The Semantics of the Adjective *Respective*

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1. Introduction

We present a semantics for the adjective *respective*, illustrated in (1a).

(1)   a. Mr. Smith and Mr. Jones love their respective wives. (Kay, 1989)

     b. Mr. Smith loves Mr. Smith's wife and Mr. Jones loves Mr. Jones's wife.

     c. Mr. Smith and Mr. Jones love their wives.

In (1a), *respective* appears to enforce a mapping on the main predication that aligns Mr. Smith with his wife and Mr. Jones with his wife, as paraphrased in (1b). Note that sentence (1c) also has this reading, in addition to one that *respective* appears to rule out in (1a), in which both men love both women.

There is an assortment of interesting facts that any analysis of *respective* must be compatible with. First are the obvious commonalities with its adverbial counterpart *respectively*, illustrated in (2a).

(2)   a. *Tolstoy and Dostoyevsky* wrote *Anna Karenina and The Idiot* respectively.

     b. *Tolstoy* wrote *Anna Karenina* and *Dostoyevsky* wrote *The Idiot*.

Like (1a), the surface form of (2a) seems rather unremarkable, in this case consisting of a simple transitive clause modified by an adverb, with conjoined noun phrases occupying the subject and object positions. However, the semantic interpretation of (2a) – essentially equivalent to that of the paraphrase given in (2b) – belies this characterization of its syntactic structure. What look to be ordinary group-denoting NPs do not in fact behave as such in the semantics; the predication denoted by the verb is instead distributed pairwise over elements in the conjoined phrases with respect to order of mention.

A key fact that must inform any analysis of these expressions is that the semantic relationships evident in (1a) and (2a) are not parasitic on some unusual and nonevident syntactic relations (McCawley, 1968; Pullum and Gazdar, 1982; Dalrymple and Kehler, 1995). This is demonstrated by examples (3) and (4) for *respectively* and *respective* respectively.

(3) Though the Trail Blazers won this series in six games from Phoenix, they were far from dominant. *Their margins of victory* were *2 points, 1 point, 6 points, and 3 points* respectively. (New York Times article, cited in Dalrymple and Kehler (1995))

(4) The students were pleased with their respective grades. (Kay, 1989, a variant)

The felicity of (3) derives from semantic and pragmatic factors, and not syntactic ones. In particular, the world knowledge that playoff series are best-of-seven affairs gives rise to the fact that there are four margins of victory, which can in turn be placed into one-to-one correspondence with the 4 point differentials in the VP. There is thus no requirement that there be conjoined phrases at both ends of the dependency, let alone that the participating NPs have the same number of conjuncts. Likewise example (4), in which each student is associated with a different grade token, has no conjuncts at all.

The mappings associated with such examples can interact with gap-containing clauses in ways that challenge contemporary syntactic accounts of filler-gap dependencies, and as such shift additional burden onto the semantic component of an analysis of such data. Consider examples (5a-b):

(5) a. I finally met Susan, Marilyn, and Lucille yesterday. They are the three sisters that Bob married, John is engaged to, and Bill is dating, respectively. (Gawron and Kehler, 2000, conjoined relative clauses)

   b. John married, Bill is engaged to, and Fred is dating their respective high school sweethearts. (right node raising)

The interpretation of (5a) does not derive from across-the-board (ATB) movement; instead, one filler corresponds to three semantically disjoint gap sites: Bob's wife, John's fiancee, and Bill's date are three different sisters. Example (5b) illustrates the same filler-gap pattern with the adjective *respective* in the context of right node raising. While such examples are problematic for any syntactic account in which such dependencies are derived from movement or any other operation (or constraint) that requires coindexing between the gap and filler, at the level of semantics examples like (5a) are analogous to (3): The three women in the denotation of *three sisters* must be assigned to three different properties in the denotation of the conjoined relative clauses.

Another crucial fact for which any theory must account is that readings of the above sort, which we will refer to as *respective readings*, exist independently of the words *respective* and *respectively*. Consider examples (6a-d).

(6) a. Propositions and properties may be summed to form proposition groups and property groups.

   b. Chance is the first baseman. Tinkers and Evers are the shortstop and the second baseman.

   c. Eleven isotopes of copper are known, two of which are not radioactive and occur with a natural abundance of 69.09% and 30.91%. (Dalrymple and Kehler, 1995, a variant)

   d. The students were pleased with their grades. (Example 4 without *respective*)

The most natural reading of (6a) is one in which propositions may be summed to form proposition groups and properties may be summed to form property groups. That is, it has exactly the reading that would be forced if the adverb *respectively* were added. The absence of *respectively* has the effect of allowing a distributive reading as well, on which both propositions and properties may be summed to form both kinds of groups. [1] Likewise, example (6d) allows the same respective reading as (4), even though *respective* does not appear. Other readings are again also possible, for instance, there is a reading in which the students as a group were pleased with the grades as an ensemble. Thus, respective readings may also compete with collective readings.

   To sum up the basic phenomenon, respective predication, like distributive and collective predication, is a mode of plural predication. The adverb *respectively* forces respective readings just as the adverbs *each* and *both* force distributive predication. We posit that quantificational operators are responsible for respective readings and that the denotations of adverbs can directly invoke these operators.

   The final key issue we discuss here bears on the scope that *respective* takes in a sentence. Given the similarities evident in the data involving *respective* and *respectively*, it may be tempting to posit an analysis in which the operator introduced by *respective* takes clause-level scope, despite the fact that its adjectival status would suggest that it not take scope outside of its host NP. For instance, suppose the student grades referred to in example (6d) were an A, a B, and a C. Then the most natural reading of example (6d) – which we will refer to as a *clause-level respective reading* – would essentially be equivalent to that of (7).

   (7) The students were pleased with grades of A, B, and C respectively.

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1.   This reading could similarly be forced with *both*, as in (i):

   (i) Both propositions and properties may be summed to form both proposition groups and property groups.

An analysis that invokes an operator taking clause-level scope for both cases, in accordance with the schematic semantics shown in (8), would capture these facts directly.

(8) respective(be-pleased-with)(the-students)(A ∨ B ∨ C)

Such an analysis is untenable, however, since there are cases in which *respective* clearly does not take clause-level scope (Okada, 1999). These include examples such as (9a-b), due to Kay (1989).

(9) a. Twelve generals and admirals from the United States, the Soviet Union, and their respective allies...met for two days of discussions. (Kay, 1989)

b. Two rock stars and their respective entourages can fill a small stadium. (Kay, 1989)

The presence of the collective predicates *met* and *fill* rule out a clause-level respective reading. Such examples contrast with similar ones containing *respectively*, as illustrated in (10); examples (10c-d) are due to Okada (1999).

(10) a. Intel and Microsoft combined their respective assets. (collective reading on object argument)

b. # Intel and Microsoft combined their assets respectively.

c. Intel and Microsoft will co-promote their respective hardware and software. (Okada, 1999, collective reading on subject argument)

d. # Intel and Microsoft will co-promote their hardware and software respectively. (Okada, 1999)

Whereas example (10a) is felicitous with collective predication, its counterpart in (10b) is unacceptable. Examples (10c) and (10d) are analogous. Given the facts that *respective* does not always co-occur with clause-level respective readings, that there is is an independent (pragmatic) source for clause-level respective readings when it does (examples (6a-d)), and the expectations one would normally have with respect to the scoping properties of an adjective, the most parsimonious analysis is one in which *respective* never takes clause-level scope. What is therefore left to be explained is how the most natural (clause-level respective) readings of sentences such as (1a) come about.

To summarize, an analysis of the semantics of respective readings has to account for the following facts. First, clause-level respective readings co-occur with both *respective* and *respectively*. Second, such readings are obligatory with *respectively*, but optional with *respective*. Third, clause-level respective readings exist independently of the appearance of either word; such

pragmatically-licensed respective readings are just another possible way of interpreting plural predication. Finally, an analysis must be compatible with felicitous cases in which respective readings interact with filler-gap dependencies, in which coindexing does not obtain between the gap site and the NP on which it is dependent.

In this paper we provide an analysis that captures these facts,[2] and that has the following features. First, a single respective operator is associated with the adjective *respective*, the adverb *respectively*, and pragmatic respective readings. Second, the central difference between the adverb and the adjective is that the adverb always takes clause-level scope whereas the adjective always takes NP-level scope. As such, it captures the similarities and differences between *respective* and *respectively* in a natural way. Third, the analysis is compositional, and it integrates smoothly with existing analyses of the semantics of plurals and distributivity.

In the next section, we review an analysis of *respectively* presented in Gawron and Kehler (2000; 2001). We then extend this analysis to *respective*, in a way that accounts for clause-level respective readings in those cases in which they are available. We then conclude by summarizing our results.

2. Analysis of *Respectively*

We first consider the adverb *respectively*, exemplified in (11a-c):

 (11)   a. Sue and Karen jog and drive respectively.

        b. Sue, Karen, and Bob jog, drive, and jog respectively.

        c. # Sue, Karen, and Bob jog and drive respectively.

The analysis of (11a) should of course extend naturally to the analysis of (11b), in which the property of jogging turns up twice. The analysis should also capture the contrast between (11b) and (11c), which poses a challenge because, on most semantic theories, including ours, the two VPs have the same denotation. Likewise, in light of our arguments against a syntactic explanation of the relationships expressed in these constructions, (11c) should be predicted to be infelicitous rather than syntactically ill-formed. That is, (11c) should turn out to have roughly the same status as (12), discussed by Pullum and Gazdar (1982).

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2.   Space limitations do not allow us to present all of the technical details of our approach here. We have written an extended version of the paper, cited herein as Gawron and Kehler (2002), that includes appendices that contain this technical detail. The paper will become available shortly at the semantics archive, `semantic-sarchive.net`.

(12) Our three main weapons are fear, surprise, ruthless efficiency, and a fanatical devotion to the pope.

The schematic version of the proposed semantics is illustrated in (13a).

(13)   a. $\text{RESP}_f(\text{jog} \sqcup \text{drive})(\text{k} \vee \text{s})$

    b. $\text{jog}(\text{s}) \sqcup \text{drive}(\text{k})$

Here we use *jog* $\sqcup$ *drive* as the semantics of the conjoined VP *jog and drive*, and *k* $\vee$ *s* as the semantics of the conjoined NP *Karen and Sue*. There is a respective operator (Resp) that distributes conjuncts in the VP meaning to conjuncts in the NP meaning to yield a representation equivalent to (13b).

There are two main ingredients required for such a Resp operator to make sense. First we need a function f that imposes an ordering on members of sums. The Resp operator is interpreted with respect to such an f, which we will call a *sequencing function*, that is supplied pragmatically. Second, on analogy with the individual sums of Link (1983), we need Boolean sums of both properties and propositions (Gazdar, 1980; Partee and Rooth, 1983). The unique feature required for this analysis is that Boolean sums must have recoverable atoms (like individual sums), which means they cannot be modeled by set intersection. For example, the sum *s* $\vee$ *k* has *s* and *k* as atoms. The proposition sum *walk*(*k*) $\sqcup$ *drive*(*s*) has the propositions *walk*(*k*) and *drive*(*s*) as atoms. And the property sum *walk* $\sqcup$ *drive* has the properties *walk* and *drive* as atoms. The details of a construction that supports these features are spelled out in Gawron and Kehler (2002, appendix).

We write $f(\sigma)(i)$ for the ith member of sum σ under sequencing function f. We require that for all σ in the domain of f, $f(\sigma)$ be defined for the same subset of $\mathcal{N}$. We may thus speak of the **cardinality** of a sequencing function f, which we will write $|f|$. For a fuller discussion of sequencing functions, see Gawron and Kehler (2002, appendix).

i	Group	
	$f(\text{s} \vee \text{k})(i)$	$f(\text{jog} \sqcup \text{drive})(i)$
1	s	jog
2	k	drive
3	↑	↑

Table 1: The sequencing function for example (11a), where $|f| = 2$

The intended application of property sums and sequencing functions is shown in (14):

i	Group	
	$f(\text{s} \vee \text{k} \vee \text{b})(i)$	$f(\text{jog} \sqcup \text{drive} \sqcup \text{jog})(i) =$ $f(\text{jog} \sqcup \text{drive})(i)$
1	s	jog
2	k	drive
3	b	jog
4	↑	↑

Table 2: The sequencing function for example (11b), where $\mid f \mid = 3$

(14) $\quad \bigsqcup_{i \leq |f|} \ [f(\text{P})(i)](f(g)(i))$

Formula (14) stands for a proposition sum of $\mid f \mid$ conjuncts, where the ith conjunct is the ith property of P applied to the ith individual of g.

Table 1 shows a sequencing function of cardinality 2 that captures the reading of (11a), in which *Sue* is the first individual and *jogging* is the first property, and *Karen* is the second individual and *driving* the second property. The ordering here is provided by order of mention, as spelled out in Gawron and Kehler (2002, appendix). Table 2 shows a sequencing function of cardinality 3 that captures the reading of (11b). The idea is that what licenses *jog* to be used for the first property and the third is that it has been mentioned twice, which is what is missing in (11c).

We can now provide a denotation for the adverb *respectively*:

(15) $\text{Resp}_f = \quad \text{respectively'}_f = \lambda\text{P}\lambda\text{g} \bigsqcup_{i \leq |f|} \ [f(\text{P})(i)](f(\text{g})(i))$

Semantically, Resp is a polymorphic operator that is parametric on f, of type $\langle$ X, X $\rangle$. This is the type of an adjunct, in particular the type of an ordinary adverb that can combine with verb phrases.

To sum up the discussion to this point, we have assigned as the denotation of the adverb *respectively* a semantic operator Resp that is parametric on a pragmatically-supplied sequencing function. This operator is defined to require that both arguments are sums. The use of individual sums in the semantics of plurals is standard; we now address the question of where property sums come from.

The most straightforward cases of property sums are illustrated in (16a-c). All three sentences contain conjoined property-denoting expressions. Example (16a) is a case of VP-conjunction, (16b) is a example of McCawley's with verb conjunction, and (16c) is a case of relative-clause conjunction. In all cases the conjoined expression denotes a property sum and is thus a suit-

able argument for the Resp operator. Therefore, per (16c), examples involving respective readings and gaps such as (5a-b) are handled without further modification.

(16)   a. Sue and Karen jog to school and drive to work respectively.
             (VP conjunction)

        b. George and Martha respectively denounced and were denounced by
            the governor. (McCawley, 1998, verb conjunction)

        c. ...that Bob married, John is engaged to, and Bill is dating...
            (conjunction of gapped Ss)

Another source of property sums is distributivity. A distributivity operator along the lines of those used by Link (1983) and Roberts (1987) is shown in (17):

$$(17) \ \text{Dist}_f = \lambda P \lambda g \bigsqcup_{i \leq |f|} P(f(g)(i))$$

The steps in (18b-d) show the application of this operator for the simple case of distributivity shown in (18a):

(18)   a. Dostoyevsky wrote *The Brothers Karamazov* and *The Idiot*.

        b. $\text{Dist}_f(\text{write}) = \lambda g \bigsqcup_{i \leq |f|} \text{write}(f(g)(i))$

        c. $\text{Dist}_f(\text{write})(\text{BK} \vee \text{I}) = \bigsqcup_{i \leq |f|} \text{write}(f(\text{BK} \vee \text{I})(i))$
            $= \text{write}(\text{BK}) \sqcup \text{write}(\text{I})$

        d. $[\text{write}(\text{BK}) \sqcup \text{write}(\text{I})](\text{D}) = \text{write}(\text{BK})(\text{D}) \sqcup \text{write}(\text{I})(\text{D})$

The resulting denotation for the VP is a property sum, the sum of writing *The Brothers Karamazov* and writing *The Idiot*, which gives the desired proposition sum when applied to Dostoyevsky in (18d).

Truth conditionally, the distributivity operator defined in (17) is the same operator as that used by Link (1983) and Roberts (1987), since the truth conditions of arbitrary property conjunction are the same as the universal quantification that they each used. The operator defined in (15) is novel, however, in the use of a sequencing function. There are two motivations for resorting to sequencing functions in the analysis of distributivity:

1. A sequencing function also defines a *cover*, in the sense of Schwarzschild (1996), by indexing the subgroups (g_i) of a group (g). As argued in Gawron and Kehler (2001), sequencing functions can capture intermediate distributivity (Gillon, 1990; Schwarzschild, 1996). This is demonstrated in Gawron and Kehler (2002, appendix).

2. To provide a natural mechanism for ordering property sums that are not the result of conjoining property-denoting constituents. For example, because *The Brothers Karamazov* is mentioned first and *The Idiot* is mentioned second, f orders *write*(BK) before *write*(I) in the property sum in (18) (see Gawron and Kehler (2002, appendix)).

We turn now to the application of the two operators Resp and Dist to example (2a). The steps in (19) break down their application:

(19) a. $[\![[_{VP} [\text{Dist wrote}] \text{AK and I}]]\!]$
$= \text{Dist write}(\text{AK} \vee \text{I})$
$= \text{write}(\text{AK}) \sqcup \text{write}(\text{I})$

　　b. $[\![\text{T and D} [[\text{Dist wrote}] \text{AK and I respectively}]]\!]$
$= \text{Resp}_f [\text{write}(\text{AK}) \sqcup \text{write}(\text{I})](\text{T} \vee \text{D})$
$= \text{write}(\text{AK})(\text{T}) \sqcup \text{write}(\text{I})(\text{D})$

The distributivity operator distributes *write* over *Anna Karenina* and *The Idiot* to yield the property sum in (19a). Note that this property sum is true of no individual or group if directly predicated. The Resp operator applies this property sum *under the ordering f* to Tolstoy and Dostoyevsky in (19b), yielding the (true) proposition sum shown.

3. Respective

In this section we argue that, given NP-level scope, the Resp operator provides the correct semantics for the adjective *respective*. An immediate challenge for such an analysis is posed by examples like (20):

(20) Alex and Janet love their respective children.

The most natural reading of this example is one in which Alex loves Alex's (possibly plural) children and Janet loves Janet's (possibly plural) children. Schematically:

(21) respective$_f$(love)(alex-and-janet)(their-children).

Here, a respective operator takes clause-level scope, and f assigns the same index to Janet's children and Janet and to Alex's children and Alex.

We begin by spelling out exactly what it means for a respective operator to take NP-level scope. The proposed semantic analysis for the NP *their respective children* is given in (22):

(22)   a. $\sigma X \, \text{Resp}_f (\text{Dist}_f (\text{CHILD-OF})(A \lor J))(X)$

      b. $\sigma X \, X = [\sigma x_1 \, \text{CHILD-OF}(A)(x_1) \lor \sigma x_2 \, \text{CHILD-OF}(J)(x_2)]$

The NP semantics in (22a) makes use of Link's σ-operator (Link, 1983), which just fixes the group denoted by the NP to be the *maximal* group satisfying the NP's descriptive conditions. Assume that f assigns Alex and Alex's children to the index 1 and Janet and Janet's children to the index 2.[3] Then the descriptive conditions of (22a) are that X denotes the maximal group that is the sum of Alex's children and Janet's children, as in (22b).

For the following discussion, we adopt the abbreviation in (23) for the meaning of *their respective children* as given in (22a):

(23)   Let $\text{CHILDREN} = (\sigma X \, \text{Resp}_f (\text{Dist}_f (\text{CHILD-OF})(A \lor J)) \; (X))$

First, note that since we allow pragmatically-licensed respective operators, we inevitably allow a clause-level respective reading for (20). We may begin with that favored reading of (20), which includes a Resp operator with clause-level scope.

(24)   a. $\text{Resp}_f (\text{Dist}_f (\text{LOVE})(\text{CHILDREN}))(A \lor J)$

      b. $\text{LOVE}(x_1)(A)$
          $\text{LOVE}(x_2)(J)$
              where $x_1 = \sigma x \, \text{child-of}(A)(x)$
              and $x_2 = \sigma x \, \text{child-of}(J)(x)$

Because of the abbreviation just introduced, (24) really has 2 Resp operators and 2 Dist operators (4 operators in all). This representation gives the desired result, namely that Alex loves Alex's children and Janet loves Janet's children. All the operators invoke the same ordering. The NP-level respective operator invokes a sequencing f which divides the set of Alex and Janet's children into Alex's children (indexed 1, along with Alex) and Janet's children (indexed 2, along with Janet). This division is then respected by the Dist operator, which distributes the love relation to just those two groups, creating a property sum in which the property of loving Alex's children is indexed 1 and the property of loving Janet's children in indexed 2. The highest Resp

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3.   This assumption is justified in Gawron and Kehler (2002, appendix).

operator must then apportion the property of loving Alex's children to Alex and of loving Janet's children to Janet. The details are spelled out in Gawron and Kehler (2002, appendix).

Because all the plural predication operators are freely occurring, we also get a number of other readings. Focus first on (25), the reading in which distributivity applies to both arguments of *love*.

(25) a. $\text{Dist}_f(\text{Dist}_f(\text{LOVE})(\text{CHILDREN}))\ (\text{A} \vee \text{J})$

b.
$$\begin{array}{ll}
\text{LOVE}(x_1)(\text{A}) & \sqcup\ \text{LOVE}(x_2)(\text{A}) \\
\text{LOVE}(x_1)(\text{J}) & \sqcup\ \text{LOVE}(x_2)(\text{J})
\end{array}$$
where $\quad x_1 = \qquad \sigma x\ \text{CHILD-OF}(\text{A})(x)$
$\qquad\qquad x_2 = \qquad \sigma x\ \text{CHILD-OF}(\text{J})(x)$

c. Alex and Janet both love both their respective children.

This case describes the Brady-bunch scenario in which Alex and Janet love each other's children as well as their own. We think this reading is legitimate, though disfavored; the evidence that distributivity is compatible with *respective* even in this case is that you can in effect pronounce both distributivity operators as in (25c). Though wordy, this version with two occurrences of *both* is in fact coherent.

Similarly, our analysis allows for the other readings in (26)-(28), which leave out one or both of the distributivity operators in (25).

(26) $(\text{Dist}_f(\text{LOVE})(\text{CHILDREN}))(\text{A} \vee \text{J})$

(27) $\text{Dist}_f((\text{LOVE})(\text{CHILDREN}))(\text{A} \vee \text{J})$

(28) $\text{LOVE}(\text{CHILDREN})(\text{A} \vee \text{J})$

Our claim, therefore, is that the clause-level respective reading of (20) is just a strong preference (see also Okada (1999)). In fact, (20) is a rather loaded example, perhaps fueled by a stereotype that parents love their own children in a way that contrasts with the children of others. Example (29) provides a case that is free of such stereotyping.

(29) Alex and Janet took their respective children to the movies.

This example has a reading which excludes a clause-level Resp operator, on which Alex and Janet jointly take the collection of their respective children to the cinema.

Summing up to this point, occurrences of the adjective *respective* are in fact independent of clause-level respective readings. The preference for a clause-level respective reading of (20) is just that, a preference. When *respective* does co-occur with clause-level respective readings it is because there are

two Resp operators in play; harmony among the effects of these distinct operators is explained because a single consistent division of plural groups into salient subgroups is being respected.

Finally, we turn to a remaining semantic property of *respective* NPs. Consider the examples (30a-c):

(30) a. Nick and Nora love their respective parents.

b. Nick and Nora love their parents.

c. Alex and Janet love their respective children. (= 20)

In marked contrast to (30b), (30a) presumably precludes the possibility that Nick and Nora are siblings. Similarly, Alex's children cannot be a proper (nor improper) subset of Janet's in (30c).

This follows from a rather natural assumption about sequencing functions, specifically that they cannot yield an identity assignment for any group in their domain. That is, for each group g and index i in its domain, a sequencing function f must provide some separation of g into proper subgroups; for no index i and group g is it the case that $f(g)(i) = g$. This requirement precludes the possibility that $f(g)$ is a constant function as a special case, which is what is required to obtain a true reading for (30a) when Nick and Nora are siblings. This constraint also excludes the following peculiar sentences:

(31) a. Nick and Nora love Fred respectively.

b. Nick and Nora love Fred and Fred respectively.

4. Conclusion

To conclude, we have provided an analysis of the semantics of *respective* that captures a variety of empirical facts concerning clause-level respective readings: (i) that they co-occur with both *respective* and *respectively*, (ii) that they are obligatory with *respectively*, but optional with *respective*, (iii) that they exist independently of the appearance of either word, and (iv) that they can interact with filler-gap dependencies to produce felicitous cases in which there is no coindexing between the gap site and the NP on which it is dependent.

The analysis accomplishes this by embodying a number of desirable features. First, it captures the similarities between *respective*, *respectively*, and pragmatically-licensed respective readings by appealing to a single operator. Because the operator is necessary anyway to account for the pragmatically-licensed cases, the semantics of *respective* and *respectively* are modeled without any additional special-purpose machinery. Also, the differences between

the forms are handled naturally through the different levels at which they take scope, and as such *respective* receives a plausible adjective-like meaning. Finally, by appealing to pragmatically-supplied sequencing functions, the analysis remains compositional, and integrates smoothly with existing treatments of the semantics of plurals and distributivity.

We will conclude by pointing out that on our analysis the basic function of *respective* is not really denotational. For instance, the denotations of the NPs in (32a-b) are identical: Assuming that *their* denotes the U.S. and the Soviet Union, both (32a) and (32b) denote the union of U.S. allies and Soviet allies.

(32) a. their allies

b. their respective allies

The basic function of *respective* instead is to invoke a division of salient groups into subgroups that can be put into correspondence. This division can in turn affect the interpretation of higher operators, as in the clause-level respective reading of (33).

(33) The U.S. and the Soviet Union called in their respective allies.

In other cases, however, the ordering invoked by *respective* has no impact other than to implicate the existence of order, as in (34a-b).

(34) a. The students were pleased with their respective grades.

b. The students were pleased with their grades.

Students do not normally share grade tokens nor experiences of pleasure, so implicating distributivity of ownership and pleasure has little pragmatic effect here. Perhaps it is such examples that caused Fowler (1965), who is far from approving of them, to say: "The simple fact is that *respective(ly)* are words seldom needed, but that pretentious or meticulous writers drag them in at every opportunity for the air of thoroughness and precision they are supposed to give a sentence".

5. Acknowledgments

References

Dalrymple, Mary and Andrew Kehler. 1995. On the constraints imposed by *respectively*. *Linguistic Inquiry (Squibs and Discussion)*, 26(3).

Fowler, H. W. 1965. *A Dictionary of Modern English Usage*. Oxford University Press, Oxford.

Gawron, Mark and Andrew Kehler. 2000. Respective readings and gaps. Presented at the Annual Meeting of the Linguistic Society of America, Chicago, January.

Gawron, Mark and Andrew Kehler. 2001. The semantics of respective readings, conjunction, and filler-gap dependencies. Submitted manuscript, San Diego State University and University of California at San Diego, October.

Gawron, Mark and Andrew Kehler. 2002. The semantics of the adjective *respective*: Extended version. Extended version of this paper with appendices, available at semanticsarchive.net, July.

Gazdar, Gerald. 1980. A cross-categorial semantics for conjunction. *Linguistics and Philosophy*, 3:407–409.

Gillon, B. 1990. Plural noun phrases and their readings: A reply to Lasersohn. *Linguistics and Philosophy*, 13:477–485.

Kay, Paul. 1989. Contextual operators: *respective, respectively,* and *vice versa*. In *Proceedings of the Fifteenth Annual Meeting of the Berkeley Linguistics Society (BLS-15)*, pages 181–192, Berkeley, CA, February.

Link, Godehard. 1983. The logical analysis of plurals and mass terms: A lattice-theoretical approach. In Rainer Bauerle, Christoph Schwarze, and Arnim von Stechow, editors, *Meaning, Use, and the Interpretation of Language*. de Gruyter, Berlin, pages 302–323.

McCawley, James D. 1968. The role of semantics in a grammar. In Emmon Bach and Robert T. Harms, editors, *Universals of Linguistic Theory*. Holt, Reinhart, and Winston, New York, pages 124–169.

McCawley, James D. 1998. *The Syntactic Phenomena of English*. University of Chicago Press, Chicago, second edition.

Okada, Sadayuki. 1999. On the function and distribution of the modifiers *respective* and *respectively*. *Linguistics*, 37(5):871–903.

Partee, B. and M. Rooth. 1983. Generalized conjunction and type-ambiguity. In Rainer Bauerle, Christoph Schwarze, and Arnim von Stechow, editors, *Meaning, Use, and the Interpretation of Language*. de Gruyter, Berlin, pages 361–383.

Pullum, Geoffrey K. and Gerald Gazdar. 1982. Natural languages and context free languages. *Linguistics and Philosophy*, 4:471–504.

Roberts, Craige. 1987. *Modal Subordination, Anaphora, and Distributivity*. Ph.D. thesis, University of Massachusetts at Amherst.

Schwarzschild, Roger. 1996. *Pluralities*. Kluwer, Dordrecht.