Truth-value gaps with integrative predicates

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1. Introduction

What generalizations can be made about the meaning of predicates? This paper compares two classes of predicates, to show that despite some superficial differences, they share substantial formal characteristics. The two classes of predicates are those that Löbner (2000) calls SUMMATIVE and INTEGRATIVE. Summative predicates quantify over parts (1a), while integrative predicates do not (1b).[1]

(1)   a.   This flag is green.
          ≈ all parts of this flag are green
     b.   This flag is rectangular.
          ≉ all parts of this flag are rectangular

Despite this apparent difference, there are some reasons to think the two classes of predicates involve the same semantic composition. In particular, both are ultra-locally strengthened to exclude conceptually related predicates. This is shown in section 2, summarising arguments from Paillé 2022.

At the same time, postulating the exact same semantic composition for both classes of predicates predicts that all properties that arise post-lexically for summative predicates should also be found with integrative ones. But there are two post-lexical elements of the intuited meaning of summative predicates that integrative predicates have never been claimed to have, namely truth-value gaps and discourse-based weakness ('non-maximality'). I show in section 3 how these properties could arise compositionally for summative predicates, namely by assuming that Exh is trivalent (Bassi et al. 2021); this will immediately predict that integrative predicates should behave the same way. Unexpectedly, we will see in section 4 that in fact, integrative predicates do behave the same way when looked at from the right perspective: they show the same kind of truth-value gaps and discourse-based weakness.

Thus, this paper both shows that the empirical picture for integrative predicates is more complex than has been described, and strengthens the case for viewing the post-lexical meaning of summative and integrative predicates as involving the same semantic process, namely ultra-local trivalent exhaustification vis-à-vis conceptually related predicates.

2. Background: all predicates are strengthened

Let's start with the assumption that integrative and summative predicates have different lexical meanings: only the latter involve lexical part-quantification. (2) is a first approximation.

(2)   a. $[\![\text{chair}]\!] = \lambda x.\textbf{chair}(x)$.
     b. $[\![\text{green}]\!] = \lambda x.\forall y[y \sqsubseteq x \rightarrow \textbf{green}(y)]$.

[1] This paper focuses exclusively on summative predicates like *green* that quantify universally in out-of-the-blue sentences (on other summative predicates, see Yoon 1996 and Haslinger & Paillé to appear), and on integrative predicates like *rectangular* that appear to lack any particularly interesting formal semantic properties (unlike e.g. *possible*, which is modal, or *unimportant*, which contains negation). When I write 'all predicates' in this paper, this refers to the subclass of summative predicates and the subclass of integrative predicates that I focus on, leaving for future work how far my claims go beyond these two subclasses.

Despite this difference in the LEXICAL semantics, there are reasons to unify the COMPOSITIONAL semantics of summative and integrative predicates (Paillé 2022). First, both classes of predicates are strong or weak in the same environments. Second, for both classes, the intuited strength can be shown to arise compositionally rather than lexically. Third, the strengthening has the idiosyncratic property of necessarily being computed ultra-locally, effectively mimicking lexical meaning.

To appreciate this, let's start with an obvious observation already made in (1): in positive sentences, summative predicates quantify universally over the parts of their argument—they are QUANTIFICATIONALLY STRONG. This can be observed both from the meaning intuited for an out-of-the-blue sentence with a single summative predicate (3a), and from the fact that a contradiction results if two summative predicates from the same class (here, two colour terms) are both predicated of the same individual (3b).

(3) a. The flag is green.
         ≈ 'The flag is entirely green'
     b. #The white flag is green.

What is less obvious is that integrative predicates are strong too. They are simply not quantificationally strong, since they do not quantify. To see this, let's consider examples akin to (3b). (3b) attempts to 'co-predicate' two predicates from a particular conceptual domain: it takes two colour terms and predicates both of the same individual. The fact that this results in a contradiction could have been special to summative predicates, but in fact, the same effect is observed with integrative predicates: (4) takes integrative predicates from various conceptual domains (genres, utensils, legal jurisdictions, vehicles) and attempts to assign two predicates from the same conceptual domain to the same individual. Contradictions result.

(4) a. #Some comedies are tragedies.
     b. #This fork is a spoon.
     c. #Some federal responsibilities are provincial.
     d. #This train is a plane.

These contradictions cannot be explained by world knowledge; there are (or we can imagine) tragicomedies (4a), sporks (4b), shared legal responsibilities (4c), and hybrid vehicles (4d). The predicates could have been weak enough to be mutually compatible, but what we find is that they are mutually exclusive. Integrative predicates may not be QUANTIFICATIONALLY strong, but they are intuited as CONCEPTUALLY STRONG.

The strength of summative and integrative predicates disappears in precisely the same environments, motivating a unified analysis of their strength. In particular, they can all be co-predicated without a contradiction when they are joined by *and* (5) or *also* (6). The *also* in (6) is meant to be understood as clause-internal, rather than being anaphoric to prior discourse; (6a), for instance, should be read as meaning that the flag is green in addition to being white, rather than in addition to having some other property given in a previous sentence.

(5) a. The flag is both white and green.   (SUMMATIVE; *and*)
     b. The play is both a comedy and a tragedy.   (INTEGRATIVE; *and*)

(6) a. The white flag is also green.   (SUMMATIVE; *also*)
     b. A tragicomedy is a comedy that is also a tragedy.   (INTEGRATIVE; *also*)

I therefore take both classes of predicates to be lexically weak (quantificationally or conceptually):

(7) a. $[\![\text{comedy}]\!] = \lambda x.\textbf{comedy}(x)$.   (where **comedy** includes e.g. tragicomedies)
     b. $[\![\text{green}]\!] = \lambda x.\exists y[y \sqsubseteq x \wedge \textbf{green}(y)]$.   (henceforth abbreviated: '$\lambda x.\textbf{green}_{\sqsupseteq}(x)$')

Possible analyses of (5)–(6) that aim to maintain that the predicates are lexically strong run into problems; this is shown in Paillé 2022, specifically chapters 2 (for the data with *also*) and 5 (for *and*).

Why, then, are the predicates interpreted as strong in sentences without *and* or *also*? The most obvious answer is that predicates are strengthened to exclude other predicates from the same conceptual domain: *green* excludes other colour terms, *comedy* other genre terms, and so on. I will model this exclusion

through the Exh(aust) operator of Chierchia et al. (2012):

(8) $[\![\text{Exh}_{\text{ALT}}(p)]\!] = 1$ iff $[\![p]\!] = 1$ and $\forall q \in \text{ALT} \, ([\![q]\!] = 1 \rightarrow [\![p]\!] \subseteq [\![q]\!])$

With summative predicates, exhaustification results in an 'exclusive existential' rather than a real universal:

(9)   a. Exh_{ALT} [The flag is green].
        b. ALT = {The flag is green, The flag is white, The flag is red, ... }
        c. $[\![(9a)]\!] = 1$ iff $\textbf{green}_\exists(f) \wedge \neg\textbf{white}_\exists(f) \wedge \neg\textbf{red}_\exists(f) \wedge \neg \dots$

If the flag is at least partly green and has no other colour, it must be entirely green. As for integrative predicates, we end up with language acting as if it was cleaning up overlap in conceptual space:

(10)   a. Exh_{ALT} [*Macbeth* is a tragedy].
        b. ALT = {*Macbeth* is a tragedy, *Macbeth* is a comedy, *Macbeth* is an epic, ... }
        c. $[\![(10a)]\!] = 1$ iff $\textbf{tragedy}(m) \wedge \neg\textbf{comedy}(m) \wedge \neg\textbf{epic}(m) \wedge \neg \dots$

Call this the EXCLUSION THEORY of predicates.

There are many strengthening effect in natural language, but the effect discussed here, whereby predicates are strengthened vis-à-vis other conceptually related predicates, constitutes a clearly defined natural class. Indeed, contrary to the formalization in (9) and (10), this particular strengthening is necessarily computed very locally to the predicate. To see this, consider again clause-internal contradictions:

(11)   #This comedy is a tragedy.

If Exh could take the entire clause as its prejacent, its prejacent would entail that the play is both in the broad set of comedies (which includes tragicomedies) and the broad set of tragedies. Exh would therefore exclude neither *comedy* nor *tragedy*, and no contradiction would be intuited in (11). On the other hand, we can create a contradiction by assuming that predicates are strengthened through a PREDICATE-STRENGTHENING effect rather than a clause- or sentence-strengthening effect. On this view, there is a predicative Exh (12) involving a generalized notion of entailment, which applies to *comedy* and *tragedy* immediately upon their merger into the syntax (13a); given that *comedy* and *tragedy* are alternatives for pred-Exh (13b), this results in mutually exclusive meanings even when the two predicates are clause-mates (13c).

(12) $[\![\text{pred-Exh}_{\text{ALT}}(P)]\!] = \lambda x.P(x) \wedge \forall Q \in \text{ALT}[Q(x) \rightarrow P \subseteq Q].$

(13)   a. This [pred-Exh$_{\text{ALT}}$ comedy] is a [pred-Exh$_{\text{ALT}}$ tragedy].
        b. ALT = {comedy, tragedy, epic}
        c. $[\![(13a)]\!] = 1$ iff this non-tragic and non-epic comedy is a non-comedic and non-epic tragedy ($\Rightarrow$ contradiction).

See chapter 2 of Paillé 2022 for more general empirical motivation that predicates are strengthened locally as a rule (and that this effect is distinct from intonationally marked contrastive focus on predicates), as well as chapters 3 and 6 for how the data with *also* and *and* (respectively) are captured on this theory. Since nothing in this paper will hinge on the locality of this exhaustification effect, I will continue putting a global Exh in my examples.

In the rest of this paper, I first turn to some facts about summative predicates that are not immediately explained by this Exclusion theory, and modify the theory accordingly (section 3). This will make predictions for integrative predicates that are at odds with how they have been described, but we will see that the problem is not the prediction, but the description they have (not) been given (section 4).

3. Improving the Exclusion theory for summative predicates

We now make two observations about summative predicates (Löbner 2000, Križ 2015) that the Exclusion theory does not capture (section 3.1), and show how slightly changing the meaning of Exh obtains the right results (section 3.2).

3.1. Two empirical desiderata for summative predicates

3.1.1. Truth-value gaps

So far, we have focused on the TRUTH CONDITIONS associated with summative predicates; they are strong (universal) outside the presence of *also* or *and*. Yet, a classic observation is that their FALSITY CONDITIONS are not the complement of their truth conditions. Following Löbner (2000), assume the FALSITY conditions of a sentence *p* are the same as the TRUTH conditions of its negation ¬*p*. The falsity conditions of (14a) therefore correspond to the truth conditions of (14b).

(14)   a.   The flag is green.
           ≈ 'The flag is all green.'
     b.   The flag is not green.
           ≈ 'The flag is not green at all.'

The negated-existential meaning in (14b) is not surprising given my claim that summative predicates are lexically existential. But if (14a) is true if the flag is all green, and false if it is not green at all, it must be NEITHER TRUE NOR FALSE if the flag is only partly green (Löbner 2000, Spector 2013, Križ 2015): there is a truth-value gap arising from the meaning of *green*.

(15) $[\![\text{The flag is green}]\!] = \begin{cases} 1, \text{ iff the flag is all green;} \\ 0, \text{ iff the flag is not green at all;} \\ \#, \text{ otherwise} \end{cases}$

The most obvious way to try to capture the truth-value gaps associated with summative predicates would be to take them to arise from a presupposition that the predicate applies to all or no parts of its argument (Löbner 2000):

(16) $[\![\text{green}]\!] = \lambda x : \forall y \sqsubseteq x [\mathbf{green}(x)] \vee \neg \exists y \sqsubseteq x [\mathbf{green}(x)] . \forall y \sqsubseteq x [\mathbf{green}(x)] .$

But this cannot be squared with what we have seen in section 2, which showed that summative predicates are lexically existential. Given the presupposition in (16), the output of *green* is universal in positive sentences regardless of whether one writes '∀' or '∃' in the output condition; the input condition ensures that *green* is only defined for entities that are either not green at all or entirely green. I therefore take it that truth-value gaps are not part of summative predicates' lexical meanings; they arise either pragmatically or in the semantic composition.

3.1.2. Discourse-based weakness

The second property of summative predicates that does not fall out from the Exclusion theory is discourse sensitivity. Summative predicates can be interpreted as weaker than universal in some contexts:

(17)   a.   SCENARIO: *We are entering a bullfighting arena. Visitors are not permitted to wear any red, but my shirt is half red, half white. A security guard says:*
     b.   Your shirt is red, you can't enter the arena.

Red in (17) is not universal, despite being in a positive sentence lacking *and* or *also*. The crucial property of (17) is that any amount of red is sufficient for the security guard's goal of deciding who can enter; the question under discussion (QUD) is 'Does the shirt have ANY red on it?' rather than 'What does the shirt look like?' This phenomenon has been called NON-MAXIMALITY (e.g. Malamud 2012, Schwarz 2013, Križ 2015, Križ & Spector 2021, Bar-Lev 2021), but I call it DISCOURSE-BASED WEAKNESS in anticipation of section 4, where we will try to observe the same thing with integrative predicates (which lack part-quantification, and are therefore not well discussed in terms of '(non-)maximality').

Recent work (e.g. Križ 2015, Feinmann 2020, Križ & Spector 2021) has suggested that discourse-based weakness should be analyzed as having a common cause with (or being caused by) the existence of truth-value gaps. The idea that there is a connection between truth-value gaps and discourse-based weakness comes from the observation that they both disappear with *all*:

(18) The shirt is all red.
  ⇒ NO TRUTH-VALUE GAP: false if the shirt is only partly red.
  ⇒ NO DISCOURSE-BASED WEAKNESS: infelicitous/false in scenario (17a).

Križ (2015: 76ff) specifically suggests that discourse-based weakness arises from truth-value gaps. The central insight of his proposal is that sentences that are neither true nor false in the world of utterance w_0 can be used felicitously if w_0 is, for the purposes of the conversation, equivalent to a world in which the sentence was true. To concretize this, Križ starts with the standard assumption (e.g. van Rooij 2003) that a question under discussion (QUD) partitions worlds by how they resolve it. Consider the sentence (19) with a toy model of three worlds (20) corresponding to different amounts of red on the shirt.

(19) The shirt is red.

(20) $\begin{cases} w_1: & \text{the shirt is all red,} \\ w_2: & \text{the shirt is half red,} \\ w_3: & \text{the shirt is not red at all} \end{cases}$

If the QUD is 'How much red does the shirt have?' or 'What does the shirt look like?,' all of these worlds are in their own cell; they all correspond to different answers to the QUD. But if the QUD is 'Does the shirt have any red on it?,' w_1 and w_2 both correspond to the answer 'yes,' so they are in the same cell.

From here, Križ (2015) takes to the letter Grice's (1975: 75) maxim of Quality, which Grice phrased as "Do not say what you believe to be false" rather than "Say what you believe to be true"—these are not equivalent in a trivalent semantics. Križ suggests that speakers can utter sentences that are neither true nor false as long as the world of utterance is in the same cell of the QUD as the worlds in which the sentence would be true. In our toy model, (19) is only true in w_1 regardless of the QUD; but with a QUD putting w_2 in the same cell as w_1, (19) can be uttered in w_2. Thus, Križ's theory allows the utterance of sentences that are neither true nor false in the world of utterance, QUD permitting.

3.2. Updating the Exclusion theory for summative predicates

As it stands, the Exclusion theory predicts neither truth-value gaps nor discourse-based weakness. Luckily, with Križ's theory of discourse-based weakness, we only need to worry about creating truth-value gaps. To do so, I suggest to define Exh so as to create them (for more elaborate discussion, see Paillé to appear). In fact, Bassi et al. (2021) do exactly this on independent grounds, calling their trivalent Exh 'Pexh':

(21) $[\![\text{Pexh}_{\text{ALT}}(p)]\!] = \begin{cases} 1, \text{ iff } [\![p]\!] = 1 \wedge \forall q \in \text{ALT}([\![q]\!] = 1 \rightarrow [\![p]\!] \subseteq [\![q]\!]); \\ 0, \text{ iff } [\![p]\!] = 0; \\ \#, \text{ otherwise} \end{cases}$

The truth-conditions created by Pexh are identical to the truth-conditions created by the bivalent Exh defined in (8); but unlike Exh, Pexh leads to non-complementary falsity conditions. A truth-value gap obtains if Pexh's prejacent p is true and there is also a non-entailed alternative q that is true. With Pexh, the Exclusion theory obtains truth-value gaps for summative predicates as follows:

(22) $[\![\text{Pexh}_{\text{ALT}} \text{ [the flag is green]}]\!] = \begin{cases} 1, \text{ iff } \textbf{green}_\exists(f) \wedge \neg\textbf{white}_\exists(f) \wedge \neg\textbf{red}_\exists(f) \wedge \neg \ldots; \\ 0, \text{ iff } \neg\textbf{green}_\exists(f); \\ \#, \text{ otherwise} \end{cases}$

If the flag is half green and half white, for example, it is neither the case that $\neg\textbf{white}_\exists(s)$ holds (as needed for the sentence to be true) nor the case that $\neg\textbf{green}_\exists(s)$ holds (as needed for it to be false). Thus, we have generated the right kind of truth-value gap, while keeping the benefits of an exhaustification approach to summative predicates, namely the relative strength and weakness observed with and without *and/also*.

4. Truth-value gaps with integrative predicates

Integrative predicates have not been described as involving truth-value gaps or discourse-based weakness.[2] However, if my claim that all predicates have the same composition is correct, a truth-value gap of the same kind is now expected for a sentence like (23).

(23)   *Macbeth* is a tragedy.

(24) represents the view from section 2. A bivalent Exh strengthens *tragedy* to exclude *comedy* and other related predicates, and the sentence would simply be false if *Macbeth* was not exclusively a tragedy.

(24) $[\![\text{Exh}_{\text{ALT}} \, [(23)]]\!] = 1$ iff $\textbf{tragedy}(m) \wedge \neg\textbf{comedy}(m) \wedge \neg\textbf{epic}(m) \wedge \neg \ldots$

But this must be incorrect, since we have replaced Exh with Pexh. With Pexh, we expect a truth-value gap:

(25) $[\![\text{Pexh}_{\text{ALT}} \, [(23)]]\!] = \begin{cases} 1, \text{ iff } \textbf{tragedy}(m) \wedge \neg\textbf{comedy}(m) \wedge \neg\textbf{epic}(m) \wedge \neg \ldots; \\ 0, \text{ iff } \neg\textbf{tragedy}(m); \\ \#, \text{ otherwise} \end{cases}$

Specifically, if *Macbeth* was a tragicomedy, (23) would be neither true nor false according to (25). This is because it would not be the case that $\neg\textbf{comedy}(m)$ held, as needed for the sentence to the true (recall from section 2 that **comedy** is a broad set including mixed-genre works like tragicomedies), and it would also not be the case that $\neg\textbf{tragedy}(m)$ held, as needed for it to be false. More generally, a truth-value gap is predicted when two same-domain predicates are true of an individual, but only one predicate is actually asserted—an under-informative predication.

In this section, I give two reasons to think that this prediction is borne out; integrative predicates behave like summative ones as far as truth-value gaps and discourse-based weakness are concerned. To avoid complications arising from the existence of the lexical item *tragicomedy*, I will use sentences with *car* (26) rather than examples with *comedy* or *tragedy*. It is predicted that *car* should give rise to neither truth nor falsity if predicated of a hybrid car-boat vehicle:

(26) $[\![\text{Pexh}_{\text{ALT}} \, [\text{this} \, (a) \, \text{is a car}]]\!] = \begin{cases} 1, \text{ iff } \textbf{car}(a) \wedge \neg\textbf{boat}(a) \wedge \neg\textbf{train}(a) \wedge \neg \ldots; \\ 0, \text{ iff } \neg\textbf{car}(a); \\ \#, \text{ otherwise} \end{cases}$

We know that *car* and *boat* are alternatives for the predicate-exhaustification effect under discussion, since these predicates require *also* to be co-predicated:

(27)   A: What kind of vehicle is this?
        B: It's a car that's #(also) a boat.

4.1. Argument 1: Well-*responses*

Križ (2015) suggests that *well*-responses are a marker of a sentence lacking a truth-value. He gives examples like (28) for truth-value gaps in plurals; A's statement (by hypothesis) is true if all the children are singing, false if none of them are, and neither true nor false if only some of them are singing.

(28)   A: The children are singing.
        B: {Well, ??No, #Yes}, half of them are.

Furthermore, at least in these simple discourses (see the Appendix), *well* is not possible with sentences that are outright true or false. If A asserts that a car is a car, *well* is a bad response (29a); if A asserts that a book is a car, *well* is also a bad response (29b).

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[2] My claim that integrative predicates have not been described as displaying discourse-based weakness should not be taken to deny that they have correctly been described as involving some vagueness in reference. For instance, what counts as a 'plant' depends on whether one is writing a biology paper or engaging in everyday conversation. But this vagueness in the meaning of *plant* isn't a case of QUD-dependency like we observed with summative predicates.

(29) a. A: This is a car.   (#*well* to a TRUE sentence)
         B: #Well, it is indeed a car.
      b. A: This is a car.   (#*well* to a FALSE sentence)
         B: #Well, it's a book.

Thus, if integrative predicates have truth-value gaps like plural predication and summative predicates, we predict that *well* should be an acceptable response to an under-informative predication. It is:

(30) A: This is a car.
      B: Well, it's a car that's also a boat.

The *well*-response shows that A's statement is neither true nor false.

An Appendix to this paper discusses in more detail the use of *well* as a marker of a previous sentence lacking a truth-value, suggesting that the test is valid, but less straightforward than presented here.

4.2. Argument 2: Discourse-based weakness

If there are truth-value gaps in under-informative integrative predications, we expect Križ's mechanism for discourse-based weakness to kick in even with integrative predicates. Recall that Križ (2015) argues that sentences that are neither true nor false can be uttered as 'true enough' if the QUD is such that their usage correctly identifies the cell containing the world of utterance. If so, we expect that for a car-boat hybrid, the effability of (31), which is neither true nor false in this situation, should hinge on the QUD.

(31)   This is a car.

In fact, sentences like (31) display QUD-dependency just as expected. Let's start with an example where *car* is exclusive of other vehicles:

(32)   SCENARIO: *We are trying to sort various objects according to what they are.*
          A: [*about a car-boat*] What kind of vehicle is this?
          B: #This is a car.
          C: Well, it's a car that's also a boat.

But we observe different meaning with a different QUD. In (33), the QUD (not explicitly uttered) is 'Is this a vehicle we can drive (on a road)?' This time, (31) is fully acceptable about a car-boat hybrid:

(33)   SCENARIO: *A and B just robbed a bank and are looking for anything to drive away in.*
          A: We need to find a car!
          B: [*about a car-boat*] Here, this is a car!
          A: Yes, great, let's go!

While the car-boat does not count as a car for the purposes of organizing artefacts (32), it does count as a car for the purposes of driving (33). This is exactly the QUD-dependency we expect on Križ's theory if there is a truth-value gap in (31).

5. Conclusion

Summative and integrative predicates are both interpreted as strong or weak in the same environments, motivating an unified analysis. Specifically, both classes of predicates undergo ultra-local exhaustification vis-à-vis conceptually related predicates (Paillé 2022). Thus, while summative and integrative predicates differ in whether they lexically refer to part-structure, they undergo the same semantic composition.

This paper has discussed two apparent challenges to this unified perspective. The literature has discussed truth-value gaps and discourse-based weakness ('non-maximality') with summative predicates, but has never pointed to a parallel with integrative predicates. In fact, for summative predicates (and other quantificational expressions like plural predication), truth-value gaps and discourse-based weakness are usually discussed explicitly in terms of part-quantification, making it a non-starter to ask whether

integrative predicates display these properties too. Yet, since both of these properties arise post-lexically for summative predicates, the assumption that summative and integrative predicates involve the same post-lexical processes predicts that integrative predicates should behave identically.

I argued that a unified semantics should be maintained for summative and integrative predicates. Once we know what kind of data to look at, we can indeed observe truth-value gaps and discourse-based weakness in integrative predications. Assuming the unification of summative and integrative predicates led us to a correct description of the data, clarifying the formal properties of predicates as a class.

Appendix: Using *well* to detect truth-value gaps

Part of the argumentation for truth-value gaps in integrative predication involved the view that *well*-responses mark a previous sentence as neither true nor false, as observed in (34), repeated from (28).

(34)   A: The children are singing.
       B: {Well, ??No, #Yes}, half of them are.

How reliable is this test? In fact, the literature on *well* (see e.g. Svartvik 1980, Carlson 1984, Bolinger 1989, Jucker 1993, Schourup 2001, Cuenca 2008, Kirk 2018) has identified numerous examples where *well* does not intuitively involve the indication that a previous sentence is neither true nor false, including in sentences with overt agreement (35a) and other non-corrective continuations (35b), and in answers to questions (35c).

(35)   a.   A: Marie looks lovely tonight.   (Schourup 2001: 1027, 1034, 1053)
            B: Well so she does!
       b.   I knew something wasn't quite kosher so I decided to wait a little longer. Well, about five o'clock I heard someone knock, and . . .
       c.   A: What's 221 divided by 13?
            B: Um, let me think. [*Thinks silently for a moment.*] OK, that'd be 17.
            A: How did you work it out?
            B: Well first I divided 13 into 22. Then . . .

Still, Križ's test, while not foolproof, essentially works once we control for other possible uses of *well*.

Schourup (2001) suggests common-sensically that *well*'s meaning is to mark "on-the-spot, pointedly epistemic consideration prefatory to continuation" (p. 1056). By using *well*, the speaker makes a show of thinking over what they are about to say. Good examples of this include (35b) and (35c). For (35a), while 'consideration' is not quite the right notion (*well* marks more on-the-spot epistemic revelation than consideration), it is still unified with the other examples for its on-the-spot epistemic INVOLVEMENT. Shourup's view also explains repeated uses of *well* like (36) (my example): "repeating *well* could be used to indicate quickly successive mental acts of assessment, suggesting, iconically through repetition, that there are various matters the speaker must attend to and process" (Schourup 2001: 1047).

(36)   Well, well, well, what do we have here.

On the view that *well* marks epistemic consideration (or more generally involvement), the pragmatic role played by *well* can vary significantly from one sentence to another. There are many reasons why one might choose to mark one's speech as considered, and *well* may show up for equally many reasons (Schourup 2001: 1057). I suggest that responding to a previous sentence that is judged to be neither true nor false like in (34) is simply one of the reasons one might use *well*. The idea is simple: given that the previous speaker A has uttered something that is neither true nor false, B cannot simply accept or reject it, and therefore B preposes their response with *well*. One could hypothesize that the speaker must engage in more deliberation precisely because they are trying to judge the sentence as true or false, and cannot come to a decision.[3]

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[3] Another proposal in the literature on *well* that would predict *well* to be a good response to neither-true-nor-false sentences comes from Svartvik (1980) and Jucker (1993), and relies on the view that the all-or-nothing effect observed with summative predicates and plural predication is presuppositional (see section 3.1.1). The Svartvik–Jucker proposal is that *well* marks a modification to or deviance from the common ground. For Svartvik (1980: 177), *well* marks that

This much shows how Križ's datapoint (34) fits with the more general meaning of *well*. But to use *well* as a diagnostic for a neither-true-nor-false sentence in our test example (37), we must show that we can eliminate other reasons why *well* could be used there.

(37)   A: This is a car.
       B: Well, it's a car that's also a boat.

Is there anything else in (37) that could have prompted B to mark epistemic consideration? If nothing can be found, *well* must be used due to a truth-value gap, making Križ's test usable. Let's go through minimal pairs, comparing (37) with (38) (repeated from (29)):

(38)   a.   A: This is a car.
            B: #Well, it is indeed a car.
       b.   A: This is a car.
            B: #Well, it's a book.

Both (37) and (38) contextualize the discourse just as much (or just as little), and involve similar types of sentences with similar predications. But B can mark on-the-spot epistemic consideration in (37) but not (38). Why might one response involve more consideration than the other? The most obvious answer is that in (37) but not (38), B cannot straightforwardly take A's statement to be true or false.

This is in contrast to the examples where it is clearly unappealing to view *well* as marking a previous sentence as neither true nor false, such as (39) (repeated from (35a)), where it is easy to think of other reasons why B might mark their response as involving on-the-spot epistemic consideration.

(39)   A: Marie looks lovely tonight.
       B: Well so she does!

With *well* (and only with *well*), there is a suggestion in B's statement that it is new information to B that Marie looks lovely; B just noticed this. B uses *well* to communicate this on-the-spot epistemic revelation (similar to 'oh!'). As written above, the notion of 'consideration' is not quite right for this example, showing that *well* is really more generally about on-the-spot epistemic involvement. Crucially, no such explanation for the use of *well* can be given to (37), where *well* does not communicate any on-the-spot epistemic change on B's behalf.

Finally, there is another hypothesis we should consider for why *well* is felicitous in (37): it could be that B takes A's statement to be false, but finds the falsity more flagrant in (38a) than in (37). Indeed, while all false statements can be answered with *no*, a pragmatic 'degree of falsity' determines whether a given false statement can be preposed with *well*:

(40)   A: How many moons does Saturn have?
       a.   B: It has 150 moons.
            A: {No, Well}, it has 145.[4]
       b.   B: It has 3 moons.
            A: {No, #Well}, it has 145.

The difference between (40a) and our test case (37) is not in the acceptability of *well*, but of *no*. *No* is clearly acceptable with false sentences of any degree of outrageousness (40), but is very marked for (37):

"the speaker is going to . . . modify one or more assumptions or expectations which have formed the basis of discourse so far"; for Jucker (1993: 438), it marks that "the addressee has to reconstruct the background against which he can process the upcoming utterance" because "what seems to be the most relevant context is not appropriate." It therefore makes sense that *well* should be usable in (34): speaker A presupposes that all or none of the children sang, attempting to put this entailment in the common ground; B takes issue with this, and uses *well* to mark a deviance from this attempted new common ground. The problem for this proposal, as noted by Schourup (2001), is that not all uses of *well* involve deviance from the common ground, as seen in all three examples in (35).

[4] 145 is the most up-to-date count. Hannah Devlin and Nicola Davis, "Saturn regains status as planet with most moons in solar system." *The Guardian*, May 12, 2023. Accessed online June 21, 2023.

(41)   A: This is a car.
        B: #No, it's a car that's also a boat.

Thus, it is better to analyze the *well* in (37) as marking A's statement as neither true nor false, than as marking A's statement as non-outrageously false.

In sum, while *well* is not an immediately reliable test to find neither-true-nor-false sentences, it is still possible to go through possibilities for why *well* is intuited as felicitous in some examples and not others. To arrive at the conclusion that A's statement in (41) (uttered of a car-boat hybrid) is neither true nor false, I have shown that *well* is felicitous, that *no* is infelicitous, and that there is no other clear explanation for why B might choose to mark on-the-spot epistemic consideration. I therefore maintain that under-informative integrative predications result in sentences that are neither true nor false.

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