)}$, if $[\![$Either Mary P, or she Q and it doesn’t show$]\!]^{w,f} = 1$, then there’s an $x \in \mathcal{D}_e$ s.t. $[\![P]\!]^{w,f}(x) = 0$ and $[\![Q]\!]^{w,f}(x) = 1$. However, it’s trivial to generate a counterexample to this: suppose that $w_1 \in C_{(9)}$ and that w_1 and f_1 are such that $\{x \in \mathcal{D}_e : [\![P]\!]^{w_1,f_1}(x) = 1\} = \{\text{Mary}\}$ and $\{x \in \mathcal{D}_e : [\![Q]\!]^{w_1,f_1}(x) = 1\} = \emptyset$. Then...

- $[\![$Either Mary P, or she Q and it doesn’t show$]\!]^{w_1,f_1} = 1$;
- however, there’s no $x \in \mathcal{D}_e$ such that $[\![P]\!]^{w_1,f_1}(x) = 0$ and $[\![Q]\!]^{w_1,f_1}(x) = 1$ (because there’s no $x \in \mathcal{D}_e$ s.t. $[\![Q]\!]^{w_1,f_1}(x) = 1$).
- Hence, ‘isn’t pregnant’ and ‘(is) pregnant’ aren’t (0,1)-connected in (9)/$C_{(9)}$.

Similar reasoning can be applied to show that ‘isn’t pregnant’ and ‘(is) pregnant’ aren’t (1,0)-connected in (9)/$C_{(9)}$ either, and that ‘pregnant’ and ‘(is) pregnant’ are neither (1,1)-connected nor (0,0)-connected in (9)/$C_{(9)}$.

It should be noted that, for the same reasons that (4)b predicts (9) not to be redundant, it also predicts (10) not to be redundant.

(10) Either Mary is pregnant, or she isn’t (pregnant).

I take this to be a good prediction. This doesn’t mean that (10) isn’t problematic: this is a tautological sentence and, as a result, asserting it is expected to result in a violation of the maxim of Quantity (Grice 1975). However, as a sentence, (10) doesn’t strike me as being redundant—that is, it doesn’t strike me as exhibiting the same kind of oddness that ‘Mary is pregnant, and she is pregnant’ exhibits.

5 Hurford Disjunctions

(4)b doesn’t predict Hurford disjunctions such as (11) to be redundant.

(11) #John was born in Paris or in France.

Non-incremental accounts might be seen as having an advantage here: these accounts rule out (11) essentially because one of its disjunct can be dropped without information loss. That said, these accounts fail to rule out examples such as (12), which are also deviant: this is because neither of (12)'s disjuncts can be dropped without information loss.

(12) #John was born in Russia or in Asia. (Singh 2008, attributed to Chomsky)

Thus, if one suspects that (11) and (12) are deviant for the same reason—a reasonable suspicion to have—then one is less likely to think that (11) is bad because one of its disjuncts is droppable.[8] As far as the account proposed here is concerned, the deviance of (11) and (12) is phenomenologically unrelated to the deviance of (2)a.

6 Closing Remarks

To conclude, I'd like to make a caveat: there at least two ways in which (4) is deficient. The first problem with (4) is that it fails to predict oddness in cases such as (13) below.[9]

(13) ^{c} John married Jane, then married Paula, but never married twice.

According to (4)a, in order for contradictoriness to kick in, two predicates need to be (v_1,v_2)-connected in μ/C_μ and, furthermore, (v_1,v_2)-incompatible in C_μ. In the example above, however, no such thing takes place. Take, for example, the matrix clause of (13): 'married Jane' and 'never married twice' are (1,1)-connected in (13)/$C_{(13)}$; however, these predicates aren't (1,1)-incompatible in $C_{(13)}$: it's possible for someone to have married Jane and, at the same time, not to have married twice. To deal with such cases, the definitions given need to be generalised to any number of predicates greater than 2 (see Feinmann 2022, § 4)—at the end of the day, what one wants to say is that (13) exhibits contradictoriness because 'married Jane', 'married Paula', and 'never married twice' are (1,1,1)-connected in (13)/$C_{(13)}$ and (1,1,1)-incompatible in $C_{(13)}$.

The other issue, brought to my attention by Benjamin Spector, is the following: it looks as if connecting one-place predicates isn't enough; to have a full description of the data, at the very least, one needs a system that, in addition to connecting one-place predicates, also connects generalised quantifiers (viewed, for this purpose, as higher-order predicates). Consider, for example, the following sentence:

(14) ^{c} None or all of the students speak French, and exactly half of them speak French.[10]

For (4)a to predict contradictoriness in (14), 'speak French' and 'speak French' would need to be either (1,0)-connected or (0,1)-connected in (14)/$C_{(14)}$ (i.e. 'speak French' and 'speak French' are both (1,0)-incompatible and (0,1)-incompatible in $C_{(14)}$). These predicates, however, are neither (1,0)-connected nor (0,1)-connected in (14)/$C_{(14)}$.[11] (4)a, therefore, makes a bad prediction here: it predicts (14) not to exhibit contradictoriness, contrary to fact.

Now, as Benjamin Spector pointed out to me, nothing stops one from having an account according to which the generalised quantifiers 'none or all of the students' and 'exactly half of (the students)' are (1,1)-connected in (14)/$C_{(14)}$;[12] on such an account, (14) would be expected to exhibit contradictoriness: 'none or all of the students' and 'exactly half of (the students)' are (1,1)-

[8] Thanks to Amir Anvari for discussion on this point.
[9] Thanks to Daniel Rothschild for making me reflect about these cases.
[10] Thanks to Benjamin Spector for this example.
[11] For a demonstration of this, see Feinmann (2022).
[12] Let P^2 and Q^2 be second-order predicate variables and k a variable over assignment functions from $\{P^2, Q^2\}$ to $\mathcal{D}_{\langle s,\langle\langle e,t\rangle,t\rangle\rangle}$; then, for any k and for any $w \in C_{(14)}$, if $[\![P^2$ speak French and Q^2 speak French$]\!]^{w,k} = 1$, then $[\![P^2]\!]^{w,k}([\![$speak French$]\!]^{w,k}) = 1$ and $[\![Q^2]\!]^{w,k}([\![$speak French$]\!]^{w,k}) = 1$.

incompatible in $C_{(14)}$ (i.e. there is no world w in $C_{(14)}$ and no one-place predicate denotation X such that $[\![\text{none or all of the students}]\!]^w(X) = 1$ and $[\![\text{exactly half of (the students)}]\!]^w(X) = 1$). To achieve this result, one would need to tweak (3) so that it also generates connection facts between generalised quantifiers, as well as upgrade the generalisations in (4).

The apparent fact that, in order to handle cases such as (14), connection needs to be established between expressions other than (first-order) one-place predicates raises the following question: how general does the definition of connection need to be? Should (3) be minimally modified to permit connection between generalised quantifiers (as suggested), or is, in fact, something more general needed (e.g. connection between any two expressions of type $\langle\langle ... \rangle, t\rangle$)? I leave this question open for future study.

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