Homogeneity, Non-Maximality, and *all**

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Abstract This paper develops a theory of the non-maximal readings of sentences with plural definite descriptions that treats them as a pragmatic phenomenon that arises from the context-dependent interaction of the well-known homogeneity property of plural predication on the one hand with independent pragmatic principles on the other. This allows us to, among other things, explain the dual effect of *all*: as a matter of its semantics, it removes the homogeneity property, but because that is one of the necessary ingredients for non-maximal readings, the function of *all* as a maximiser/"slack regulator" emerges as a consequence.

Keywords plurals, homogeneity, polarity, non-maximality, imprecision, pragmatic slack

1 Introduction

Sentences with definite plural noun-phrases[1] are, among other things, known for the two notable phenomena of *non-maximality* and *homogeneity*.

Following Brisson (1998), we use the term *non-maximality* to describe the phenomenon where such sentences often seem to allow exceptions.[2] (1) can often be felicitously used to describe a situation even if there are, in fact, some townspeople who are still awake (example from Lasersohn 1999).

(1) The townspeople are asleep.

Homogeneity (sometimes called *polarity*) refers to the fact that such sentences (and their negations) are neither true nor false when the plurality in question is mixed with respect to the property ascribed to it (modulo the exceptions allowed by non-maximality).[3]

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1 We will without distinction refer to those as *definite plurals*, *plural definites*, and *plural definite descriptions*.

2 The first vague hint at this fact in the literature that we are aware of is in Scha 1981. It is treated more or less as a matter of course already by Link (1983) and Dowty (1987), although they all mention it only in the context of collective predicates. Pointed attention was paid to the phenomenon in Brisson 1998, Lasersohn 1999, and Malamud 2012.

3 Cf. Schwarzschild (1994), Löbner (1987, 2000), Gajewski (2005), Breheny (2005), Büring & Križ (2013), Spector (2013), and Magri (to appear).

(2) John (didn't) read the books.
true/false $\sim$ if John read all of the books
false/true $\sim$ if John read none of the books
neither otherwise

Both of these properties disappear in the presence of *all* (Brisson 1998, Lasersohn 1999, and Moltmann 1997: 132 for non-maximality, Löbner 2000 for homogeneity).

We present an analysis according to which non-maximality is a pragmatic phenomenon that arises post-compositionally from the interaction of the purely semantic properties of plural predication, in particular homogeneity, on the one hand, and general pragmatic principles on the other. The semantic effect of *all* is assumed to be the removal of homogeneity. Since this means that one of the components needed to derive non-maximal readings is now missing, the precisifying effect of *all* follows as a consequence. Note that we do not attempt to explain homogeneity — only to describe it — or to give a compositional semantics that captures how exactly *all* effects this removal of homogeneity and how homogeneity behaves in complex sentences with multiple definite descriptions and/or quantifiers.

We start by introducing the phenomenon of non-maximality in some detail in section 2. In section 3, we present a pragmatic explanation of how it arises and how it is tied to homogeneity, some further consequences of which we explore in section 4. Section 5 explores the phenomenon of homogeneity in greater empirical depth and points out corresponding predictions of our theory. Finally, we argue in section 6 that our approach is promising for other constructions than just definite plurals, including generics and conditionals. A discussion of previous treatments of non-maximality can be found in appendix A.

2 Non-Maximality

It has long been known that the truth conditions of plural predications are not always strictly universal and we often judge such sentences as correctly describing a situation where there are, in fact, some exceptions. The precise extent of this tolerance seems to depend on various contextual factors. Following Brisson (1998), we call this phenomenon *non-maximality*.

In this section, we will present the empirical phenomenon and develop an intuition about its nature, which is then to be implemented in a theory. In doing so, particular attention will be paid to what is required for an individual to be an admissible exception.

2.1 The Basic Phenomenon

Besides the very illustrative example in (1), due to Lasersohn 1999, many more can be constructed. Imagine, for example, that we are trying to gauge the audience's reaction to Sue's talk, and (3) is uttered. This would seem quite appropriate even if the perpetually dour Prof. Smith, who is known to never smile anyway, is, in fact, looking neutral.

(3) The professors are smiling.

In some contexts, non-maximality can even go so far as to yield essentially existential readings. Malamud (2012) points out an example along the lines of (4). Here it seems that Mary's utterance simply means that enough windows are open to warrant going back to the house.

(4) Context: *Mary and John leave Mary's house to go on a road-trip. A few minutes into the ride, the following discourse takes place:*
J: There is a thunderstorm coming. Is the house going to be okay?
M: Oh my, we have to go back — the windows are open!

Once we add *all* to a plural sentence, however, this readiness to tolerate exceptions disappears (Brisson 1998, Lasersohn 1999). For example, if Prof. Smith didn't smile, even if we know that he never does, it is strange to hear (5a), and very natural to react to it by uttering (5b).

(5) A: After her talk, Sue looked at the audience. All the professors were smiling.
B: No, Smith didn't. I know it doesn't mean much, but still.

2.2 The Properties of Exceptions

Despite these apparently not-quite-universal truth conditions of plural predications, it is not straightforwardly possible to mention the exceptions explicitly. It was already pointed out by Kroch (1974: 190f.) (cited in Lasersohn 1999) that sentences of the form of (6a) sound contradictory, while (6b) does not.

(6) a. #Although the professors are smiling, one of them is not.
b. Although more or less all the professors are smiling, one of them is not.

The same effect can be observed with *but* (*pace* Brisson 1998).

(7) a. #The professors are smiling, but one of them isn't.
b. More or less all the professors are smiling, but one of them isn't.

It is not entirely impossible to admit exceptions, but this can be done only in what feels like an aside that does not address the main point the speaker was making. This impression is strengthened by the obligatory presence of an adverbial like *of course*.

(8) a. The professors are smiling. Of course, not Smith, but you know, he never smiles, it doesn't mean anything.
b. The townspeople are asleep. Of course, the gatekeeper is probably still up, but we know that's he's always there anyway.

The intuitive conclusion we draw from this, and which has been drawn by Lasersohn (1999), is that plural sentences allow only for exceptions that are irrelevant for the current purposes of the conversation: the sentence can be used as long as we are, for current purposes, close enough to its being true on a strict universal reading. Lasersohn also provides a scenario in which every exception would matter and in which a plural sentence consequently cannot be interpreted non-maximally:

> "Suppose we are conducting an experiment on the nature of sleep. We have several people serving as experimental subjects there in our lab, lying on beds, dozing off one by one. In order for the experiment to proceed, we need to make sure that all of them are completely asleep; otherwise the experiment is ruined. In this sort of situation, if you assert (9), every last one of the subjects had better be asleep; exceptions are not tolerated.
>
> (9) The subjects are asleep."

It is worth pointing another aspect of this exception tolerance that has not hitherto received explicit attention in the literature: it is not only the number and identity of the exceptions that influences whether they are acceptable, but it also makes a difference what they do instead of fulfilling the predicate.

To illustrate, take up again the example of the smiling professors. We will readily tolerate a non-smiling Smith and still judge *The professors smiled* true if Smith just had a neutral expression on his face, especially if he is known to smile only rarely. If, however, he looked visibly angry, the judgment seems to change and we are less prepared to still accept the sentence as true. More likely, it would count as neither true nor false in such a situation.

Similarly, when a small number of townspeople are having a noticeable party in the street, we would be much less inclined to call the sentence *The townspeople are asleep* true than in a situation where the very same people are at home and reading quietly.

2.3 Negated Sentences

It is worth noting that we find analogous behaviour also for negated sentences. Recall that by homogeneity, (9) is true only if (almost) none of the students knew how to solve the problem. Non-maximality again permits some slight deviation from strict universality. If a professor, after grading an exam, utters (9), this will be an appropriate description of a situation where only one or two students knew what to do. The point she wants to make is presumably that this was a really bad class, or maybe she is admitting that she didn't do a good job of teaching them, and in that context, the few exceptionally smart individuals don't detract from her point.

(9) The students didn't know how to solve the problem. (Of course, Alice and Bob got everything right, but they are really exceptionally smart and you can't compare them with the others.)

In contrast, if she were to say (10), *none* being the negative analogue of *all*, even Alice and Bob would falsify her utterance and she would not be giving an appropriate description of the situation.

(10) None of the students knew how to solve the problems.

2.4 Non-Maximal Predication, Maximal Reference

Before we present our theory on how non-maximal readings come to be, we would like to establish one way in which it *cannot* be explained: non-maximal readings do not arise through salience- or relevance-based domain restriction of the definite description.

Individuals who are outside of the domain are not included in the reference of a definite description and are simply not being talked about. Bringing them up as exceptions is a *non sequitur*. This is exemplified in the discourse in (11). However, exceptions that were ignored by way of non-maximality can always be brought up by an interlocutor, prompting the original speaker to justify glossing over them, as shown in (12).

(11) *Uttered at the ENS in Paris.*
A: The students are happy.
B: #Well, actually, the students at the Sorbonne aren't.
A': What? I wasn't talking about THEM.

(12) A: The professors smiled.
B: Well, actually, Smith didn't.
B': Well, yeah, but you know, he NEVER does.

That even in the face of non-maximality, the reference of a definite plural is always maximal can also be seen in cases of predicate conjunction and when anaphoric pronouns are involved. With predicate conjunctions, it is perfectly possible to have a reading that is non-maximal with respect to one conjunct, but maximal with respect to the second conjunct. This can be enforced by adding adverbial *all* in the second conjunct without detracting from the possibility of non-maximality in the first.

(13) *All the professors except Smith smiled and then left, leaving Smith behind.*
#The professors smiled and then (all) left the room.

Similarly, *they* in (14) doesn't automatically refer to just those professors who smiled.

(14) The professors smiled. Then *they* (all) stood up and left the room.

Salience-based reference restriction patterns differently from non-maximality with respect to the above. The example in (15) is inspired by Schlenker 2004. It seems clear that *they* only refers to the girls who have to go to the bathroom.

(15) Context: *A group of ten boys and ten girls are on an excursion with their teacher B. Three of the girls raise their hands to indicate that they need to go to the bathroom.*
A: Wait, the girls need to go to the bathroom.
B: Okay, but *they* will have to catch up with the rest of us.

Imagine further one of the girls who have *not* raised their hand bringing up herself as a supposed exception. This is likely to be perceived as a *non sequitur*, further setting apart this case of actual restricted reference from non-maximality.

(16) A: Wait, the girls need to go to the bathroom.
G: #Well, actually, some of us don't...

3 Proposal

In this section, we will propose a theory on which non-maximal readings can be derived as conversational implicatures, in particular as *quality implicatures*. Starting with an exposition of our background assumptions, we will spell out formally how such implicatures are derived. We then further propose a principle that prevents them from arising for sentences that do not display homogeneity behaviour, such as those with *all*.

3.1 Semantic Assumptions

We will assume that in virtue of their literal semantics, predications with definite plurals have universal truth conditions, identical to those of the corresponding sentence with *all*. It has recently been argued by Schwarz (2013a) that experimental findings support this: reaction times in a truth-value judgment task were shorter when subjects judged the a sentence with a definite plural according to a strictly maximal interpretation, suggesting that additional (pragmatic) processing was necessary to obtain a non-maximal interpretation.

Furthermore, we assume with Schwarzschild (1994) that homogeneity is part of the compositional semantics in the following way. Every sentence is assigned two sets of worlds: a set of worlds where it is true, which we call the *positive extension*, and a set of worlds where it is false, the *negative extension*. Those worlds where the sentence is neither true nor false make up its *extension gap*. For many sentences, the negative extension is just the complement of the positive extension, and their extension gap is empty. However, this is not so for sentences with definite plurals: those are only false when the corresponding universal negative is true. Following Löbner 2000, we assume that corresponding sentences with *all* have no extension gap and are instead false whenever they are not true.[4]

Writing $[\![S]\!]^+$ for the positive extension of a sentence S, and $[\![S]\!]^-$ for its negative extension, this plays out as follows.

4 Two caveats are in order here. First, we are considering only sentences with one-place predication, as a sentence like (ia) still has an extension gap triggered by the plural definite *the books*.[5]

(17) a. All the boys read the books.
b. The boys read the books.

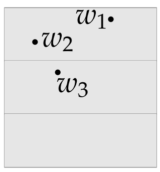
(18) $[\![\text{The professors smiled}]\!]^+ = \{w \mid \text{all the professors smiled in } w\}$
$[\![\text{The professors smiled}]\!]^- = \{w \mid \text{none of the professors smiled in } w\}$
$[\![\text{All the professors smiled}]\!]^+ = \{w \mid \text{all the professors smiled in } w\}$
$[\![\text{All the professors smiled}]\!]^- = \{w \mid \text{not all the professors smiled in } w\}$

We will not attempt to specify a compositional semantics that delivers such results. The development of a formal system that captures the phenomenon of homogeneity and its interaction with various operators in full generality (so as to incorporate the observations in section 5 and data from Križ & Chemla 2014) poses considerable obstacles and will have to be left to further research.

3.2 The Current Issue

In section 2.2, we stated the intuition that non-maximal readings allow for exceptions as long as the exceptions are somehow irrelevant for current purposes. This means that we need to operationalise the notion of *current purposes* to use it in a formal theory. We represent them by a partition of the set of possible worlds, which we will call an *issue*. We assume that speakers always posit such an issue that the conversation aims at resolving, where to resolve the issue it to determine which of its cells contains the actual world. The idea of interpreting definite plurals against the backdrop of such a partition was first proposed by Malamud 2012, inspired by van Rooij's (2003) use of such in the interpretation of questions. We will say more about what exactly we take to be the nature of this issue in section 4.5, when the mechanics of the theory are in place.

For concreteness, let us establish the following extremely simplistic scenario for future use: we are interested in how Sue's talk was received, and right now we are only going to judge it based on the facial expressions of the professors in the audience. We partition the set of possible worlds into three cells: a cell i_1 where Sue's talk counts as well-received, a cell i_2 where the reception is mixed, and finally i_3, where it was ill-received.[6]



i_1: positive reception
i_2: mixed reception
i_3: negative reception

A world where all the professors smiled, say, w_1, is obviously in i_1. Let w_2 be a world where all the professors smiled except Smith, who looked neutral, as he almost always does. Such a world will also be in the cell for *positive reception*. If, however, only half of the professors smiled (w_3), we'll count this as a mixed reception.

Second, we will, for now, pretend that the only way a sentence can fail to be true of false is due to homogeneity. We will discuss the role of presuppositions in section 4.4.

6 Presumably, there is some vagueness or uncertainty as to where the borders of these cells are. This is a separate issue that is of no concern to us here.

3.3 Quality Implicatures

Given this formalisation, we can now approach a definition of what it means for exceptions to be irrelevant for current purposes: their presence doesn't influence which cell we are in; we are still in the same cell that we would be if there were no exceptions. A sentence that is true modulo such irrelevant exceptions will be called *true enough*.[7]

(19) **Sufficient Truth**
We write $\approx_I$ for the equivalence relation that holds of two worlds u, v iff u and v are in the same cell of I. A sentence S is **true enough** in world w with respect to an issue I iff there is some world w' such that $w' \in [\![S]\!]^+$ (S is literally true in w') and $w \approx_I w'$.

In terms of the example above, the sentence "The professors smiled" is not true in w_2, but it is true enough, because w_1, where it is literally true, is in the same cell.

The next ingredient of our theory is a change in the maxim of quality. As one of the Gricean maxims of conversation (Grice 1975), it is traditionally stated as the imperative to make only true statements (to the best of one's epistemic ability). But by definition, the purpose of the conversation is only to resolve a certain issue — to learn which cell of the issue the actual world is in —, so this is an unnecessarily strong requirement. We therefore suggest that the maxim of quality is in fact weaker and requires only that one should say sentences that are *true enough* for current purposes.

(20) **(Weak) Maxim of Quality**
A speaker may say only sentences which, as far as she knows, are true enough.

This might seem radical, but when the whole theory is in place, we will see that speakers are still not allowed to say something that is actually *false*, so that its effect is restricted to sentences with an extension gap.

The weakened maxim of quality gives rise to systematic quality implicatures: the information that is communicated by a sentence is not its literal truth-conditions, but rather the union of all question cells that are compatible with (i. e. have a non-empty intersection with) its positive extension. For an example, take the interpretation of (21) in light of our toy issue.

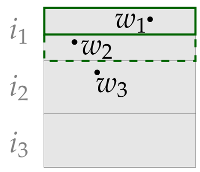
(21) The professors smiled.

Even if the speaker knows that the sentence is not literally true and that we are in w_2 rather than w_1, the maxim of quality still permits her to utter the sentence. Knowing this, a hearer can infer no more than that we must be in i_1, and so the proposition[8] communicated by (21), given the current issue, is simply i_1. More generally, the procedure for arriving at the communicated meaning is to simply

7 We thank Roger Schwarzschild for suggesting this manner of presentation.
8 Here and always, we use the term *proposition* in its technical sense to mean a set of worlds.

extend the literal meaning of the sentence to the closest cell boundaries. This is reflected by the dashed line below.

$[\![\textit{The professors smiled.}]\!]^+$



w_1: all smiled

w_2: Smith neutral, rest smiled

w_3: only half smiled

Note that at the same time, we predict that a plural is interpreted maximally when it is in fact the case that every single exception would be relevant, as in Lasersohn's sleep study scenario (cf. section 2).

3.4 Addressing an Issue

So far, nothing prevents us from applying the same reasoning to a sentence without an extension gap like (22).

(22) All the professors smiled.

After all, an utterance of this sentence in w_2 still complies with the maxim of quality: we are in a world that is in the same cell as one where it is literally true (e. g. w_1). However, (22) is just *false* in w_2 and cannot be appropriately used to describe it. More generally, *any* sentence cannot be used when it is literally false, only when it is either true, or neither true nor false.

We suggest that what is behind this is a restriction on which sentences can be used to address an issue: a certain alignment is required between the two.

(23) **Addressing an Issue**
A sentence S may be used to address an issue I only if there is no cell $i \in I$ such that i overlaps with both the positive and the negative extension of S, i. e. S is true in some worlds in i and false in others.

This condition may be seen as a way of extending Lewis's (1988) notion of *aboutness* to sentences with extension gaps, where aboutness is defined as follows:

(24) S is **about** I iff $\forall i \in I : i \subseteq [\![S]\!] \vee i \cap [\![S]\!] = \varnothing$.

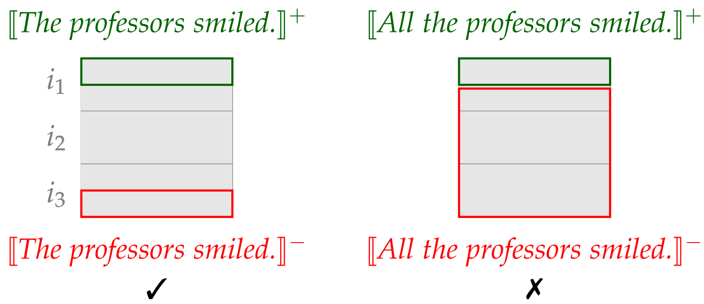
This means that the worlds in any given question cell may not fall on different sides of the true-false boundary of the sentence. It is this formulation which we have generalised to three-valued sentences: the worlds in one cell may not fall on different sides of the boundary, but, now that the boundary is extended, they may fall *onto* it. The worlds that fall onto the boundary (i. e. into the extension gap) somehow don't count; they are hushed up, which fits intuitively with the fact that the extension gap of a plural sentence is, in a way, not to be spoken of.[9]

Another way of regarding the condition in (23) is an extension of the principle of non-contradiction to the level of communicated content: just as a sentence

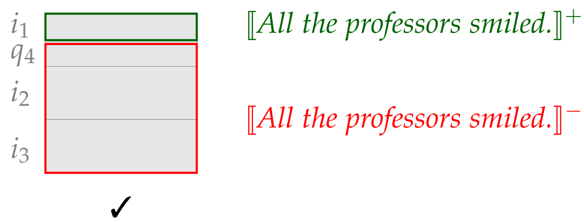
9 This may be something which sets plural predication apart from vague predication, cf. 4.4.

cannot have a positive extension that overlaps with its negative extension, a sentence cannot be used in a context where the communicated meaning of its positive version would overlap with the communicated meaning of its negative counterpart.[10]

As applied to our example, condition (23) entails that the *all*-sentence (22) simply cannot be used to address the issue, because its positive and negative extension are both compatible with i_1.



It could only be used if the issue were different, i. e. if we cared whether really all professors, even Smith, smiled. This is a perfectly sensible issue, too: a speaker may find it worth pointing out that even Smith, who almost never smiles, did smile. By using (22), she can convey this information.



Thus, given that the *all*-sentence was, in fact, used, the speaker must take herself to be addressing an issue where every exception would matter, and so she must intend a maximal meaning. Hence, no weakening quality implicature is available.[11]

More generally, it follows that no sentence can be used when it is literally false. For assume that the actual world w is in the question cell i_1, and S is false in w. Then either S is not true in any world in i_1 and therefore eliminates i_1 as a possible answer to the current issue, in which case it is obviously inappropriate because the right answer shouldn't be eliminated. Or alternatively, S is true in some of the worlds in i_1, but then it is false in others in the same cell (including w). This means, by (23), that S cannot be used to address the issue at hand.

An immediate consequence of this is that sentences without the homogeneity property cannot be used imprecisely: the only way for such a sentence not to be

10 Note, though, that this line of thinking is at odds with the paraconsistent view on vagueness. People have been reported to agree to (i) in a situation where John is a borderline case of tallness, cf. Sauerland 2011 and Ripley 2011.

(i) John is both tall and not tall.

11 This is similar in spirit to what Lauer (2012) says of *exactly*: he assumes that the function of *exactly* is to mark that the speaker takes tiny differences with respect to a quantity to be relevant.

literally true is to be false, and we just saw that a sentence cannot be used when it is false; so a sentence without an extension gap can only be used when it is literally true.[12]

3.5 Intermediate Summary

The upshot of what we have said is, in general terms, this: a sentence S can be used to describe a situation w iff (i) S is not false in w, and (ii) w is, for current purposes, equivalent to some situation in which S is literally true. Since non-homogeneous sentences are [not false] only when they are true, it follows that they can only be used when literally true.

This is a consequence of the interaction of two components of the theory. The first component is a weakened maxim of quality, which causes a sentence's communicated meaning to be the set of worlds which are, for current purposes, equivalent to a world in its literal positive extension. The second component is a condition on which issues a sentence can be used to address, requiring a certain kind of alignment between the sentence's meaning and the distinctions that are at issue: a sentence can not be used if some worlds in its positive extension are, for current purposes, equivalent to some worlds in its negative extension.

With this theory in place, we will now proceed to explore a number of further consequences and applications of it.

4 Further Applications and Consequences

4.1 Unmentionability of Exceptions

We are now in a position to explain the properties of exceptions that we noted in section 2.2. Recall that it is not possible to mention exceptions explicitly without further ado, as evidenced by the fact that the sentences in (25) are always infelicitous.

(25) a. #Although the professors smiled, one of them didn't.
b. #The professors smiled, but/while/and one of them didn't.

This, we interpreted, following hints by Lasersohn (1999), as indicating that exceptions have to be in some sense irrelevant in order to be permitted — an idea that is now implemented in our formal theory.

If the current issue is such that the plural statement may be used non-maximally, then the proposition that mentions the exception cannot be relevant to it. This is so because in order for the plural to be interpreted non-maximally, there must be a cell (call it i_1) in the current issue that contains both exceptionless worlds (u among them) and worlds with exceptions (call one of them v). But the exception-mentioning sentence E is false in the exceptionless world u; thus, the

12 As pointed out by a reviewer, imprecise uses of numerals and descriptions of location are *prima facie* counterexamples to this. Our approach does seem to be incompatible with, though not entirely dissimilar in spirit from, Lauer's (2012), but it is not at odds with what Krifka (2002, 2007) suggests. In fact, Krifka's theory can even be translated surprisingly faithfully into our framework.

cell i_1 contains both a world where E is true (namely v) and one where it is false (viz. u), and so, by (23), E cannot be used to address this issue.

We also observed that if certain adverbials, in particular *of course*, are employed, it is possible to mention exceptions after all. We have nothing profound to say about this, but would like to note that it seems to us that the function of *of course* is to somehow signal that a shift to a more fine-grained issue is to be performed which is necessary to make relevant the utterance that is to follow. A deeper investigation of this and other adverbials (*actually*, *indeed*, and *in fact* would seem to be obvious candidates to look at) will have to be left to future research.

4.2 What Exceptions Do

An important prediction which sets our theory apart from previous approaches to the same phenomenon that we know of (to the extent that they are well-specified) is the following: for determining whether an individual is tolerated as an exception to a plural predication in a given situation, it matters not only who that individual is, but also what they do instead of fulfilling the predicate. We will readily tolerate a non-smiling Smith and still judge *The professors smiled* true if Smith just had a neutral expression on his face, especially if he is known to smile only rarely. If, however, he looked visibly angry, the judgment seems to change and we are less prepared to still accept the sentence as true. More likely, it would count as neither true nor false in such a situation.

This issue has not been recognised in previous treatments of non-maximality, which, as will become clear in section A, were formulated in terms of a comparison between different individuals — for example, all the professors together, and the professors without Smith. This makes it difficult, although not impossible, to bring the particulars of the deviant individuals' behavior into the picture.

One way to solve this problem is to properly intensionalise the theory and compare individual concepts rather than individuals. Our theory, however, has a different structure: it is entirely post-compositional and looks at the decision-theoretic equivalence of whole worlds, not of individuals; and so the above facts are predicted without any additional assumptions. A world in which, say, nine of ten professors smile and the one exception, who is furthermore known to rarely smile, has a neutral expression is still one in which the talk would count as generally well-received, and thus is in the same cell of the current issue as one where all professors, without exception, smile. However, a situation in which nine professors smile while the tenth one is visibly angry is likely to be considered to constitute a mixed reception of the talk. Thus, a world in which this is the case is in a cell that does not contain worlds where all professors smile, and so is in no sense equivalent to such a configuration. Therefore, the sentence "The professors smiled" is not true enough in such a world and is not an appropriate description of the situation.

4.3 Embedded Definite Plurals

The theory we have presented straightforwardly makes predictions for sentences with plurals embedded under quantifiers (including cases with bound possessive pronouns). Such sentences display extension gaps according to a certain pattern, first called attention to by Spector (2013) and empirically investigated by Križ & Chemla (2014).

(26), for example, is clearly true if every child loves all of their siblings, and clearly false if at least one child loves none of their siblings. But in a situation where not every child loves all of their siblings, but every child loves at least some of them, e. g. when every child loves half of their siblings.

(26) Every child loves their siblings.

Again, we will not try to account for this fact here, but merely note that a compositional theory of homogeneity will eventually have to explain it. What is important in the context of the present paper is that the sentence has an extension gap (in the sense that there are situations where it is neither true nor false), and this should, according to our theory, give rise to non-maximal uses. We predict that (26) can be used to address any issue which is such that if there is a single child who doesn't love any of their siblings, we are in a different cell than we could be if all children loved all of their siblings. Further, it *communicates* that something is the case which is equivalent to all children loving all their siblings. Thus, non-maximality is possible with respect to the object position, but not the subject position. It is thinkable, for example, that we would regard it as a matter of course that lunatic siblings who are serial criminals are not loved, and then (26) would be true of any scenario in which every child loves all of their non-crazy siblings (provided every child has at least one such sibling; otherwise, there would be a child who loves none of their siblings and we would be in a different cell).

Similar considerations apply to other quantificational expressions. Therefore, even though our theory applies only at the level of the denotation of whole sentences, it can make sense of non-maximally interpreted plurals embedded under quantifiers.

Note that (27), with a plain plural instead of the universal quantifier as the subject, also communicates that the actual situation is equivalent to one in which all children love all their siblings, but can be employed to address a broader range of issues because of its narrower falsity conditions: it is only false if no child loves any of their siblings.

(27) The children love their siblings.

Thus, we predict that here, non-maximality is possible with respect to both pluralities. If, for example, the issue is whether fraternal violence is to be expected, it seems plausible that (27) would permit some children not to love any of their siblings as long as those are still not violently disposed towards their siblings.

4.4 Presuppositions and Vagueness

We have argued that extension gaps enable non-maximal readings, but so far, the only extension gaps we have considered are those due to homogeneity. This raises the question of whether presuppositions in general give rise to such weakening quality implicatures, especially in light of the fact that homogeneity has frequently been called a presupposition[13]: predication of a predicate P of a plurality a is supposed to presuppose that either all members of a are P or none are.

On the assumption that our theory applies to the extension gaps that presuppositions give rise to, it predicts the following: a sentence S with a presupposition p can be used despite p being false if and only if the actual situation is, relative to the current issue, equivalent to one where both p and S are true. The following is a potential candidate for such behaviour.[14] It is well-known that a singular definite description can sometimes be used in apparent violation of the uniqueness presupposition. The sentences in (28) are typical examples. It is conceivable that this is possible precisely because in the contexts where such usage occurs, the fact that the uniqueness presupposition is violated is irrelevant and so the actual situation is equivalent to one in which there is only one entity of the relevant kind.

(28) a. John took the elevator.
     b. Mary met her sister yesterday.

This, however, cannot be correct, as the following wrong prediction shows. (29) should have a non-maximal reading that it does not, in fact, have. The reasoning goes as follows. Whether all the professors smiled or all but Smith doesn't matter for current purposes (and so it doesn't matter which one Bill knows, as long as he knows that which is the case). Take a world w where all professors except Smith smiled, and Bill knows this. This situation w would then, for current purposes, be equivalent to one in which all professors smiled and Bill knows it. Since in w, the presupposition that all professors smiled is false, we should be able to non-maximally use (29) to describe w.

(29) Bill knows that all the professors smiled.

It is clear, however, that this is not so and that (29) requires all professors to have smiled just as "All the professors smiled" does. The non-maximal reading just described can only be obtained for (30), without *all*.

(30) Bill knows that the professors smiled.

It seems to us that the way non-maximality interacts with presuppositions is the following: a sentence can never be used when the presupposition is false, but when the presupposition itself is neither true nor false, then it can be used as long as the actual situation is equivalent to one where both the presupposition

13 This manner of speaking can be found, for example, in Schwarzschild 1994, Löbner 2000, and Gajewski 2005.

14 This was suggested by Philippe Schlenker (p. c.).

and the sentence itself is true. This would explain the apparent embedded non-maximality that (30b) permits.

In order for this to make sense, of course, homogeneity must not be a presupposition itself, and a presupposition failure's effect on assertability must be direct and not mediated through the lack of a truth-value. Our intuitions incline in that direction: a sentence that suffers a homogeneity violation is undefined in the sense of being half-way between truth and falsity, but presupposition failure makes the whole question of truth and falsity feel entirely moot and somehow inapplicable. We will not explore any further the nature of presuppositions and how their falsity causes inassertability, but point out independent reasons not to identify homogeneity as a presupposition.[15]

Spector (2013) points out that a weak objection to analysing homogeneity as a presupposition is that violations of it cannot be objected to in the same way as presupposition failures.

(31) A: Does John know that Mary either bought all the jewels or none of them?
B: Wait a minute! I didn't know she can't have bought just some of them.

(32) A: Did Mary buy the jewels?
B: #Wait a minute! I didn't know that she can't have bought just some of them.

This objection is weak insofar as we know that presuppositions differ in how easily they can be accommodated and the homogeneity presupposition might, for some reason, be extraordinarily easy to accommodate.[16]

In addition, Spector notes that it is not even clear that asking the question (32a) commits the speaker to the belief that Mary bought either all or none of the jewels. If it does not, then homogeneity does not project from questions in the first place. However, we do also find local accommodation of presuppositions in questions. If Bill is behaving very nervously all the time, one might ask (33) even if one is ignorant about whether Bill used to smoke. Thus, it might be that homogeneity is just particularly easy to accommodate locally.

(33) Did Bill (just) stop smoking (or something)?

Since we do not have sufficient knowledge of the projection behaviour of presuppositions from the scope of quantifiers, no detailed comparison with homogeneity can be made.[17] But there is one further context in which presuppositions and homogeneity show starkly different behaviour. As is well-known, presuppositions project from the antecedent of a conditional. (34), for example, presupposes that John bought the ring.

15 We should point out that we do not take those works which have called homogeneity a presupposition to crucially depend on this categorisation. It is, rather, our theory that crucially depends on the *rejection* of this categorisation.

16 It is not clear to which extent presupposition triggers differ in their propensity towards local accommodation, but Smith & Hall 2011 have presented evidence that they do.

17 Indeed, a family of theories of presupposition projection has been advanced that would predict the pattern empirically found for homogeneity, namely those by George (2008a,b).

(34) If Mary knows that John bought the ring, he's probably angry.

If homogeneity were the presupposition that either every or no member of the plurality fulfills the predicate, then we would expect (35) to entail that either all or no subject is asleep. This is quite clearly not the case.[18]

(35) If the subjects are asleep, the study can start.

While local accommodation in the antecedent conditional is sometimes a possibility for presuppositions, too, the fact that it would be obligatory in the case of homogeneity strongly puts the burden of proof on anyone who wishes to categorise homogeneity as a presupposition, who, to make their case, would have to explain how it comes to differ from other presuppositions in this respect.

As an alternative, there is a suggestion that homogeneity is conceptually akin to vagueness,[19] that is to say, a sentence fails to be true or false in the face of a homogeneity violation in the same way that a vague predicate fails to be true or false of a borderline case. We find this view appealing, but would like to point out two ways in which homogeneity seems to differ from vague predication as well.

First, Alxatib & Pelletier (2011) and Ripley (2011) have found that speakers accept apparently contradictory sentence, affirming and denying the same vague predicate of an individual, when borderline cases are concerned. An example of such is (36a). However, it is completely impossible to say (36b) in a situation where half of the books are in Dutch.

(36) a. Bill is both tall and not tall.
b. #The books both are and aren't in Dutch.

Second, borderline cases of vague predicates can be made explicit by denying both the predicate and its negation of an individual. Again, nothing of the kind is possible with pluralities that are mixed with respect to a predicate.

(37) a. Bill is neither tall nor not tall.
b. #The books are neither in Dutch nor aren't they (in Dutch).

Thus, if homogeneity is to be the same kind of phenomenon as vagueness, something will have to be said to explain these differences. The precise nature of homogeneity is clearly a topic for further research.

18 We should point out that there seems to be an optional reading that might be explained by some sort of homogeneity projection, but it looks entirely different from what should happen if homogeneity were a presupposition. If the study is not performed on all subjects at the same time, but individually, then (35) could be used to convey that every subject is such that if it is asleep, the study can begin.

19 Philippe Schlenker and Benjamin Spector (p. c.). With less focus on homogeneity, a parallel between vague predicates and plurals has also been suggested by Burnett (2012).

4.5 More on the Current Issue

An obvious question to ask is whether the current issue that we postulate can be identified with the *question under discussion* (QUD) as frequently employed in the literature on information structure (cf. the seminal Roberts 1996). The idea is that there is a stack of questions (or rather, question meanings) that a conversation aims at resolving. These questions may be implicitly accommodated, but asking an overt question puts the meaning of this question on top of the QUD stack. The topmost element of this stack is frequently referred to as the QUD *simpliciter*.

It would, of course, be desirable to be able to identify the current issue, as postulated in our theory, with this QUD. However, obstacles quickly surface, and we take the following example to be decisive.[20] Assume that it is known that in order to pass an exam, Peter has to either solve all of the math problems, or solve at least half of the problems and write an essay on mathematical Platonism. With respect to the question (38a), then, all worlds in which he did either of these two things are equivalent. Thus, we would predict that the answer (38b) means the same thing as (38c). In reality, however, to the extent that (38b) is felicitous, we would rather take it to convey additional information, namely that he passed the exam by solving all the problems.

(38) Context: *In order to pass, Peter has to solve either all the math problems, or at least half of them and write an essay on mathematical Platonism.*
  a. Did Peter pass the exam?
  b. Yes, he solved the math problems.
  c. Yes, he passed the exam.

This wrong prediction would follow because, in a way, our theory doesn't constrain the information conveyed by a quality implicature to actually be only about the books.[21] It is precisely the same feature of the theory — that it compares worlds for equivalence, and not individuals — that allows us to take into account the properties of exceptions and causes this problem.

Recall that we started from the intuitive notion of *equivalence for current purposes*. What speakers of English mean when they use the phrase *current purposes* is rarely just the immediate last question that has been asked in the conversation. Rather, it would seem that they refer to something like the overarching goals of the participants, as relevant to this conversation. This is what we take the current issue to represent. It is, of course, strongly underdetermined by linguistic material and so subject to massive uncertainty and probably also vagueness. However, the questions asked and assertions made by a speaker do convey some information about what their purposes are, since they are constrained by considerations of relevance and the condition for Addressing an Issue.

This weakens the predictive power of the theory, since we cannot set up a context so precisely as to fully constrain the current issue, in this sense, and put a prediction to the test directly. Rather, we are forced to restrict ourselves

20 It was suggested by Benjamin Spector (p. c.).
21 Note that it isn't even clear what *being about the books* actually means in precise terms.

to considerations of plausibility. On the other hand, this perspective allows us to make sense of examples such as (38). The overtly asked question (38a) need not be all that the speaker wants to know, indeed it most likely is not. It is quite possible that she is also interested in knowing the manner in which Peter passed the exam, if he did. Thus, the person supplying an answer cannot rely on the assumption that worlds in which he solved all problems, and worlds in which he solved half and wrote an essay, are equivalent for the purposes of the conversation, even though they are equivalent with respect to the question that was last asked explicitly. Hence, she will only give the answer (38b) if she is safe in doing so, i. e. if Peter passed the exam by solving all problems.

It seems to us that the predecessors of our approach, van Rooij 2003 and Malamud 2012, intend their use of decision problems (and the partitions derived from those) to be understood in the same spirit. Indeed, we think that no satisfactory of pragmatics can ultimately do without it, so that we are not unduly proliferating theoretical notions. It seems likely that even quantity implicatures are, in fact, computed not with respect to the top element of the QUD stack, but with respect to the current issue as we understand it. Otherwise, it would be predicted that (39b), in reply to (39a),[22] could never implicate that Mary didn't eat all of the apples. However, it seems to us that this implicature is, in fact, present to the extent that the asker of (39a) can be assumed to care about distinctions that are finer than those made by her simple existence question.

(39) a. Did Mary eat some of the apples?
b. Yes, she ate some of them.

4.6 A Puzzle

Plural definite descriptions containing numerals, such as in (40), pose a puzzle for any theory of non-maximality: their reference is the same as that of a description without the numeral, uttered in the same context, but non-maximal readings seem to be much harder, perhaps impossible, to obtain with them.[23]

(40) The ten professors smiled.

Our theory does not predict this behaviour, and we can merely offer a speculation on what might be going on. Perhaps the overt mention of the numeral indicates that the speaker takes the number of professors to be relevant, and this makes it likely that she also takes the precise number of professors who smiled to be relevant. As hearers, we therefore accommodate a current issue where this number makes a difference, so that a world where only nine professors smiled cannot be equivalent to one where all ten smiled.

This presupposes that the addition of a numeral inside the definite description doesn't interfere with homogeneity. If it does, then of course there is no problem, as non-homogeneous sentences are not expected to show non-maximality. While we are intuitively inclined to believe that definite descriptions with numerals

22 No focal stress on *some* is intended in either sentence.
23 We thank an anonymous reviewer for pointing this out.

are homogeneous in English, we have been told that they are not in French. In particular, in a negated sentence with such a definite description, it is possible to overtly state that some individuals do fulfill the predicate, as in (41a). This is not possible when the numeral is absent, in which case a homogeneous reading is obtained and exceptions are unmentionable as usual, shown in (41b).

(41) Jean devait rencontrer trois étudiants pour leur parler de son projet.
John had to meet three students to talk with them about his project.

a. Il arriva à l'heure au rendez-vous, mais il ne parla pas avec les trois étudiants. Il parla seulement avec l'un d'entre eux.
He arrived on time, but he didn't speak with the three students. He only talked to one of them.

b. Il arriva à l'heure au rendez-vous, mais il ne parla pas avec les étudiants. #Il parla seulement avec l'un d'entre eux.

The potential locus of cross-linguistic variation that we see here strikes us as warranting further investigation.

5 More on Homogeneity

In order to identify further concrete predictions of our theory, it is necessary to have a closer look at the various guises in which homogeneity appears. So far, all our examples have involved so-called *stubbornly distributive predicates*:[24] predicates which can only hold of a plurality in virtue of holding of all its atomic parts. Collective predicates, however, also show a version of the same thing.[25]

We will first describe homogeneity-like effects in collective predicates empirically and then give a general descriptive formulation of what homogeneity amounts to, capturing both distributive and collective predicates. We will then proceed to identify corresponding predictions with respect to non-literal readings that our theory makes.

5.1 Generalised Homogeneity

We find that mixed and collective predicates, just like stubbornly distributive ones, have negative extensions that are not the complement of their positive extensions, i. e. they have an extension gap.[26] For distributive predicates, the generalisation is easy to state in one of many equivalent ways:

(42) **Homogeneity for Distributive Predicates**
A homogeneous predicate P undefined of a plurality a if P is true of some

24 Moltmann (2004) makes a point of the existence of this kind of predicates, but the catchy term originates, as far as we are aware, with Schwarzschild (2011).

25 Homogeneity for collective predicates received some attention in Büring & Križ 2013, and was independently brought up by Benjamin Spector (p. c.).

26 So far, we have spoken of the extensions of sentences. The translation of this way of speaking to predicates is straightforward: a predicate's positive extension is the set of individuals in which it is true, and its negative extension is the set of individuals of which it is false.

members of a and false of others, i. e. if a is not homogeneous with respect to P.

We propose that the correct generalisation for homogeneous predicates, which applies to both distributive and collective ones, is as in (43). What this amounts to is that in order for P to be true of a, a must not in any way be tainted by *non-P*-ness, and analogously for falsity. The name *homogeneity* is therefore still not entirely inappropriate.

(43) **Generalised Homogeneity**
A homogeneous predicate P is undefined of a plurality a if it is not true but there is a plurality b that overlaps with a (i. e. has mereological parts in common) such that P is true of b.

To see this, consider the collective predication in (44), spoken with reference to the students' activities on a particular evening.

(44) The boys are performing *Hamlet*.

The sentence is true if is a performance of *Hamlet* going on in which all and only the boys participate, and we predict it to be false only if no boy is taking part in any performance of the play. There are several types of scenarios in which neither one nor the other is the case and the sentence is predicted to be undefined.

Scenario 1 *Only a subgroup of the boys is staging the performance.*

The sentence in question isn't true in such a scenario,[27] but it certainly isn't false, either. Being true not of the plurality of all boys, but of a plurality that overlaps with them (in this case, a proper part), the predicate is constrained to be undefined by homogeneity.

Scenario 2 *All students together, including the boys, are performing the play.*

Here, the boys are performing *in Hamlet*, but we would not call (44) true.[28] However, it doesn't strike us as false, either. Consider that it is strange to say (45) to describe the situation:

(45) ??The boys aren't performing *Hamlet*, but they are doing so together with the girls.

27 Putting aside the phenomenon of *team credit*, which we will suggest below is actually an instance of non-maximality.

28 Some collective predicates, like *carry a piano*, and even more easily *play the Kreutzer sonata*, seem to be able to undergo reinterpretation to yield a participatory reading, i. e. *participate in a piano-carrying* or *participate in a performance of the Kreutzer sonata* We are doubtful that this is possible for *perform Hamlet* in English, and assure the reader that it most certainly is not for the German translation of this predicate (*Hamlet aufführen*).

This is in line with our prediction: since the plurality of all boys overlaps (in this case, is a part of) with a plurality of which the predicate is true (namely the plurality of all students), the sentence shouldn't be false.

Scenario 3 *Some of the boys together with some of the girls are engaged in the performance.*

Again, we submit that (44) is actually neither true nor false in this scenario.

It is interesting to note that the addition of *all* to collective predicates does not seem to remove every aspect of homogeneity. Its effect is, rather, the following: it makes the sentence false as soon as there is a mereological part of the plurality of which the predicate is false. This will cause (46) to be false in Scenario 1 above, because there is a group of boys which is not taking part in any performance of *Hamlet* and of which the predicate is consequently false. The same is true of Scenario 3.[29]

(46) All the boys are performing *Hamlet*.

However, (46) is still neither true nor false in Scenario 2, because all the boys are participating in the performance and so the predicate isn't false of any of them; it's undefined of all of them.

5.2 Non-Maximality with Collectives

The instances of non-maximality that arise with distributive predicates involve scenarios analogous to Scenario 1 above — a predicate is ascribed to a plurality even though it is only literally true of a subplurality — , and our theory predicts that we should find the same with collective predicates. And indeed, examples with collective predicates are easily found. Indeed, examples of collective predicates requiring not even close to universal participation have long been noted in the literature.[30] (47), for instance, may easily be used to describe a situation where a fraction of the boys just sat on the shore and watched the others without contributing to the effort (example from Brisson 1998).

(47) The boys built a raft.

One might think that being a bystander actually counts as participating in the collective action here, although that raises the question of what exactly the conditions are under which this happens. Our theory offers an alternative view:

29 In the latter case, there is an additional complication. While the negation of (46), (ia), is clearly true in Scenario 1, it seems slightly strange in Scenario 3. We believe that the reason for this is that it tends to trigger the implicature (ib), which is certainly not true, and likely undefined, in Scenario 3.

(i) a. Not all the boys are performing *Hamlet*.
b. Some of the boys are performing *Hamlet*.

30 The *locus classicus* for this observation is Dowty 1987. The phenomenon is frequently referred to as *team credit* in the literature, but we have not been able to ascertain who coined the term.

being an attentive bystander is not to participate, but it is a way of being an irrelevant exception. The reason why collective predicates frequently allow a rather larger number of exceptions than distributive predicates, we submit, is this: when we use a collective transitive verb, the point of the statement is usually that the result was brought about — that a raft was built — and that the plurality denoted by the subject was somehow around and none of its members did anything else of interest. In the contexts where we would use such sentences, it doesn't usually make a difference whether all, or even nearly all, individuals actually participated in bringing about the described result.

As predicted, to the extent that it receives a collective reading, *all* seems to enforce universal participation, for example in (48).[31]

(48) All the boys built a raft./A raft was built by all the boys.

We also expect non-maximality in the opposite direction: it should be possible to ascribe a predicate to a plurality if there were irrelevant *additional* participants. While not ubiquitous, plausible examples of such exist. Small children frequently do not perform complicated manual tasks unaided, and so (49) could easily be considered true even when some of the actual glueing was done by a parent.

(49) The girls built a model plane.

According to our theory, it should be possible to ignore both irrelevant exceptions from the original group and additional agents at the same time, which, given that both are possible separately, would not be surprising. And indeed, it seems to us that if a group of boys built a raft assisted by an adult, with some of them not actually participating, but being around and not doing anything of note, one may well describe this by saying that "the boys built a raft".

5.3 Intermediate Conclusion

We have argued that most treatments of homogeneity, focussing on distributive predicates, have described a special case of a slightly more general phenomenon: homogeneity is, in fact, the constraint that individuals in the positive extension of a predicate may not have mereological parts in common with individuals in its negative extension. With collective predicates, this constraint gives rise to several different types of homogeneity violations, including cases where more, rather than fewer, individuals than those that constitute the plurality in question participate in the event. We further claim that the corresponding non-maximal readings that our theory predicts do, indeed, exist, and that the phenomenon known as *team credit* may be reducible to them.

31 Collective readings with *all* may be very hard to obtain due to it being a priori implausible that universal participation matters for current purposes, which is what would be required in order for *all* to be usable. This would explain intuitions that *all* nudges predicates towards a distributive reading, while clearly not containing distribution as a matter of its lexical semantics.

6 Beyond Definite Plurals

There is nothing, in principle, that restricts the predictions of the theory presented in this paper to definite plurals. Its scope is, in principle, the whole range of constructions that display homogeneity: all of them should allow for non-maximal readings. And this is as it should be.

6.1 Non-Mereological Parts

Homogeneity and the associated non-maximality appear with respect to other parthood relations than mereological parthood (cf. also Löbner 2000). Those involved in (50), for example, are evidently of spatial character. (50a) is neither true nor false if only part of the wall is painted, and so is (50b) if there are both dense and non-dense subregions of the forest.

(50) a. The wall is/isn't painted.
     b. The forest is/isn't dense.

Even more abstractly, would we say that (51) is either true or false if the book contains a mix of brilliant and surprisingly silly chapters?

(51) The book is intelligently written.

These other dimensions of homogeneity have their own analogues to nominal and adverbial *all*. In the spatial cases, the a homogeneity remover in the noun phrase is *whole*, while the adverbial one is *everywhere*. For the abstract case in (51), *whole* also works, while an adverbial homogeneity remover doesn't seem to be available in English.[32]

(52) a. The whole wall is painted.
     b. The wall is painted everywhere.

(53) a. The whole forest is very dense.
     b. The forest is very dense everywhere.

(54) The whole book is intelligently written.

The corresponding predictions for non-maximality seem to be borne out. (50a) seems to strongly tend towards a maximal reading, as we find it hard to imagine a way in which part of the wall not being painted could be irrelevant. (50b), on the other hand, seems quite compatible with a few sparser patches as long as they don't significantly diminish the potential for getting lost in the forest. Similarly, in most contexts, one can surely say that a book is intelligently written even if some passages contain a blunder when those don't detract form the point that it's worth reading.

32 There seems to be considerable variation between languages with respect to which homogeneity removers are available in which position for which dimensions of homogeneity. German, for example, has an adverbial *durchgehend* that works for (51).

6.2 Conjunctions

A potential problem for the correlation between homogeneity and the possibility of non-maximality that we claim exists is posed by conjunctions. It has been argued that conjunctions of proper names are homogeneous, so that (55) is only true if both Bill and Peter came, and false if none of them came (Szabolcsi & Haddican 2004, Magri to appear).

(55) Bill and Peter came.

Given this, we would predict non-maximal readings for such conjunctions to be possible, which they generally don't seem to be. However, if our suggestion that team credit is, in fact, nothing other than non-maximality is correct, the following might be a counterexample.

(56) *John planted a tree. His little daughter Mary stood by him and watched intently.*
Mary: We planted a tree!
Susan (mother): John and Mary planted a tree. Well, of course, John did the work and Mary actually just watched.

Still, there is no doubt that, if they are possible at all, non-maximal readings for conjunctions are very rare and hard to obtain. We can merely offer an intuitive consideration to make sense of this: If an individual weren't relevant to the current issue, it wouldn't be listed explicitly in a conjunction. Its mention will thus prompt the hearer to accommodate a current issue relative to which no non-maximal reading of the conjunction is possible.[33]

6.3 Bare Plural Generics

Generics, too, show homogeneity effects (Cohen 2004, Magri 2012). (57a) certainly isn't true, but it's not false, either, as demonstrated by the infelicity of (57b).[34]

(57) a. Israelis live on the coastal plain.
b. #It's false that Israelis live on the coastal plain, but some of them do.

Once *all* is added, homogeneity disappears just as with definite plurals.

(58) a. (All) Israelis (all) live on the coastal plain.
b. It's false that (all) Israelis (all) live on the coastal plain, but some of them do.

Of course, if any one construction is known for allowing exceptions, it is generics. For example, we have no problem accepting (59) even though not every single Israeli person speaks English.

(59) Israelis speak English.

33 A similar view is expressed by Schwarzschild (1996: 92).
34 The example is a hybrid between one of Cohen's and one of Magri's.

Cohen contributes a relevant further observation in this connection: it is not only the number of exceptions which matters or their (non-)centrality in the category being talked about, but also the manner of their occurrence. If there were a whole coherent region of Israel where nobody spoke any English, (59a) would suddenly seem much less true.

This fits well with our account of non-maximality: in order to be acceptable, the permissions must be irrelevant for current purposes. When a statement like those in (59) comes up, we usually care about such things as whether, going to Israel, a have to fear finding myself in a place where there is nobody I can communicate with. If there are just a few non-English-speaking Israelis who are relatively homogeneously distributed across the country, this doesn't have much of an influence: there will still always be plenty of people around who speak English. If, however, there is a whole region where nobody knows English, then what if I happen to go to that region? Suddenly, my ability to communicate, given that I go to Israel, is not such a virtual certainty anymore. Thus, when concentrated in a place, the non-English-speakers, even if their number isn't greater, are suddenly relevant for my purposes.

The effect of *all* on the exception tolerance of generics strikes us as less clear, and less pronounced, than in the case of plurals. One of the standard examples for exception tolerance of generics is (60), which, as a generalisation, is acceptable despite the fact that penguins are birds and can't fly.

(60) Birds can fly.

However, (61) seems much less acceptable, indeed it is straightforwardly false, given that there are entire species of flightless birds.

(61) All birds can fly.

Interestingly, (62) seems much better again, even though there are still obvious exceptions, such as injured and sick birds and those with clipped wings.

(62) All eagles can fly.

We do not have a developed theory on why this is so, but suggest that it might have something to do with whether we actually look at all individual instances of a kind, or of subkinds according to some relevant partition. If *all* quantifies over subkinds, and *eagles that had their wings clipped* do not count as an accessible subkind, so that (62) means something along the lines of "All eagle species can fly", then the sentence might be acceptable because if you take any species of eagle, then *can fly* is non-maximally true of that species because injured birds and those with clipped wings can be ignored as irrelevant exceptions (whereas penguins in (61) cannot be ignored because they are a proper subkind of *birds* of which *can fly* is plainly false, since no penguin can fly). Further exploration of this, in particular the question of what, exactly, homogeneity in generics is about (instances? subkinds?), is needed to make our theory fully applicable to generics.

6.4 Conditionals

In the case of conditionals, it has, indeed, though partly on different grounds, been argued that they are the counterpart of plural definite descriptions in the domain of possible worlds (Bittner 2001, Schlenker 2004). The analogue of homogeneity in conditionals is known as the *conditional excluded middle* (Stalnaker 1981, von Fintel 1999). If, given Mary's coming, John's happiness could still go either way, (63) is not true, but it doesn't seem to be quite false, either. For it to be false, it would seem to be required that Mary's coming would ensure that John isn't happy.

(63) If Mary comes, John will be happy.

Adding *necessarily* in the consequent removes this property: (64) is false as soon as there is any possibility that Mary comes and John still isn't happy.

(64) If Mary comes, John will necessarily be happy.

Conditionals, too, are known for allowing exceptions. If we are trying to decide whether to invite Mary, then (63) is a perfectly appropriate even if there are some unlikely ways in which Mary's coming could fail to bring about John's happiness. There might be a very small chance, for example, that Sue (the girlfriend of one of the other invitees) might come, and her and Mary always get into fights, which makes John unhappy. This possibility can be disregarded as irrelevant for current purposes, because we have no influence on Sue's coming (we can hardly tell Bill that he's not allowed to bring his girlfriend) and inviting Mary is certainly a good idea regardless. It has already been noted by Schlenker (2004) that *necessarily* removes this tolerance for exceptions in conditionals, and indeed, the same sentence with *necessarily*, however, would not be appropriate in this context.[35]

6.5 Intermediate Conclusion

The phenomena connected to other parthood relations than mereological parthood are straightforwardly in alignment with what our theory predicts. Conjunctions, which are often taken to denote mereological sums of individuals just like definite plurals, pose a potential problem in that they may be homogeneous, but are generally quite resistant to non-maximal readings. However, we have argued that, while the details are still unclear, it is most likely that their behaviour can be made sense of in a way that is compatible with our overall approach.

While the exception tolerance of generics and conditionals has in the past been analysed in rather different terms from ours,[36] and it is beyond the scope of

35 Indeed, it is hard to imagine any context where this particular sentence could ever be uttered at all, since it is rare for one person's presence to have such complete control over another's happiness.

36 For generics, the focus has been on the characterisation of admissible exceptions as non-central or abnormal (e. g. Greenberg 2007) and the resulting non-monotonic logic (e. g. Asher & Morreau 1995). For an overview of the literature on generics, see Cohen 2002. For conditionals, something similar has been done using orderings of worlds by closeness to the world of utterance (the *locus*

the paper to show that the approach presented in this paper is more promising, we submit that it is a virtue of our theory that it opens up a perspective that may lead to a unified treatment of a wider range of constructions with similar properties.

7 Conclusion and Outlook

In this paper, we have proposed a theory on which the non-maximal readings of plural statements are a consequence of the interplay between the semantic property of homogeneity that pertains to plural predication and certain pragmatic principles. In particular, we have proposed the following: first, a weakened version of the maxim of quality, which says that a sentence may be used to describe a situation in which it is not literally true as long as that situation does not differ from one in which it would be true in a way that matters for current purposes. And second (Addressing an Issue), a sentence can only be used if it matters for current purposes whether it is true or false, but the distinction between situations where it is true and others where it lacks a truth value need not be important. This entails that a sentence can never be used when it is literally false, but may be used when it is neither true nor false. We then formalised these two principles, operationalising the intuitive notion of *current purposes* as a question denotation in the traditional sense of a partition of the set of possible worlds.

We assume that the effect of *all* is purely semantic: it removes the extension gap that results from the homogeneity property of plural predicates, thus making the positive and the negative extension of the sentence complementary. The principle for Addressing an Issue thus forces a sentence with *all* to be used only in situations where it really matters whether the plural predication is literally true or not. If such tiny differences matter, then the leeway allowed by the weakened maxim of quality is exactly zero, and a strictly maximal interpretation results. The maximising/"slack regulating" function of *all* is thus derived as a consequence of its semantics.

We then proceeded to identify a number of welcome predictions of this approach, presenting new data on the homogeneity property that come to light once collective predication is properly considered. We also hope to have shown that our approach of linking non-maximality to homogeneity is promising for extension to other domains (in particular, generics and conditionals), as it may enable a unified treatment of several constructions which display parallel behaviour.

What we have presented leaves open several points for further research. It would be desirable to derive the principle for Addressing an Issue from deeper considerations of relevance. If those could be stated quantitatively, it might also open up an avenue for explaining another fact that we have not discussed: while *all* clearly reduces the tolerance for exceptions, and often eliminates it completely, it is not always completely impossible to use *all* despite the presence of exceptions.

classicus being Lewis 1973), or alternatively in terms of domain manipulation (von Fintel 2001, Gillies 2007).

(65) probably does not really require every single person at the party to be very happy.

(65) All the people at the party were very happy.

This is not, to our knowledge, a phenomenon that any existing theory can explain, and it remains to be seen whether our approach can be improved in a way that allows for this possibility.

Furthermore, we have only presupposed that a compositional semantics can be given that delivers the right extension gaps for sentences with homogeneous predicates. Actually providing such a semantics, which correctly captures collective predicates and explains how *all* and other quantifiers and quantifier-like elements interact with and modify homogeneity is a highly non-trivial task that we have to leave to future work.

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A Comparisons

A.1 Brisson 1998, 2003

Brisson (1998, 2003) presents an account of the possibility of non-maximal readings based on Schwarzschild's (1996) theory of covers. Greatly simplified, we may illustrate the theory thus: when a predicate is combined with a plurality, a contextually supplied function C intervenes which maps that plurality to a subplurality of itself. Thus, the meaning of (66a) is (66b), for some contextually supplied C.

(66) a. The professors smiled.
b. $[\![\text{smiled}]\!](C([\![\text{the professors}]\!]))$

When C is the identity, then we obtain a maximal reading. If the context supplies a C that maps the professors to a proper subplurality of them, then we get a non-maximal reading. The way that *all* now removes the possibility for non-maximal readings is by forcing C to be the identity function regardless of the context, which it accomplishes through some unspecified action-at-a-distance mechanism. No provision is made for the, as it were, super-maximal readings with collective predicates that we discussed in section 5.2, but it seems possible in principle to allow for them by changing what kinds of functions C be (i. e. it could map a plurality not only to a subplurality, but to any overlapping plurality).

Brisson does not explore the rules that govern the choice of C for a given context, nor does her account incorporate homogeneity. It is difficult to see whether the theory could be developed into something of similar or wider coverage than what we have presented, and we cannot explore this question here, so a meaningful comparison is hardly possible.

A.2 Burnett 2011

Burnett (2011b) defines a semantics for predicate logic with plurals — though only for unary distributive predicates — in which a sentence is assigned three kinds of truth-conditions, in an adaptation of a system originally developed under the name of *Tolerant, Classical, Strict* by Cobreros et al. (2012) for vague predication. Classical truth is two-valued and basically gives plural predication universal truth-conditions and complementary (existential) falsity conditions. Classical truth, however, is only used to derive the two other notions: tolerant truth and strict truth. To do this, a relation $\sim$, parameterised by predicates, is added to the model. For any predicate P, the binary relation $\sim_P$ between individuals is reflexive and symmetric, but not necessarily transitive. Assume that for any individual a, $\underline{a}$ is a name for that individual in the object language. Then the truth definitions are as follows:

(67) **Tolerant and Strict Truth**
$M \vDash^t P(\underline{i_1})$ iff $\exists i_2 \sim_P i_1 : M \vDash^c P(\underline{i_2})$
$M \vDash^s P(\underline{i_1})$ iff $\forall i_2 \sim_P i_1 : M \vDash^c P(\underline{i_2})$

While classical falsity is simply the negation of classical truth, the tolerant and strict logic have their falsity conditions defined in terms of each other:

(68) **Tolerant and Strict Falsity**
$M \vDash^t \neg\phi$ iff $M \nvDash^s \phi$
$M \vDash^s \neg\phi$ iff $M \nvDash^t \phi$

The relation $\sim$ is not analysed any further, but given primitively in the model. However, it is clear what notion it is meant to reflect: if $i_1 \sim_P i_2$, then $P(\underline{i_1})$ and $P(\underline{i_2})$ are, for present purposes, equivalent. This will be the case if i_1 is a plural individual that contains some irrelevant exceptions that do not fulfill P, while i_2 is i_1 minus those exceptional individuals. That $\sim_P$ is assumed to be symmetric has a problematic implication. Assume that i_1 contains some exceptions to P, while i_2 is the maximal subgroup of i_1 that contains no exceptions; and furthermore, that $i_2 \sim_P i_1$. Then $P(\underline{i_1})$ is tolerantly, but not strictly true, but $P(\underline{i_2})$, despite the fact that i_2 contains no exceptions, is also not strictly true, because there is i_1, with which it stands in the relation $\sim_P$ and of which P is not classically true. However, this is easily remedied by making $\sim_P$ antisymmetric, which I see no reason not to do.[37]

Assume that all the details are worked out and things are as they should be: a sentence $P(\underline{a})$ is strictly true if all members of a are P, and tolerantly true if a contains only irrelevant exceptions to P. There are then some puzzling consequences, which may be adequate for vagueness, but seem odd for plurals. If tolerant truth is what enables non-maximal readings, then it is predicted that a sentence and its negation are always equally appropriate on a non-maximal reading, which is clearly absurd. See also section **??** for why such, while perhaps appropriate for vagueness, is problematic for plurals.

Furthermore, polarity is only predicted for the strict interpretation, and even then, it is a weird kind of polarity: a predicate would be strictly false on individuals that it is not tolerantly true of. That is, as soon as we find a point where we are definitely not inclined to call the sentence true, we should immediately call it false. Again, this doesn't seem to be appropriate for plurals. If exactly half the boys went swimming, (69) is definitely not true; but it's definitely not false, either.

(69) The boys went swimming.

Burnett's (2011a) theory is the only one that we are aware of (besides our own) that links the effects that *all* has on homogeneity and non-maximality. In this, it relies on the peculiar features of the TCS system. Burnett proposes that the truth-conditions for predication with *all* are very simple:

(70) $M \vDash^t P(\textit{all }\underline{a})$ iff $M \vDash^s P(\underline{a})$
$M \vDash^s P(\textit{all }\underline{a})$ iff $M \vDash^s P(\underline{a})$

That is, *all* simply sets the tolerant truth conditions to be identical to the strict ones. This makes *all* remove both polarity and non-maximality in one fell swoop, since by (68), $P(\textit{all }\underline{a})$ is strictly false iff it is not tolerantly true, and by (70) it is tolerantly true iff it is strictly true, so it is strictly false iff it is not strictly true. This elegantly connects the polarity-removing and precisifying effects of *all*, and it also sits well with the fact that *all* is not an alternative to the definite article, but is added, as it were, on top of a definite DP. However, as we saw

37 In fact, Burnett (2014) argues on psychological grounds that a symmetric $\sim$ is probably not desirable in the analysis of vague adjectives, either.

above, the polarity in the system is of an odd sort that doesn't appear to be quite what we see with plurals, and if it were to be replaced by something more appropriate, the connection that Burnett's system establishes between polarity and non-maximality would be broken.

A.3 Malamud 2012

Malamud (2006, 2012), too, starts from the idea that plural sentences are interpreted with reference to a partition on the set of possible worlds that formalises an intuitive notion of the current purposes of the participants of the conversation, in doing so, presents the first theory to say something substantial about the way in which non-maximal readings depend on context.

However, apart from this commonality, Malamud's theory has a very different architecture from the one we have presented. We consider our approach to be preferable on the basis of the following four points. The remainder of this section will be devoted to demonstrating these.

1. Malamud has to assume a non-compositional interpretation procedure for definite plurals.
2. The theory makes the same predictions as ours for distributive predicates, but overpredicts not only non-maximal, but existential readings with collective predicates.
3. The theory does nothing to link homogeneity and non-maximality.
4. The theory has nothing to say about how the addition of *all* prevents non-maximal readings.

To first see intuitively how Malamud's interpretation procedure[38] procedure works, consider, as the simplest case, a sentence ϕ containing one definite plural DP α being used to address a question Q. The intuitive idea is that you first form various alternatives of ϕ which are obtained by replacing α by a different definite description whose denotation is a mereological part of α's denotation, so if the sentence is (71a), then (71b) and (71c) are, informally, some of these alternatives.

(71) a. The professors (= Jones, Brown, and Smith) smiled.
  b. Jones and Brown smiled.
  c. Smith smiled.

Then you take, from this set of alternatives, those which are most relevant to the question Q, and form the disjunction of them. This disjunction is the final meaning of the sentence.

38 We should note that, in an attempt to improve transparency and legibility, we have chosen to present Malamud's theory in a manner quite different from what is found in the original paper. We would like to point out that the final definition of Malamud's operator in (58) on p. 38 takes expressions, and not denotations, as its arguments and cannot be reduced to a compositional operator, even though its predecessor in (51) is compositional.

In defining the procedure formally, we shall write $[\![\cdot]\!]$ for the usual denotation function, and $[\![\cdot]\!]^*$ for the final meaning of the sentence after Malamud's procedure has been applied. The latter has the following form:

(72) $[\![\phi]\!]^* := \lambda w.\exists p : p \in \max_Q(\text{Alt}_w(\phi)) \wedge p(w)$

Formally, the set of propositions $\text{Alt}_w(\phi)$ can be defined as follows:[39]

(73) $\text{Alt}_w(\phi) := \{[\![\phi[\xi/\alpha]]\!] \mid [\![\xi]\!](w) \sqsubseteq [\![\alpha]\!](w) \text{ and } [\![\xi]\!] \text{ is constant}\}$

To obtain this set, we have to perform several steps.

1. Take the extension of the plural DP α in the world w. (α itself denotes an individual concept, i. e. a function from worlds to individuals.)
2. Collect all the individuals x_i that are mereological (not necessarily atomic!) parts of $[\![\alpha]\!](w)$.
3. For every such individual x_i, take an expression ξ_i which denotes a constant individual concept that in all words has x as its extension.[40]
4. Then we take the sentence ϕ and replace α with the various ξ_i, yielding a collection of sentences.
5. Take the denotations of these sentences and collect them.

The set of propositions that this procedure yields is $\text{Alt}_w(\phi)$. If the professors in w are Smith, Brown, and Jones, for example, and the sentence in question is *The professors smiled*, then $\text{Alt}_w(\phi)$ is the following set of propositions:

$$\{[\![\text{Smith smiled}]\!], [\![\text{Brown smiled}]\!], [\![\text{Jones smiled}]\!],$$
$$[\![\text{Smith and Brown smiled}]\!], [\![\text{Brown and Jones smiled}]\!],$$
$$[\![\text{Smith, Brown and Jones smiled}]\!]\}$$

Going back to (72), we also need to know what $\max_Q$ does. $\max_Q(\text{Alt}_w)$ designates the subset of $\text{Alt}_w(\phi)$ that consists of those propositions that are maximally relevant to the question Q, where relevance is assessed by counting the number of cells in Q that a proposition eliminates. $[\![\phi]\!]^*$ then contains the world w if the

39 Assuming λ-abstraction in the object language, there is an alternative formulation that does not presuppose that we have names for all the individuals involved:

(i) $\text{Alt}_w(\phi) := \{[\![\lambda\xi.\phi[\xi/\alpha]]\!](x) \mid x(w) \sqsubseteq [\![\alpha]\!](w) \text{ and } x \text{ is constant individual concept}\}$

40 For the reader who wishes to compare our reconstruction with Malamud's presentation, we note that the definitions of *REL* in (51) and (58) clearly select individuals, not individual concepts. Thus, the writing $g(w)$ in (55b) and (56b) must be assumed to be an oversight. The same holds for p instead of $p(w)$. Thus, (55b) should read, with corrections in boldface:

$$\lambda w.\exists p[p \in \{\mathbf{g}\ \textit{is open} \mid \mathbf{g} \in \textit{REL}(\textit{DeP})(\textit{win})(\textit{open})(w)\} \wedge \mathbf{p}(\mathbf{w})]$$

Analogous corrections apply to (56b).

disjunction of all these maximally relevant propositions is true in w, and analogously for a different word u if it makes one of the most relevant propositions based on the set of professors in u true, etc.

This definition has disastrous consequences in the general case. For the constitution of the set of professors may vary from world to world; Smith may be a professor in some worlds, but not in others, and the hearer of an utterance of *The professors smiled* may have no idea which particular individuals the professors were. Thus, there will be worlds where Smith is a professor in all cells of the current issue, and worlds where he isn't. The proposition that Smith smiled, therefore, is simply irrelevant: it doesn't eliminate a single cell; and similarly for all other propositions that are about particular individuals. Whenever such a situation arises, all propositions are equally relevant. This means that $[\![\phi]\!]^*$ contains w if just one of these professors (the professors in w) smiled, and contains u if one of the professors in u smiled, etc. Thus, in general, when the extension of the plural DP is not known to be the same particular group in all worlds, Malamud's procedure yields an existential reading for plural definites. In order to get an even close to maximal reading, the hearer has to know which particular individuals most of the professors were (and furthermore we have to assume that the question Q partitions not all possible worlds, but is restricted to, say, the common ground). This is obviously absurd.

To dig further, let us set aside this problem by assuming that *the professor* has the same extension in all worlds, i. e. that the professors have been established to be a particular group of individuals. We then find that the theory cannot distinguish between relevant and irrelevant exceptions. In our discussion in section 2.2, we argued that it is important what the professors who don't smile do instead. In Malamud's system, such situations lead to overly strong readings. Assume that the current issue is $Q = \{i_1, i_2, i_3\}$. i_1, corresponding to a favorable reception of Sue's talk, contains worlds where all professors smile, and also those worlds where all professors except Smith smile and Smith doesn't anything to overtly indicate displeasure. i_2 contains, among others, worlds where all the professors except Smith smile and he displays anger. i_3 contains only worlds where less than two professors smile. Then the proposition that Jones and Brown smiled eliminates only i_3, whereas the proposition that all three professors smiled eliminates i_3 and i_2, consequently being more relevant. What results is a maximal reading: all three professors smiled. In general, as soon as there is at least one way in which an individual could be a relevant exception, it is precluded from being an exception in any way at all.

Both of these problems can be fixed by restating the theory in terms of individual concepts instead of individuals, which furthermore simplifies its presentation. Take again the sentence ϕ with the definite description α. We then compute, world-independently, a set of propositions, let's call it $\mathrm{Alt}(\phi)$.

(74) $\mathrm{Alt}(\phi) := \{[\![\phi[\xi/\alpha]]\!] \mid \forall w : [\![\xi]\!](w) \sqsubseteq [\![\alpha]\!](w)\}$

These propositions are again the meanings of variants of ϕ where α is replaced by another expression that denotes an individual concept. But this time, ξ need not be constant — we merely require that its extension in any world be a part of the extension of α in that world.[41] Setting aside matters of definedness, ξ could be something like *the female professors*.

The effective meaning of ϕ is then the disjunction of the maximally relevant propositions in that set:

(75) $[\![\phi]\!]^* := \bigvee \max_Q(\mathrm{Alt}(\phi))$

Now it doesn't matter if the set of professors varies from world to world — we can have the individual concepts in the alternatives vary with it. To see how this takes care of the problem concerning the identity and activities of exceptions, take the individual concept a such that $a(w)$ denotes $[\![$the professors except Smith$]\!](w)$ if Smith deviates from smiling in an unimportant manner in w, and otherwise denotes $[\![$the professors$]\!](w)$. This individual concept is obviously a part of $[\![$the professors$]\!]$ by the above definition. Then $\lambda w.[\![\text{smiled}]\!](w)(a(w))$ is in the set of candidate propositions, and, by construction, it is one of the maximally relevant propositions; so Smith ends up being permitted as an exception depending on what he does instead of smiling, replicating the results of our theory.

On the empirical side, there is a dubious prediction of Malamud's account that arises specifically with collective predicates. Assume a scenario in which some girls are blonde and some aren't, and all of them together formed a circle. (76) would not be true in that case, because the predicate *formed a circle* certainly doesn't hold of a subplurality of the girls; it does not, after all, mean *be involved in the formation of a circle*.

(76) The blonde girls formed a circle.

Conversely, as pointed out in section 5.1, (77) is not true if *only* the blonde girls formed a circle, whereas the non-blonde girls didn't participate.

(77) The girls formed a circle.

If this is so, Malamud's machinery overpredicts existential readings for collective predicates. Assume that the current issue contains three cells: i_1, where all the girls together formed a circle, i_2, where some proper subgroup of the girls formed a circle, and i_3, where no circle at all was formed, and that further the extension of *the girls* is the same group g_1 in all worlds. Let g_2 be any proper subgroup of the girls. The alternative propositions, from which the most relevant ones are to be chosen, will contain, among others, the proposition p_1 that g_1 formed a circle, and the proposition p_2 that g_2 formed a circle. p_1 is true only in i_1, and thus eliminates two cells — i_2 and i_3. p_2 is true in some worlds in i_2, but not in any worlds in i_1 or i_3, and hence eliminates two cells as well. Thus, p_1 and p_2 are equally relevant, and the eventual meaning of (77) will contain them as disjuncts. Since g_2 is any subgroup of the girls, what results is simply an existential statement: that some (proper or improper) subgroup of the girls

41 To be completely precise, we have to take into account the fact that definite descriptions are not defined for all worlds; thus, the above definition should be understood as involving quantification only over those worlds in which both concepts are defined, and we may further want to require that $[\![\xi]\!]$ should have the same domain as $[\![\alpha]\!]$.

formed a circle — in spite of the fact that by stipulation, it matters for current purposes whether it was all or only some of the girls that formed a circle. This is clearly inappropriate.

Worse yet, one can even construct a scenario in which $[\![(77)]\!]^*$ eliminates no cell from the current issue at all. Assume that there are some worlds in i_3 where a subgroup g_3 of the girls formed a circle, and that g_3 did not form a circle in any world in i_2 or i_1. Then the disjunction that is $[\![(77)]\!]^*$ contains as disjunct, among other things, the propositions that g_1 formed a circle, that g_2 formed a circle (which is only true in worlds in i_2), and that g_3 formed a circle, and is thus compatible with all three cells of the current issue.

This problem arises with collective predicates due to the fact that they are not upward-monotonic with respect to the join-semilattice that is the domain of individuals. For distributive predicates, the proposition p_2 would always be true throughout i_1, and so eliminate fewer cells than p_1 (thus being less relevant and not occurring in the disjunction that is the final interpretation of the sentence in question) unless it is indeed, for current purposes, equivalent to p_1, in which case it would eliminate equally many cells.

The theory can be repaired in a way that makes it, as far as the predicted non-maximal readings for plurals are concerned, equivalent to the one presented in this paper. The reason for the above prediction is that we chose the most relevant alternative propositions, not the ones that identify the same cell as the maximal interpretation. If the latter rule is used instead, the theory makes equivalent predictions to ours about the conditions under which non-maximality is possible.

However, an approach like Malamud's, due to its fundamental structure, does nothing to link non-maximality and homogeneity. The theory works for negated sentences only if homogeneity holds in the underlying logic.[42] Assume that the professors are Brown, Jones, and Smith in all worlds, and we want to interpret (78).

(78) The professors didn't smile.

Then the set of propositions from which we need to pick the most relevant ones contains, among others, these:

(79) $[\![$Jones didn't smile$]\!]$, $[\![$Jones and Smith didn't smile$]\!]$, $[\![$Smith didn't smile$]\!]$, $[\![$Brown didn't smile$]\!]$, $[\![$Jones, Brown and Smith didn't smile$]\!]$, . . .

If we assume no homogeneity for these sentences, so that they have their classical truth conditions — so that *Jones and Smith didn't smile* is true as soon as either of them failed to smile — , then we have a problem: the final interpretation of (78) is to be a disjunction of such propositions, but no such disjunction will ever amount to the proposition that none of the professors smiled. Indeed, it would be impossible for a negated plural sentence to entail that more than one individual in the plurality failed to satisfy the predicate! Only if we assume that the propositions in the set of alternatives say of various subpluralities of

42 The discussion of example (64) on p. 34 in the paper is liable to be read as suggestive to the contrary, as the assumption of homogeneity in the underlying logic is not made explicit.

the professors that *all* members of those pluralities failed to smile — i. e. if the underlying logic has homogeneity effects — do we get the desired reading, since then we pick the most relevant ones from among propositions like the following:

(80) ⟦Jones didn't smile⟧, ⟦Neither Jones nor Smith smiled⟧, ⟦Smith didn't smile⟧, ⟦Brown didn't smile⟧, ⟦Neither Jones nor Brown nor Smith smiled⟧, . . .

Malamud 2012 is an important improvement over previous theories in that it spells out explicitly how a notion of current purposes of the conversation influences the availability of non-maximal readings, but we conclude, based on the shortcomings demonstrated above, that what we have presented in this paper is a more promising approach.