Exhaustivity and the Meaning of Colour Terms

Mathieu Paillé
McGill University

1. Introduction

A simple observation about colour terms is that they usually mean 'entirely of a colour': that is, (1) means the flag is all red. It would be false to say it about the flag of France, for example.

(1) The flag is red.
$\approx$ completely red

The seemingly obvious conclusion is that colour terms are lexically *total* rather than *partial*, to borrow terminology from Yoon (1996). This is defined in (2) for 'red.'

(2) a. TOTAL COLOURS
$[\![\text{red}]\!] = \lambda x.\ \forall y[y \sqsubseteq x \rightarrow \text{red}(y)]$
b. PARTIAL COLOURS
$[\![\text{red}]\!] = \lambda x.\ \exists y[y \sqsubseteq x \wedge \text{red}(y)]$

Taking colour terms to be total also makes the contradictory effect of sentences like (3) unsurprising.

(3) #The white flag is green.

(3) means that the *entirely* white flag is *entirely* green, and therefore it is contradictory, as expected if colour terms' lexical meaning is total.

In spite of these first appearances, I argue that colour terms' lexical meaning is in fact partial. Under this hypothesis, the total reading is the result of exhaustification, as proposed by Levinson (1983). While the view that colour terms' totality is the result of exhaustivity is not new, I will further show that the neo-Gricean implicature-based account of exhaustivity makes a number of wrong predictions. In particular, colour terms' exhaustivity needs to be calculated locally to the lexical item by a grammatical Exh(haustivity) operator (Chierchia et al., 2012), as in (4).

(4) The flag is [Exh_{ALT} red_F].

Since non-local readings are unattested, the exhaustification of colour terms behaves in a hitherto undescribed manner. As we will see, the fact that colour terms' totality is necessarily calculated close to the lexical item often gives totality the appearance of being lexical.

This paper is organized as follows. In section 2, I lay out previous discussion about colour terms' lexical meaning, which has focused on the conjunction of colour terms and whether or not it shows that colour terms are partial. The answer that Krifka (1990) gives is that conjunction in fact does *not* show this. We are left with no argument for partiality, making lexical totality the simplest hypothesis. However, in section 3, I provide new evidence for partial colour terms, both by showing that conjunction

* I thank Luis Alonso-Ovalle and Bernhard Schwarz for all their help throughout this project. I also thank Nadine Bade, Masashi Harada, Marcin Morzycki, Andrés Salanova, Uli Sauerland, Junko Shimoyama, and Michael Wagner for helpful discussion, as well as the audience at McGill's Syntax–Semantics reading group and WCCFL 38 at UBC, and anonymous reviewers for WCCFL 38 and SALT 30. All errors are my own. This research is supported by a Vanier Canada Graduate Scholarship.

Cascadilla Proceedings Project
Completed August 19, 2020

data in fact do provide an argument for partiality, and by presenting an empirically new pattern where the additive particle *also*, not just *and*, makes colours terms' partial meaning visible. Upon accepting that colour terms are lexically partial, in section 4, I ask why they usually display the stronger total meaning. I show that a neo-Gricean account of exhaustivity fails to handle much of the data; a grammaticalized (local) exhaustivity operator Exh is needed instead (Chierchia et al., 2012). I further show that not only *can* the totality inference be calculated locally, but in fact it *must*. Finally, in section 5, I show that the novel data on additive particles and their interaction with colour terms is predicted by the account of colour terms' totality as exhaustification, if taken together with Bade's (2016) theory of obligatory additives.

2. Conjoined colours: evidence for partiality?

So far, the literature on colour terms has largely focused on minimal pairs like (5): 'white' means 'entirely white' in (5a), but in (5b), it clearly does not.

(5) a. The flag is white.
$\approx$ completely white
b. The flag is white and green.
$\not\approx$ completely white

For Levinson (1983), what these data show is that the apparent totality of colour terms in (5a) is an illusion; the conjunction in (5b) shows that colour terms are actually lexically partial. He goes on to argue that the total meaning in (5a) arises from an implicature.

However, for Krifka (1990), these data do not show this at all. He keeps colour terms lexically total, and explains conjunctions like (5b) by using a posited non-Boolean *and*. If Krifka is right, the data point Levinson uses to show that colour terms are partial does not in fact show anything about colour terms at all. Telling whether colour terms are lexically partial or total, then, comes down to seeing whether putting the explanatory burden on a non-Boolean *and* yields the right results.[1]

2.1. Krifka's non-Boolean conjunction

Krifka's argument is based on a parallel between the colour data in (5) and data with plural subjects. First notice that the distributivity of predicates like *bark* or *crow* (for example) is akin to the totality of colour adjectives, as in (6). But this totality disappears with conjunction, as in (7).

(6) The animals barked.
$\approx$ they all barked

(7) The animals barked and crowed.
$\approx$ some barked, others crowed
(cf. Krifka 1990:165)

In (7), *barked* and *crowed* are read as 'partial': some (not all) animals barked, others crowed, but no animal did both. Interpreting *and* in this way is forced in this example due to the world knowledge that some animals bark (e.g. dogs) and others crow (e.g. roosters) but no animal vocalizes in both ways. What

[1] Lasersohn (1995) proposes a third way to handle the conjunction data. He explains (5b) by arguing that these colour terms are nouns, as opposed to the adjective in (5a). However, the same judgments as in (5) also hold in French, which can morphologically mark the colour terms in (5b) as in fact being adjectives: they can agree with the subject. For this reason, Lasersohn's argument is insufficiently general.

(i) a. La chambre est blanche.
the.F room.F is white.F
'The room is white.'
b. La chambre est verte et blanche.
the.F room.F is green.F and white.F
'The room is green and white.'

is striking in these data is that they display a total–partial contrast that behaves just like colour terms': there is totality with the bare predicates, but partiality with the conjoined predicates.

For Krifka (1990), the partiality effect in (7) is the result of a non-Boolean conjunction: not the logical intersective *and*, but rather a conjunction which joins entities or predicates. There is independent evidence that *and* here is non-Boolean, since the conjoined predicates cannot distribute over their argument. (7), which is felicitous, is not equivalent to (8), which is not.

(8) #The animals barked and the animals crowed.

Krifka argues that non-Boolean *and* makes reference to parts of the plural subject, so that one predicate (*barked*) applies to one part, and the other (*crowed*) to the other:

(9) $\exists x, x'[\text{the.animals} = x \oplus x' \wedge \text{barked}(x) \wedge \text{crowed}(x')]$
(Krifka, 1990:165)

This captures the intuited meaning that the animals are partitioned between those who barked, and those who crowed.

2.2. Krifka's total colours

From the total–partial contrast of predicates like *bark* and *crow* in sentences with plural subjects, it is only a small step for Krifka to assume that non-Boolean *and*'s partitioning effect can apply to atomic individuals too – not just pluralities like the one expressed by *the animals*. That is, it is reasonable to assume from the above that it's not only with plural arguments that non-Boolean *and* can refer to parts of the argument; this also happens with atomic arguments. To foreshadow my subsequent discussion, I emphasize that while it is a small step, nonetheless it does constitute a new assumption.

As such, Krifka deals with conjoined colours in the same way as he deals with animals barking and crowing: by claiming that the conjunction makes reference to parts of the argument. Hence, (10) has the truth conditions in (11) (Krifka, 1990:165).

(10) The flag is green and white.

(11) $\exists x, x'[\text{the.flag} = x \oplus x' \wedge \text{green}(x) \wedge \text{white}(x')]$

In other words, the flag is made up of two parts, the one entirely green and the other entirely white. Of course, this is correct as a description of the truth conditions, but what is important is that Krifka arrives there by predicating colours in a total way of parts of the flag, rather than predicating colours in a partial way of the entire flag. Indeed, central to Krifka's reasoning is an assumption that colour terms are total: "green and white are contradictory" (Krifka, 1990:187). From this perspective, there is no way around having a non-Boolean *and* in (10).

At this point, it seems that conjunction data like in (5), used by Levinson (1983) to argue that colour terms are lexically partial, do not in fact provide evidence of colour terms' partiality: it is possible to account for the conjunction data while adhering to total colours.

3. New arguments for partiality

In this section, I provide two arguments in favour of lexical partiality for colour terms. First, I argue in section 3.1 that colour conjunctions are felicitous (non-contradictory) even when Boolean. In fact, they can even be argued to always be Boolean. Hence, Levinson's (1983) argument for partiality is back in force: if colour terms were total, they would lead to infelicity when conjoined with a Boolean *and*. The second argument for colour terms' partiality, provided in section 3.2, comes from the fact that multiple colour terms can be predicated of an argument not only through conjunction, but also by way of an additive particle, namely *also*.

3.1. Colour term conjunctions are in fact Boolean

I start with arguments that *and* in sentences like (10), where conjoined colour terms are predicated of an atomic subject, is in fact Boolean. That is, it does not refer to parts of the atomic subject, predicating one conjunct of one part, the other conjunct of the other. We see this first by controlling for a Boolean reading of the conjunction by using *both*, and second, by using modifiers like *completely* to see whether the colour conjunctions remain acceptable when the conjuncts are made explicitly total. The conclusion of these tests is that *and* in colour conjunctions is Boolean. As such, we cannot put the burden on *and* to capture the partiality of colour terms in examples like (10). This shows that colour terms are lexically partial, as Levinson (1983) argues.[2]

3.1.1. An explicitly Boolean conjunction

My first argument is based on the observation that whether or not *and* is Boolean can be tested by whether it allows *both*. Indeed, *both* can be added to a Boolean conjunction as in (12a), but not a conjunction like (12b) that is necessarily interpreted as non-Boolean (here, due to world knowledge of animals). The subjects in (12) are quantified with *five* in order to avoid an irrelevant reading where *both* quantifies over the subject rather than the predicates.

(12) a. Boolean *and*
The five students are (both) tall and happy.
b. Non-Boolean *and*
The five animals (#both) barked and crowed all night.

The crucial point is that the non-Boolean *and* in (12b) rejects *both*. We therefore predict that, if colour conjunctions are only ever non-Boolean, as argued by Krifka (1990), they too should be rendered contradictory by the inclusion of *both*. But in fact, *both* is felicitous with conjoined colour terms:

(13) The flag is (both) white and green.

That is, it is possible for the *and* in conjoined colour terms to behave like the Boolean *and* in (12a). Hence, a Boolean interpretation of this conjunction must at least be available. Since a Boolean conjunction does not lead to a contradiction, colour terms must be lexically non-contradictory with one another: they must be partial.

3.1.2. Explicitly total conjuncts

We just saw that a Boolean interpretation of colour conjunction is at least available; we will now see that it is in fact the only possible interpretation. Recall that Krifka's view is that colour conjunctions involve total colours predicated of parts of the subject, rather than partial colours predicated of the subject as a unit. Hence, if there is a way to make it explicit that the conjuncts are total, Krifka predicts that doing this should not affect the acceptability of the conjunction. It turns out that there are indeed ways to make totality explicit. Predicates can be modified with lexemes like the maximizer *completely* or the universal *all*; call these 'totalizers.' I will show that Krifka's prediction does not go through: with an atomic subject, adding totalizers to colour conjuncts results in an outright contradiction. This is in contrast to plural subjects, where the non-Boolean reading is indeed available, as in (7).

Totalizers provide partial predicates with a total reading, while also felicitously modifying total predicates and maintaining their totality. Hence, they can apply to either partial or total predicates, and the result is always a semantically total phrase. To see this, consider for instance the partial predicate *dirty* and its total antonym *clean*. We know they are partial and total respectively because *x* is *dirty* as long as part of *x* is dirty, but for *y* to be *clean* it must be entirely clean (Yoon, 1996):

(14) a. The chair is dirty.
$\approx$ at least part of it is dirty
b. The chair is clean.
$\approx$ all of it is clean

When modified with *completely* or *all*, *dirty* becomes 'total' insofar as *x* must be entirely dirty (all parts

[2] To give as much power to Krifka's argument as possible, I am putting aside debate about whether or not a non-Boolean *and* even exists (Schmitt, 2019).

of it must be dirty) for it to be true:

(15) a. The chair is all dirty.
 b. The chair is completely dirty.

Hence, totalizers make partial predicates total. Crucially, they are also felicitous with total predicates. When modifying these, they introduce a slight change in meaning having to do with the granularity of the judgement (Sassoon & Zevakhina, 2012; see also the commentary in Rotstein & Winter, 2004:283); what matters for our purposes is that the predicate remains total.

(16) a. The chair is all clean.
 b. The chair is completely clean.

Thus, regardless of whether they modify a predicate P that is lexically partial (15) or total (16), *completely* and *all* mean that all parts of P's argument is P.

To tell whether the *and* in colour conjunctions is Boolean or not, we can test whether it is possible to totalize each colour term in the conjunction. Recall that the way Krifka obtains the truth conditions in (17), repeated from (11), is by having each colour term predicated in a total way of one part of a partitioned flag (rather than having each colour term predicated in a partial way of the entire flag).

(17) $\exists x, x'[\text{the.flag} = x \oplus x' \wedge \text{green}(x) \wedge \text{white}(x')]$

Each colour term should be totalizable (Krifka assumes they are already lexically total), with the meaning left unchanged for all practical purposes. In line with Krifka's discussion of (7), totalizing each conjunct is acceptable when the subject is plural, resulting in an interpretation where the conjunction refers to parts of the subject.

(18) a. The animals are completely brown and completely grey.
 b. The animals are all brown and all grey.

(18) means that some animals are entirely brown (and not grey), others are entirely grey (and not brown). Note that the colour terms apply in a total way to the atomic individuals that make up the plurality. Following Krifka, the sentences in (18) have the following truth conditions, thanks to the non-Boolean *and*.

(19) $\exists x, x'[\text{the.animals} = x \oplus x' \wedge \text{completely.brown}(x) \wedge \text{completely.grey}(x')]$

The question now is whether Krifka is right to have this non-Boolean meaning carry over to cases where the subject is an atomic individual rather than a plural. But in fact, totalizing conjuncts with an atomic subject leads to a sharp contradiction:

(20) a. #That flag is completely green and completely white.
 b. #That flag is all green and all white.

Both sentences in (20) mean that the entire flag is simultaneously of both colours. Yet, to reiterate, if (17) (where colours are total) was a possible representation, (20) would felicitously mean that one part of the flag is completely green, and the other completely white – just like (19) with a plural subject. Apparently, it is not possible for a non-Boolean *and* to refer to parts of atomic individuals in the way Krifka (1990) had in mind. Given that colour conjunctions are non-contradictory even with atomic subjects, which can't be broken up into mereological parts by the conjunction itself, there is no way to capture this non-contradictoriness other than to accept that colour terms are in fact lexically partial.

3.1.3. Interim summary

I have argued that conjunction data like (5b) and (10) do in fact show that colour terms are lexically partial (Levinson, 1983). They can be conjoined non-contradictorily using a Boolean conjunction, as evidenced by the acceptability of adding *both*; in fact, colour conjunctions with atomic subjects are necessarily Boolean, as evidenced by the unacceptability of totalizing the conjuncts.

3.2. Partiality with additive particles

The second piece of evidence for taking colour terms to be lexically partial comes from their behaviour with additive particles. In line with the assumption that colour terms are total, a contradiction obtains when we try to predicate more than one (non-conjoined) colour term of an argument:

(21) #The white flag is green.

But what is surprising is that it is possible to rescue sentences like (21) with an additive particle:

(22) The white flag is also green.

To be sure, (22) requires a scenario explaining why *white* is presupposed but *green* is asserted. An example scenario could be that we're at a plant that specializes in recycling different cloths, and these must be sorted by colour first. There is a pile of flags that are all at least partially white, though a few are both white and green. The boss tells a worker that they need to remove all the green parts from the otherwise white flags:

(23) Some of the white flags are #(also) green, so I want you to cut off the green parts.

More conversational examples like (24) and (25) are also straightforwardly good:

(24) A: The flag is completely white.
B: No, it's also green.

(25) A: The flag is white.
B: Yes, but it's #(also) green.

Again, an additive can rescue a sentence that would otherwise come across as contradictory (or in the case of (24), have the unintended meaning that the flag is entirely green).

It's hard to see how one would deal with such data if colour terms were total. When a sentence is given an additive, it presupposes that there is another true and prominent sentence differing only in the focused associate of the additive (Kripke 2009[1990]; Heim 1992; Bade 2016). In (26), for example, *also* gives the sentence "John walks" the presupposition that someone else walks; this is verified in (26) because the context establishes that Mary walks.

(26) Mary walks. John$_F$ also walks.

The important point is that additives do not affect the assertion. But if colour terms were lexically total, this meaning would be part of the assertion and therefore left unaffected by additives. And indeed, the way *also* behaves with colour terms contrasts sharply with real lexical contradictions, which cannot be fixed by *also*:

(27) a. #Some bachelors are also married men.
b. #The closed door is also open.
c. A: The door is closed.
B: #Yes, but it's also open.

In conclusion, the fact that additives let colour terms be interpreted as partial means they can't be lexically total.

3.3. Interim conclusion and moving forward

Recall that Levinson (1983) uses conjunction data like (28b) to argue that colour terms are lexically partial, but Krifka (1990) argues such data can be dealt with by a non-Boolean *and*.

(28) a. The flag is white.
$\approx$ completely white
b. The flag is white and green.
$\not\approx$ completely white

In this section, I gave evidence that *and* in (28b) is in fact Boolean, so (28b) actually does show us that colour terms are partial. I also gave additional evidence against lexical totality by showing that *also* allows for more than one colour term to be predicated of an argument. The conclusion is that colour terms are lexically partial; the remaining puzzle is to account for how total readings come about.

4. Deriving totality in the meaning of colour terms

With Levinson (1983), I argue that the totality intuited in examples like (28a) is the result of exhaustivity. However, a neo-Gricean account of exhaustivity is problematic in two ways. First, it runs into problems in regards to the alternatives to the asserted colour term. Second, and arguably more fundamental, colour terms' meaning needs to be calculated locally, rather than based on entire sentences. Hence, we need a semantic exhaustivity operator Exh (Chierchia et al., 2012), which can be embedded. However, totality behaves in a surprising way even for the grammatical theory of exhaustivity of Chierchia et al. (2012), since not only *can* the exhaustivity be local, in fact it *must*. Theoretically, this is unexpected; what is more, this means that colour terms' totality, while not lexical, effectively imitates lexical meaning in necessarily being calculated close to the lexical item.

4.1. Colour terms' alternatives

Levinson (1983:106) attributes the strengthening of '(partially) white' to mean 'totally white' in (28a) to the first sub-maxim of Quantity:

(29) **The maxim of Quantity** (Levinson, 1983:101)
a. Make your contribution as informative as is required for the current purposes of the exchange.
b. Do not make your contribution more informative than is required.

As Levinson (1983:106) explains, "Since I have given no further information about other colours the flag may contain, . . . I may be taken to implicate that the flag has no other colours and is thus wholly white."

Levinson does not elaborate more than this, but presumably the alternatives for the neo-Gricean account involve conjoined colour terms, since these are logically stronger than the assertion.

(30) The flag is WHITE.
$\rightsquigarrow$ ¬The flag is WHITE AND BLUE.
$\rightsquigarrow$ ¬The flag is WHITE, GREEN AND YELLOW.
$\rightsquigarrow$ etc.

Given the assertion that the flag is white, and the implicatures that the flag is not white and some other colour, then it must be only white.

However, this is already problematic from a modern neo-Gricean perspective. Katzir (2007) argues that alternatives are at most as complex as the sentence itself. From this perspective, the alternatives must really be other non-conjoined colour terms:

(31) The flag is WHITE.
$\rightsquigarrow$ ¬The flag is BLUE.
$\rightsquigarrow$ ¬The flag is GREEN.
$\rightsquigarrow$ etc.

But we are now negating alternatives that are not logically stronger than the assertion, contrary to the neo-Gricean norm.

4.2. Totality is computed locally

In addition to the issue of the alternatives, a number of examples are deeply puzzling from a neo-Gricean perspective due to the scope of exhaustivity. Since the neo-Gricean approach takes exhaustivity to the a pragmatic phenomenon (it is a quantity implicature), it must be calculated based on entire sentences. But I show below that totality is computed in embedded contexts; hence, it needs to be explained using a grammatical theory of exhaustivity (Chierchia et al., 2012). Under the grammatical theory, strengthening comes from an operator, Exh, which asserts that its prejacent is true and all alternative propositions that are not entailed by the prejacent are false.

(32) $[\![\text{Exh}_{\text{ALT}}(\text{S})]\!]^{w} = 1$ iff $[\![\text{S}]\!]^{w} = 1$ and $\forall\varphi \in \text{ALT}\ (\varphi(w) = 1 \rightarrow [\![\text{S}]\!] \subseteq \varphi)$
(Chierchia et al., 2012:2304)

In fact, using Exh rather than the maxim of Quantity also fixes the issue of alternatives that was a problem for the neo-Gricean account: as defined in (32), Exh negates all non-entailed alternatives, rather than only stronger ones. Thus, colour terms' alternatives can now non-problematically be bare (non-conjoined) colour terms.

It is not just the case that colour terms' totality *can* be embedded, however. As it turns out, in all cases where a difference in meaning between local and non-local exhaustivity is predicted to be observable, we find that Exh *must* be local to the colour term. By extrapolation, I assume this also occurs in simple sentences.[3] The local-only Exh is schematized in (33). To be sure, Exh is defined in (32) as a propositional operator, but is written out as only taking an adjective in (33); we can either assume that Exh is in fact type-flexible, or that 'white' in (33) is given a null subject (cf. Heim & Kratzer, 1998:sec. 8.5).

(33) $[\![$The flag is [Exh_{ALT} white$_F$].$]\!]$
= The flag is [white & not blue & not red & . . .]
≈ The flag is completely/only white.

To see this, I first discuss the scope of Exh compared to some other operator, and then turn to a subset of such scope data, namely cases where colour terms not local to one another yield sentence-internal contradictions rather than being interpreted as partial. If the claims in this paper are accepted, the exclusively local distribution of Exh means that the exhaustification of colour terms behaves in a way that has not been previously described.

4.2.1. Scope vis-à-vis other operators

Let us first observe Exh's locality to colour terms by testing its height in relation to unrelated operators. The example I will focus on involves a sentence with a quantified subject:

(34) Every flag is blue.

The only attested meaning of (34) is that all flags are entirely blue. Yet, a global calculation of exhaustivity (whether neo-Gricean or with a global Exh) generates the following meanings (abstracting away from colours other than blue, white, and red).

(35) Every flag is blue &
¬[Every flag is white] &
¬[Every flag is red].

In other words, the assertion is that all flags are partly blue; and the exhaustification amounts to meaning

[3] The only case where Exh has to be interpreted not entirely locally to the colour term is the conjunction data we have looked at. Colour conjunctions must be exhaustified as a unit rather than each conjunct being individually exhaustified, which would result in a contradiction. I leave for future work the question of how locality is to be defined exactly. One could claim, for example, that Exh must appear within a projection of the lexical item, so that, on the assumption that conjunctions inherit the category of their conjuncts, having a single Exh for the whole conjunction would suffice.

that for any other colour c, not all flags are partly of the colour c. This would be true and felicitous if all flags were only half blue, with some flags half red and the rest half white. Clearly this is not intuitively the meaning of (34): global exhaustification creates a meaning that is unattested. What is needed to generate the right meaning is locally computed exhaustivity:

(36) ⟦Every flag is [Exh_{ALT} blue_F].⟧
= Every flag is [blue & not white & not red]

4.2.2. Scope vis-à-vis other colour terms

I now turn to a second empirical domain in which to observe Exh's local scope, namely its behaviour in sentences with two non-conjoined colour terms. Such sentences are contradictions, rather than displaying colour terms' partial lexical meaning:

(37) #The blue flags are white.

To obtain a contradiction in (37), we need 'white' to be strengthened to 'completely white' *despite 'blue' also being in the same sentence* (and/or vice-versa). But global exhaustivity cannot do this. It would see that 'white' and 'blue' are both entailed by the sentence, so neither would be negated. That is, a global Exh wrongly creates the non-contradictory (38a), rather than something like (38b).

(38) ⟦Exh_{ALT} [The blue flag is white_F].⟧
a. = The blue flag is white & ¬[the blue flag is red].
b. ≠ The blue flag is white & ¬[the blue flag is blue] & ¬[the blue flag is red].

To create the observed contradiction, at least one of the colour terms must be exhaustified locally, as in (39).

(39) ⟦The blue flag is [Exh_{ALT} white_F].⟧
= The blue flag is [white & not blue & not red] ⇒ contradiction

This is the only way to ensure that Exh does not know that "the flag is blue" is actually entailed by the sentence. All Exh sees in (39) is the adjective *white*, which it therefore strengthens to mean 'not blue.' Crucially, this local Exh must be the only available parse of the sentence. If a non-contradictory parse (i.e. one with a global Exh) was available, we would not intuit a contradiction, choosing the non-contradictory parse over the contradictory one.

In summary, a neo-Gricean account of totality runs into two main problems. First, the set of alternatives to colour terms is predicted by Katzir (2007) to consist of bare colours, but these are not logically stronger than the assertion. Second, and arguably most importantly, it also predicts that exhaustification can (only) be computed globally. But not only is exhaustification of colour terms found in embedded environments, in fact it does not exist at all at the global level. Hence, we need a grammatical Exh operator to compute colours' totality. But the above observations also have a consequence for the grammatical theory of exhaustivity: something must constrain Exh's distribution with colour terms (presumably some other predicates too) to force it to appear locally. I leave this for future research.

5. Additives thwart unwanted exhaustification

I conclude with a brief note on additives. As discussed in section 3.2, additive particles bring colour terms' partial lexical meaning to the surface. However, I have not yet given an explanation of why this is. In fact, accounting for colour terms' totality through exhaustification (whether it stems from Exh or a Gricean maxim) makes the data with additive particles unremarkable, and part of a broader pattern. Recall that *also* makes it possible to predicate more than one colour term of some argument (it is a case of an *obligatory additive*, since the sentences under discussion are infelicitous without it):

(40) The white flag is #(also) green.

Krifka (1998), Sæbø (2004), and Bade (2016) all argue that when additives are obligatory, it is because an unwanted implicature (or unwanted exhaustivity) would arise without the additive. Bade (2016) specifically takes additives to avoid an unwanted Exh. We see this independently in examples like (41). The contrastive topics yield the inference that *ate pasta* applies only to the contrastive topic in its sentence, so that B's saying "John ate pasta" creates the inference that Mary did not, contradicting the previous sentence. But this can be solved with an additive.

(41) A: What did Mary and John eat?
B: Mary ate pasta. John ate pasta #(too).
(Krifka 1998)

Accepting the two premises that obligatory additives serve to avoid unwanted instances of Exh, and that colour terms are lexically partial (and totality is the result of of Exh), it is now unsurprising that *also* can felicitously predicate more than one colour term: it ensures non-exhaustivity. Thus, it is predicted to make colour terms' partial meaning visible.

6. Conclusion

In light of the observation that colour terms' interpretation is sometimes partial and sometimes total, I argued that they are lexically partial (pace Krifka 1990), and their total reading is the result of exhaustivity (Levinson, 1983). The evidence comes from problematic predictions made by accounting for conjunction data by putting the burden on a non-Boolean *and*, and from the fact that *also* can felicitously predicate more than one colour term of an argument. In addition to backing up Levinson's claim that colour terms are partial, I also showed that the exhaustivity must be calculated locally, and never globally. In other words, while colour terms are not lexically total, the totality inference essentially approximates lexical meaning in necessarily being computed locally. This leads to the interesting question of why colour terms' exhaustification behaves this way, which is left for future research.

References

Bade, Nadine (2016). *Obligatory Presupposition Triggers in Discourse: Empirical Foundations of the theories Maximize Presupposition and Obligatory Implicatures*. Ph.D. thesis, University of Tübingen, Tübingen.

Chierchia, Gennaro, Danny Fox & Benjamin Spector (2012). Scalar implicatures as a grammatical phenomenon. Maienborn, Claudia, Klaus von Heusinger & Paul Portner (eds.), *Semantics: An International Handbook of Natural Language Meaning*, De Gruyter Mouton, Berlin, vol. 3, 2297–2331.

Heim, Irene (1992). Presupposition projection and the semantics of attitude verbs. *Journal of Semantics* 9, 183–221.

Heim, Irene & Angelika Kratzer (1998). *Semantics in Generative Grammar*. Blackwell, Malden, MA.

Katzir, Roni (2007). Structurally-defined alternatives. *Linguistics and Philosophy* 30, 669–690.

Krifka, Manfred (1990). Boolean and non-Boolean 'and'. Kálmán, László & László Pólos (eds.), *Papers from the Second Symposium on Logic and Language*, Akadémiai Kiadó, Budapest, 161–188.

Krifka, Manfred (1998). Additive particles under stress. Strolovitch, Devon & Aaron Lawson (eds.), *Proceedings of SALT 8*, Cornell University, Ithaca, NY, 111–129.

Kripke, Saul A. (2009[1990]). Presupposition and anaphora: Remarks on the formulation of the projection problem. *Linguistic Inquiry* 40:3, 367–386.

Lasersohn, Peter (1995). *Plurality, Conjunction and Events*. Kluwer Academic Publishers, Dordrecht.

Levinson, Stephen C. (1983). *Pragmatics*. Cambridge University Press, Cambridge.

Rotstein, Carmen & Yoad Winter (2004). Total adjectives vs. partial adjectives: Scale structure and higher-order modifiers. *Natural Language Semantics* 12, 259–288.

Sæbø, Kjell Johan (2004). Conversational contrast and conventional parallel: Topic implicatures and additive presuppositions. *Journal of Semantics* 21, 199–217.

Sassoon, Galit & Natalia Zevakhina (2012). Granularity shifting: Experimental evidence from degree modifiers. *Proceedings of SALT 22*, 226–246.

Schmitt, Viola (2019). Pluralities across categories and plural projection. *Semantics & Pragmatics* 12, 1–49.

Yoon, Youngeun (1996). Total and partial predicates and the weak and strong interpretations. *Natural Language Semantics* 4, 217–236.