Wide-scope distributivity*

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1. Introduction

Sentences like (1) are ambiguous between a collective and a distributive interpretation. Previous literature (Roberts 1987, Link 1987) has motivated an account of such ambiguities in terms of presence or absence of a covert operator (hereafter DIST).

(1) The women from Boxborough brought a salad.

    a. **Meaning 1:** one salad was brought.   (collective)
    b. **Meaning 2:** each woman brought one salad.   (distributive)

Without the operator, the sentence is interpreted collectively, as in (1a). Inserting the operator as in (2a) gives rise to the distributive reading.

(2)   a. The women from Boxborough [DIST brought a salad]
    b. $[\![\text{DIST}]\!] = \lambda p_{et}.\lambda X_e. \forall x \prec_{at} X, p(x)$[1]

Because DIST applies to predicates formed syntactically (after LF-movement), there are restrictions on where the universal quantification it contributes can take scope. For instance, Winter (2001) (crediting Ruys (1992)) notes that while the indefinite *three relatives of mine* can take exceptional scope over the conditional in (3), distributivity cannot. In concrete words, the reading in (3b) does not obtain.

(3) If three relative of mine die, I will inherit a house

[1]Notations: $x \prec_{at} X$ means "x is an atomic part of X" ; $x \prec X$ means "x is a (possibly non-atomic) part of X"

a. **Available:** I have three relatives such that if each of them die, I will inherit a house. $\qquad (3 \gg \text{if} \gg \text{DIST})$

b. **Unavailable:** Three relatives of mine are such that for each person x among them, if x dies, I will inherit a house. $\qquad (3 \gg \text{DIST} \gg \text{if})$

To derive the impossible reading, DIST would need to apply to a predicate that can only be formed by island-violating LF movements, as in (4) for instance.

(4) three relatives of mine DIST λx. if x die, I will inherit a house

                    *

   My goal in this paper is to investigate a particular class of exceptions to this generalization. We will refer to such cases as cases of *wide-scope distributivity*. We will show that apart from the challenges that they raise to the standard picture (section 2.1), these cases seem to also threaten well-motivated generalizations about dependent plurals (section 2.2). I will argue that the latter puzzle solves the former by revealing the presence of a new distributivity operator which does not apply to predicates and whose semantics is index-based.

    By severing distributivity from syntactically formed predicates, enough room is provided for the cases of *wide-scope distributivity*, while retaining the unacceptability of Ruys' examples. This analysis is presented in section 3, and one implementation of it is given in section 4. Section 5 is a discussion of the broader implications of the analysis and some further predictions.

2. Data

2.1 Wide-scope distributivity

The sentences of interest are in (5)-(7). In each of these sentences, a plural expression (underlined) is embedded in a scope island, but the universal force associated with the distributive reading thereof takes scope over the whole sentence. We will refer to sentences that have such readings as WSD sentences.

(5) **Context:** *We're testing a new drug. Speaker just came back with the results of the test.*
(The test was ineffective.) Either the drug made <u>the participants</u> sleepy or it made them numb.
Interpretation: *for each of the participants p, either the drug made p sleepy or it made p numb.*

(6) **Context:** *Alex is a guard at the nuclear powerplant facility. The powerplant employees have different work hours and do not all arrive at the same time.*

When these employees arrived, Alex smiled. (But she didn't when those ones did.)
Interpretation: *for each of these employees e, when e arrived, Alex smiled.*

(7)   **Context:** *Each player receives 3 items in the first level.*[2].
The 3 items that I put in the players' inventory helped them complete the first level.
Interpretation: *for each of the players p, the 3 items that I put in p's inventory helped p complete the first level.*

In the operator view on distributivity of Roberts (1987), this reading is surprising[3]. One could in principle derive the relevant reading by applying DIST to the predicate p in (8). This predicate in turn must be formed by moving *these employees* to the root of the sentence. That such movements are banned by the grammar is shown by the lack of a corresponding wide-scope interpretation in (9).

(8)   these employees DIST [λx. when x arrived, Alex smiled]$_p$.

(9)   #When every employee arrived, Alex smiled.

  As noted in the introduction, some plural expressions cannot get a wide-scope distributive interpretation. Indefinites cannot (cf Ruys' observation from section 1), and neither can plural quantifiers of various stripes. However, definites, possessives, proper name coordinations and plural pronouns all can. This is illustrated in (10) and (11).

(10)   a.   When the employees from Glasgow arrived, Alex smiled.   *(definites)*
         b.   When John and Mary arrived, Alex smiled.   *(conjunction)*
         c.   When my employees arrived, Alex smiled.   *(possessives)*
         d.   When they arrived, Alex smiled.   *(pronouns)*

(11)   a.   When all the employees arrived, Alex smiled.   *(all)*
              $\neq$ *for all employees X, for each atom x of X, when x arrived, Alex smiled.*

         b.   When most (of the) employees arrived, Alex smiled.   *(most)*
              $\neq$ *for most employees X, for each atom x of X, when x arrived, Alex smiled.*

         c.   When three employees arrived, Alex smiled.   *(indefinite)*
              $\neq$ *for three employees X, for each atom x of X, when x arrived, Alex smiled.*

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[2]Parsing the relative clause as a functional relative clause is excluded, because the gap c-commands the plural expression (Sharvit 1999)

[3]The reading is similarly surprising for event-based distributivity operators (Champollion 2016). In these views too, the distributive operator and the plural expression associated with it must be in the same clause. This is not the case in WSD sentences.

What is the dividing line between these plural expressions that can receive a WSD interpretation and those that don't? I suggest that only plural expressions of type *e* (hereafter *referential expressions*) can get a WSD reading.

To sum up, we are faced with two puzzles: first, we must explain what mechanism allow the *wide-scope distributive* interpretation; second, we must explain why this mechanism can only apply to referential expressions. To solve these puzzles, I will make a detour and show another surprising feature of the WSD sentences, pertaining to dependent plurals.

2.2 Dependent plurals

Dependent plurals (Spector 2003, Zweig 2008, Ivlieva 2013, Minor 2017) can be defined as plural expressions which do not, on the face of it, carry multiplicity inference (see more precise characterization in Zweig (2008)). The underlined expressions below are examples of dependent plurals.

(12) a. All our graduates wrote <u>dissertations on case</u>
          $\nRightarrow$ All our graduates wrote multiple dissertations.

     b. All our graduates wrote <u>their dissertations</u> on case.
          $\nRightarrow$ All our graduates wrote multiple dissertations.

Building on previous literature and new observations, Minor (2017) draws many empirical generalizations about dependent plurals. I will focus on two such observations. The first observation is given in (13).

(13) *Licensing condition on dependent plural.*
      Dependent plurals must be licensed ; in particular they must be in the scope of one of the following plural expressions: they, definites, plural quantifiers including "*all*"

The second observation concerns plural pronouns with singular reference. As is well known, some bound plural pronouns refer to singularities despite their plural marking (Rullmann 2003). For instance, *they* in (14a) must refer to an individual girl, in order to avoid contradictory beliefs. Singular reference is blocked by floated *all* ; this is why (14b) reports a contradictory belief.

(14) a. The girls thought they were the tallest.
     b. The girls thought they all were the tallest.

Minor (2017) establishes the following property of plural pronouns with singular reference.

(15) *Licensing condition on dependent plural.* Pronouns with singular reference (including those marked in plural) cannot license dependent plurals.

The generalization cannot be tested on simple sentences such as (14), because the binder of the plural pronoun can itself act as the licensor for the dependent plural. Minor (2017) manages to rule out this possibility using intervention effects, but such details do not concern us here.

Turning back to WSD sentences, let us start by observing that WSD sentences license dependent plurals. This is so whether the plural expression is definite or a plural pronoun.

(16)   **Context:** *Speaker is presenting a survival game show. The situation seems critical.*

      a.   Either the participants finished their ration boxes or they lost them to mountain lions.
          ✓ *one ration box per participant*

      b.   Either they finished their ration boxes or they lost them to mountain lions.
          ✓ *one ration box per participant*

On the other hand, pronouns in WSD sentences have singular reference. As observed earlier, a plural pronoun associated with a floated *all* cannot have singular reference. Similarly here, the WSD reading is cancelled when a floated *all* is added.

(17)   Either they all finished their ration boxes or they lost them to mountain lions.

We now face a conundrum ; on the one hand, dependent plurals are licensed in WSD sentences. On the other hand, the only visible licensor is a pronoun with singular reference and these pronouns cannot serve as licensors, as per the observation in (15).

In the next section, we will argue that this second puzzle raised by WSD sentences naturally paves the way to an explanation of why WSD sentences are possible in the first place.

3.   Analysis

3.1   From dependent plurals to wide-scope distributivity

For the time being, I strategically focus on WSD sentences with plural pronouns, such as (16b), repeated below in (18). Recall the puzzle: dependent plurals are licensed even though the only visible licensor is a pronoun with singular reference and it is known that these pronouns cannot license dependent plurals.

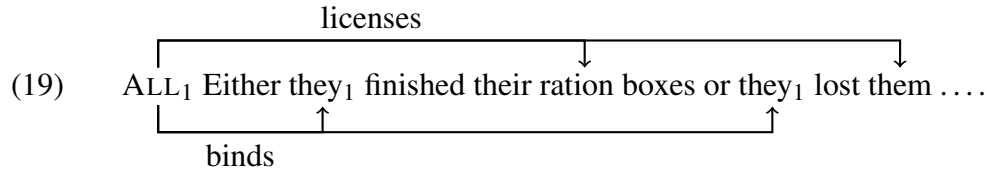(18)   Either they finished their ration boxes or they lost them to mountain lions.

If no visible licensor of dependent plurals can be found in such sentences, then the licensor must be covert. Let us conspicuously name this putative covert licensor ALL.

I now make the following speculation: assume that in the WSD sentence in (16b), it is ALL that contributes distributive quantification. Since ALL is an independent operator, it is not required to take a scope local to the plural expression. Distributive force can thus be
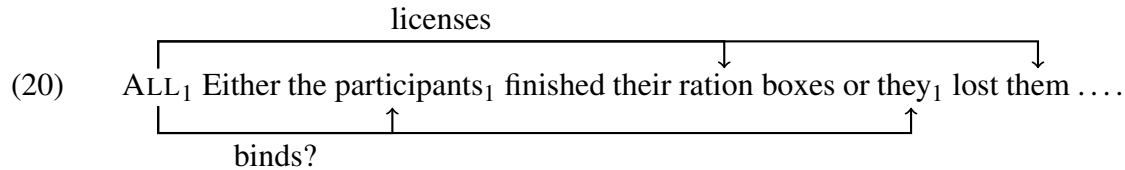
arbitrarily remote from the location of the pronoun itself, yielding a reading of distributivity of arbitrarily wide scope. Although details remain to be spelled out, it seems that positing ALL not only explains the licensing of dependent plurals, but also the possibility of wide-scope interpretation, our initial puzzle.

There is one missing piece. What relation does ALL bear to the pronoun *they*? I have argued that despite its number marking, *they* has singular reference in (18). Such behaviour is a tell-tale sign that the pronoun is bound. ALL seems to be a natural candidate for the role of binder.

To recapitulate, we will work on the basis of the LF in (19).

(19)
$$\text{licenses}$$
ALL$_1$ Either they$_1$ finished their ration boxes or they$_1$ lost them . . . .
binds

This LF bears a certain theoretical commitment that our analysis will have to comport with. Remember that WSD sentences are also felicitous with plural definite descriptions and other referential expressions. To be consistent with the solution suggested above, we must assume that in WSD sentences, such definite descriptions are in fact bound, as in (20).

(20)
$$\text{licenses}$$
ALL$_1$ Either the participants$_1$ finished their ration boxes or they$_1$ lost them . . . .
binds?

While this move may seem strange, observe that the same diagnostic we used to show that pronouns have singular reference in WSD sentences applies to other referential expressions as well. Indeed, use of a floated *all* removes the WSD reading of the sentences (cf (21)). This suggests that in these sentences as well, definite descriptions denote singularities, in spite of their apparent plural descriptive content. Section 5.2 will try to motivate the idea that definite plurals and referential expressions can be bound on independent grounds.

(21)   Either the participants all finished their ration boxes or they lost them to mountain lions.

4.   Implementation

4.1   Formal set-up

Our characterization of the problem drew on Minor's (2017) observations about dependent plurals. Our solution should thus import a successful account of dependent plurals. While wide in coverage, Minor's (2017) own solution and its adaptation to our current puzzle is richer than I can demonstrate in the space here.

I will therefore develop a toy account of WSD sentences that remains faithful to the solution informally spelled out above. While I continue to use properties of dependent plurals as diagnostics, I will not offer a formal account of them.

Semantics of ALL.   In our LF, ALL scopes over a node of type t, not type et ; this is not usually the kind of node which can receive quatification. This problem can be evaded by adopting an index-based semantics for distributivity (as in Dotlačil (2010, 2013)).

Specifically, I assume that ALL bears an index. This index makes reference to the plurality that ALL must distribute over. In the case of (19) for instance, repeated in (22), the index 1 makes reference to the set of candidates to the survival game.

(22)   ALL$_1$ either they$_1$ finished their ration boxes or they$_1$ lost them to mountain lions.

An immediate consequence of this is that ALL cannot distribute over pluralities which are not present in the assignment function. This property will play a crucial role in explaining Ruys' observation in section 5.2.

The basic semantics of ALL$_i$ universally quantifies over the singularities that are contained in $g(i)$. For reasons that will become clear very shortly, it will prove important to keep the original plurality $g(i)$ in an index related to i, one that I will call the *range index* and write as $\oplus i$.

(23) $[\![\text{ALL}_i \ \alpha]\!]^g = \text{true iff } \forall x \prec_{at} g(i), \ [\![\alpha]\!]^{g[i \to x, \ \oplus i \to g(i)]}$

Bound plural pronouns.   By keeping the original plurality in the range index $\oplus i$, it becomes possible to create a split between what the number features of a pronoun make reference to and what the pronoun itself refers to. In other words, it becomes possible for a pronoun to refer to a singularity while carrying plural marking. This is exactly the kind of split we observe with plural bound pronouns. The following lexical entry fleshes out this intuition.

(24) $[\![\text{they}_i]\!]^g = g(i)$ (**presupposing:** $g(\oplus i)$ is a plurality)

To cover the case of unbound plural pronouns, I assume that the assignment function against which the whole sentence is evaluated has the following property: for all indices i, $g(i) = g(\oplus i)$. In short, only plural quantifiers can create a split between what an index refers to and what its corresponding range index does.

This approach to features on bound plural pronouns has convergences with Sudo's (2012) analysis, who treats number features on bound plural pronouns as imposing conditions on the range of values that a pronoun takes. The range index can be seen as storing this range in the assignment function.

Simple cases. This account straightforwardly predicts WSD sentences with plural pronouns. In each case, ALL binds an embedded plural pronoun from the matrix clause, contributing its distributive quantification at matrix level.

(25)   a.   ALL$_1$ [either the drug made them$_1$ sick or it made them$_1$ numb]
       b.   If $g(1)$ are the participants to the experiment,

$$[\![(25a)]\!]^g = \forall x \prec_{at} g(1), \ [\![\alpha]\!]^{g'}$$
$$\text{where } g' = g[1 \to x, \ \oplus 1 \to g(1)]$$
$$= \forall x \prec_{at} g(1), \ \big(\text{it made } g'(1) \text{ sick}\big) \vee \big(\text{it made } g'(1) \text{ numb}\big)$$
$$\text{defined iff } g'(\oplus 1) \text{ is a plurality}$$
$$= \forall x \prec_{at} g(1), \ (\text{it made } x \text{ sick}) \vee (\text{it made } x \text{ numb})$$
$$\text{defined iff } g(1) \text{ is a plurality}$$
$$= \forall x \prec_{at} \text{the participants}, \ (\text{it made } x \text{ sick}) \vee (\text{it made } x \text{ numb})$$
$$\text{defined iff } g(1) \text{ is a plurality}$$

(26)   a.   ALL$_1$ [when they$_1$ arrived, Alex smiled]

       b.   If $g(1)$ are the employees,

$$[\![(25a)]\!]^g = \forall x \prec_{at} g(1), \ [\![\alpha]\!]^{g'}$$
$$\text{where } g' = g[1 \to x, \ \oplus 1 \to g(1)]$$
$$= \forall x \prec_{at} g(1), \ \text{when } g'(1) \text{ arrived, Alex smiled}$$
$$\text{defined iff } g'(\oplus 1) \text{ is a plurality}$$
$$= \forall x \prec_{at} g(1), \ \text{when } x \text{ arrived, Alex smiled}$$
$$\text{defined iff } g(1) \text{ is a plurality}$$
$$= \forall x \prec_{at} \text{the participants}, \ \text{when } x \text{ arrived, Alex smiled}$$
$$\text{defined iff } g(1) \text{ is a plurality}$$

Other referential expressions. As discussed in section 3.1, referential expressions other than pronouns have singular reference in WSD sentences and thus, by the logic of my account, must be bound by ALL. Just like pronominal features in binding configurations, the content of a referential expression must not determine its referent -who is singular- but rather the range of values that this referent spans.

     This is achieved by a structure like the one in (27) where a covert indexed pronominal adjoins to a node of type e. I assume that the semantic effect of this adjunction is that the referent of the referential constituent is presupposed to be equal to the range index.

(27)   a.

          i   the participants

       b. $[\![\text{i the participants}]\!] = g(i)$ (**presupposing**: $g(\oplus i) =$ the participants)

In this structure, the referential expression fulfills the same duty that number features were fulfilling in (25a) and (26a). It constrains the range of values that the covert pronominal with index 1 takes to be the set of all participants. The computation runs as follows:

(28)   a. ALL_1 [either the drug made the participants$_1$ sick or it made them$_1$ numb]

   b. $[\![(28a)]\!]^g = \forall x \prec_{at} g(1), \; [\![\alpha]\!]^{g'}$

$$\text{where } g' = g[1 \rightarrow x, \; \oplus 1 \rightarrow g(1)]$$

$$= \forall x \prec_{at} g(1), \; \big(\text{it made } g'(1) \text{ sick}\big) \vee \big(\text{it made } g'(1) \text{ numb}\big)$$
$$\text{defined iff } g'(\oplus 1) = \text{the participants}$$
$$= \forall x \prec_{at} g(1), \; \big(\text{it made } x \text{ sick}\big) \vee \big(\text{it made } x \text{ numb}\big)$$
$$\text{defined iff } g(1) = \text{the participants}$$
$$= \forall x \prec_{at} \text{the participants}, \; \big(\text{it made } x \text{ sick}\big) \vee \big(\text{it made } x \text{ numb}\big)$$
$$\text{defined iff } g(1) = \text{the participants}$$

This is the correct wide-scope reading. Note that there is a presupposition that index 1 refers to the set of all participants. We will discuss this requirement in section 5.2. Next section develops broader implications of the account and give an account of Ruys' observation.

5.   Implications and predictions

5.1   Another parallel with dependent plurals.

Notice the contrast between the a-b examples and the c-d examples below. Any time a singular indefinite is used in the scope of "*all*", any plural indefinite cannot be interpreted as a dependent plural and must be interpreted as "*more than one …*", resulting in oddness.

(29)   **Background:** *one only ever writes one dissertation and marriage is monogamous.*

   a.   All of our graduates wrote dissertations on case before marrying rich heirs.
   b.   All of our graduates wrote a dissertation on case before marrying a rich heir.
   c.   #All of our graduates wrote dissertations on case before marrying a rich heir.
   d.   #All of our graduates wrote a dissertation on case before marrying rich heirs.

(30)   a.   All of our graduates either wrote dissertations on case or married rich heirs.
   b.   All of our graduates either wrote a dissertation on case or married a rich heir.
   c.   #All of our graduates either wrote a dissertation on case or married rich heirs.
   d.   #All of our graduates either wrote dissertations on case or married a rich heir.

Under the analysis proposed above, WSD sentences contain a covert ALL operator. If this analysis is on the right track, then the same constraint that applies to the sentences above should apply to WSD sentences as well: use of a singular indefinite should block the dependent plural reading of a plural indefinite. This is indeed what we find:

(31) **Intended:** *for every graduate x, either x wrote a dissertation on case or x married a rich heir.*

    a.   Either our graduates wrote dissertations on case or they married rich heirs.

    b. #Either our graduates wrote a dissertation on case or they married rich heirs.

(32) **Intended:** *for every graduate x, x married a rich heir soon after x wrote a dissertation on case.*

    a.   Soon after our graduates wrote dissertations on case, they married rich heirs.

    b. #Soon after our graduates wrote a dissertation on case, they married rich heirs.

5.2 Tying up loose ends

Accommodated referents. Our analysis assumed that the plurality to be distributed over by ALL was provided in the assignment function. In (33) (repeating (27b)), this means that the set of all participants is contained at index 1. The presupposition on the range index ensured that $g(1)$ was indeed the set of all participants.

(33)   a.   Either it made the participants$_1$ sick or it made them$_1$ sleepy.

         b.   **Presupposition at root node:** $g(1)$ = the participants

However, WSD sentences can be uttered even when no previous mention of "*the participants*" has been made. In such contexts, the assignment function presumably does not contain a value for index 1. This challenges one of the assumption underlying the analysis, namely that WSD sentences are only possible if the assignment function contains an index that ALL can distribute over.

    But note that the presupposition of (33) is sufficiently precise that a hearer knows the value of $g(1)$ intended by the speaker, even if she initially entertained a context that did not have a value for $g(1)$. Thus, it is conceivable that the hearer can accomodate the referent for $g(1)$ when it is not given.

    Such mechanisms of referent accommodation have precedents in the Dynamic Semantics literature. Heim (1982) uses a mechanism of the sort to provide an elegant unification of anaphoric definites and the standard existence-and-uniqueness presuppositions of novel definites. Following her, we can assume that referent accomodation will be possible whenever global presuppositions can uniquely identify the missing referent.

Ruys' observation Ruys observed that indefinites do not receive WSD readings, even though they can take widest scope (my terminology, illustrated in (34a)). In the account that I offered, this observation is a consequence of the fact that the semantics of ALL is index-based.

(34)   a.   If three relatives of mine$_1$ die, I'll inherit a big house.

         b.   **Possible LF:** ALL$_1$ [if three relatives of mine$_1$ die, I'll inherit a big house.]

Suppose we were to apply ALL with index 1 outside the scope of *if* in (34a), as required for WSD readings. For such an LF to be felicitous, the assignment function has to provide a value for index 1 at the level where ALL_1 is introduced. Could the indefinite contribute that value?

No: even when the indefinite "*three relatives of mine₁*" takes exceptional scope above "*if*", the value of $g(1)$ it contributes is only available for nodes that it c-commands on the surface. This is shown by the fact that even exceptional scope indefinites cannot bind pronouns that c-command them, cf contrast in (35) (Strong Crossover). I take this to mean that no value for index 1 is available for the pronouns in (35), because they are too high in the tree.

(35)   a.   When he$_{2,*1}$ discusses with the wife of a friend of mine₁ about financial matters, they always get into a fight.
(under the reading "*there is a friend of mine, such that when …*")

   b.   When a friend of mine₁ discusses with his$_{1,2}$ wife of about financial matters, they always get into a fight.
(under the reading "*there is a friend of mine, such that when …*")

Thus, it seems that a value for index 1 will not be available for an ALL_1 inserted above the *if*-clause. Could referent accomodation, as discussed above, provide for the missing value? Last section placed a condition on when referent accomodation could apply: the value at the index must be uniquely identifiable on the basis of global presuppositions. Contrary to the case of novel definites, sentences like (34a) do not carry presuppositions about the value of index 1 and thus referent accomodation cannot take place.

Even if referent accomodation can somehow happen, the resulting reading would be vacuous. For the quantification of ALL_1 to be contentful (or any quantification for that matter), it must bind some variable in its scope. In my account, only referential expressions can be bound. No such bindee can be found in (34a). This is the reason why other quantifiers than indefinites, will not receive WSD readings either.

Bound referential expressions.   The existence of a covert ALL responsible for licensing dependent plural has, at this point, been motivated. But accepting this has led us to posit that referential expressions can be bound. This consequence was in line with the fact that these expressions did seem to have singular reference in WSD sentences. However, evidence for bound referential expressions beyond WSD sentences was not offered.
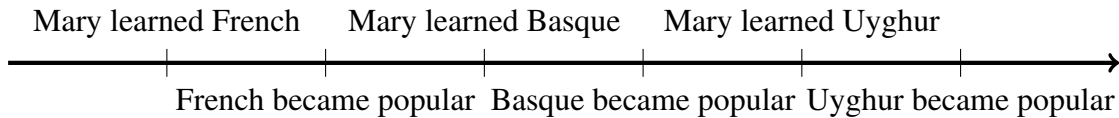
At first blush, this assumption seems counter-intuitive. Remember that the class of referential expressions (type *e* expressions) includes definite descriptions, demonstratives, proper names, and conjunctions of the above. If all of these expressions can be bound, then why can't they be used in the place of regular bound pronouns in (36)?

(36)   a.   *Every child though the child would win
   b.   *All of my four sons thought my sons would win the Chess Championship.

That being said, cases of exactly that sort have been discussed in the literature (Wilson 1984, Schlenker 2005, Elbourne 2013):

(37) a. Every scientist who was fired from the observatory was consoled by someone who had known the scientist as a youth. (Wilson 1984)

   b. John fed no cat of Mary's before the cat was bathed. (Elbourne 2008)

There is no uncontroversial explanation for the contrast between (36) and (37). Multiple factors seem to be at play: disambiguation, whether the quantifier c-commands the pronoun on the surface, etc. All these conditions will contribute to obscure the basic facts about whether referential expressions can be bound. For our purposes, observing that definite descriptions may sometimes be bound is not enough. Not only do we need all referential expressions to be amenable to binding but we furthermore need them to be bound *qua* singular-denoting variables, in the same way as *they* in *the boys thought they would win*. When we control for the confounding factors mentioned above, do we find that bindings of the relevant sort obtains? (38) are cases in point.

Mary learned French Mary learned Basque Mary learned Uyghur

French became popular Basque became popular Uyghur became popular

(38) a. Mary learned these languages BEFORE these languages became popular.
   b. Mary learned French, Basque and Uyghur BEFORE French, Basque and Uyghur became popular.

Speakers consulted found the sentences acceptable with the timeline in mind. If these speakers interpreted the second DP "*these languages*" with plural reference, one would expect the sentence to mean that all three languages were learned before *any* of them became popular, inconsistently with the timeline. However, speakers reported on the example's unnaturalness (indepedently from the timeline). For this reason, the evidence is not entirely satisfactory. Since these cases are not obvious, I leave it open for future research to determine whether referential expressions can indeed be bound in the way described above.

5.3 Distributivity operators at large

The analysis I proposed begs the question of the status of the newly introduced ALL$_i$. Is it meant to coexist with other covert distributivity operators assumed in the literature or should it be seen as a replacement for some or all of them? More evidence needs to be examined before any case can be made but I wish to speculate that with ALL$_i$, one may indeed dispense with some operators altogether, DIST in particular.

 Let me show how. In the current state of affairs, DIST takes scope over a predicate and contributes its usual distributive semantics. Consider the most typical case where the predicate is formed by λ-abstraction, as in (39a). Because the λ-abstractor contributes a

value at index i, ALL_i is licensed to apply in its scope, so another LF may be considered in which ALL_i is inserted below the abstractor, i.e. (39b). It is an easy exercise to show that these two LFs yield equivalent truth-conditions.

(39) a. **Canonical view:** $\ldots$ **DP** DIST $\lambda_i \ldots$
     b. **ALL$_i$-based view:** $\ldots$ **DP** λ_i ALL$_i \ldots$

Two generalizations of distributivity are discussed in the literature ; we can ask whether they too can be reduced or adapted to ALL_i. First, it is known since Schwarzschild (1996) that distributivity operators may distribute down to salient subpluralities, instead of atoms (cf (40a)). This is captured by providing covers (salient ways to divide a plurality into its part) as arguments to the distributivity operator. Second, two and more arguments may receive a co-distributive reading (Beck and Sauerland (2000), cf (40b)).

(40) a. **Context:** *flowers are sold by bouquets ; each bouquet cost $20*
        The flowers cost \$20.

     b. The 10 girls kissed the 15 boys.
        ⤳ *each of the 10 girls kissed one of the 15 boys*
        <u>*and*</u> *each of the 15 boys was kissed by a one of the 10 girls*

Our current denotation for ALL_i will not capture these readings. It is however conceivable to modify it so that it can: one can for instance add a cover argument to ALL for instance, and suitably generalize the denotation to multiple indices (denotations in (41)).

(41) a. $[\![\text{ALL}_{i,\,C}\ \alpha]\!]^g = \text{true iff } \forall x \prec g(i),\, C(x) \to [\![\alpha]\!]^{g[i \to x,\ \oplus i \to g(i)]}$

     b. $[\![\text{ALL}_{i,\,j}\ \alpha]\!]^g = \text{true iff } \forall x \prec_{at} g(i), \exists y \prec_{at} g(j), [\![\alpha]\!]^{g'} \wedge \forall y \prec_{at} g(i),$
        $\exists x \prec_{at} g(j), [\![\alpha]\!]^{g'} \text{ where } g' = g[i \to x, j \to y, \oplus i \to g(i), \oplus j \to g(j)]$

6.   Summary

Wide-scope distributive sentences are unexpected under standard views on distributivity. Using dependent plurals as a diagnostic, I showed evidence that such sentences contain a covert operator scoping over the whole clause, ALL. To interpret the structure that the diagnostic motivates, I proposed that ALL is endowed with an index, whose value indicates which plurality it must distribute over. The plural expression that receives the WSD reading is interpreted as a bound variable, whose range is constrained by its descriptive content. Together, these two assumptions explained Ruys' observation or why only referential expression can receive WSD readings. This account leaves open two questions. First, can referential expressions be bound in the way that the analysis required? The relevant data is elusive for independent reasons, but I provided preliminary evidence that they could. Second, does ALL co-exist with more traditional distributivity operators or can it be used to replace them?

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References

Beck, Sigrid, and Uli Sauerland. 2000. Cumulation is needed: A reply to Winter (2000). *Natural Language Semantics* 8:349–371.

Champollion, Lucas. 2016. Covert distributivity in algebraic event semantics. *Semantics and Pragmatics* 9:11–15.

Dotlačil, Jakub. 2010. Anaphora and distributivity: A study of same, different, reciprocals and others. Doctoral dissertation, Universiteit Utrecht.

Dotlačil, Jakub. 2013. Reciprocals distribute over information states. *Journal of Semantics* 30:423–477.

Elbourne, Paul. 2008. Demonstratives as individual concepts. *Linguistics and Philosophy* 31:409–466.

Elbourne, Paul. 2013. *Definite descriptions*, volume 1. Oxford Studies in Semantics.

Heim, Irene. 1982. The semantics of definite and indefinite noun phrases. Doctoral dissertation, University of Massachusetts Amherst.

Ivlieva, Natalia. 2013. Scalar implicatures and the grammar of plurality and disjunction. Doctoral dissertation, MIT.

Link, Godehard. 1987. Generalized quantifiers and plurals. In *Generalized quantifiers*, 151–180. Springer.

Minor, Sergey. 2017. Dependent Plurals and the Semantics of Distributivity. Doctoral dissertation, The Arctic University of Norway.

Roberts, Craige. 1987. Modal subordination, anaphora, and distributivity. Doctoral dissertation, University of Massachusetts, Amherst.

Rullmann, Hotze. 2003. Bound-Variable Pronouns and the Semantics of Number. *Proceedings of the Western Conference on Linguistics 2002* 243–254.

Ruys, Eduard Gerbrandus. 1992. *The scope of indefinites*. LEd.

Schlenker, Philippe. 2005. Non-redundancy: Towards a semantic reinterpretation of binding theory. *Natural Language Semantics* 13:1–92.

Schwarzschild, Roger. 1996. *Pluralities*.

Sharvit, Yael. 1999. Functional relative clauses. *Linguistics and Philosophy* 22:447–478.

Spector, Benjamin. 2003. Plural indefinite DPs as Plural-polarity items. *Amsterdam Studies in the Theory and History of Linguistic Science (Series 4)* 295–314.

Sudo, Yasutada. 2012. On the semantics of phi features on pronouns. Doctoral dissertation, MIT.

Wilson, George M. 1984. Pronouns and pronominal descriptions: A new semantical category. *Philosophical Studies* 45:1–30.

Winter, Yoad. 2001. *Flexibility principles in Boolean semantics: The interpretation of coordination, plurality, and scope in natural language*. Cambridge, MA: MIT Press.

Zweig, Eytan. 2008. Dependent plurals and plural meaning. Doctoral dissertation, New York University.

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