

# On an inadequate defense of an ellipsis-based analysis for Right Node Raising

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## Abstract

A recent manuscript by Yatabe and Tam (2017) argues that an analysis of coordination in categorial grammar (CG), of the sort defended in detail by Kubota and Levine (2015) and whose key insights go back to proposals by Steedman (1985) and Dowty (1988) in the 80s, is inadequate on empirical grounds. Of the three pieces of evidence they offer, facts about the so-called ‘summative agreement’ phenomenon seems at first sight to be the strongest possible candidate for a real problem for the CG approach. In this short paper, we critically assess the argument offered by Yatabe and Tam involving these summative agreement facts, and argue that their refutation of the CG approach critically rests on a particular assumption about morphological number agreement and semantic plurality that can be shown to be too simplistic on independent grounds. Once this assumption about agreement is replaced by a more adequate analysis of the relationship between semantic plurality and morphological number agreement that is in line with the standard assumptions in the contemporary formal semantics literature, summative agreement facts are no longer problematic for the CG approach. Based on this discussion, we conclude that the CG approach still remains to be the simplest and empirically most robust analysis of the coordination facts in English.

## 1 Summative agreement

Summative agreement is exemplified in the following datum, taken from Postal (1998):

- (1) The pilot claimed that the first nurse, and the sailor proved that the second nurse, were spies.

This agreement pattern appears problematic under the assumption that the ‘raised’ VP in such data is a single token VP linked to two separate gap sites, with its form regulated by the morphosyntactic condition in each of the corresponding gaps sites:

- (2) The pilot claimed that the first nurse  $\left\{ \begin{array}{l} \text{was a spy} \\ * \text{were spies} \end{array} \right\}$  and the sailor proved that the second nurse  $\left\{ \begin{array}{l} \text{was a spy} \\ * \text{were spies} \end{array} \right\}$ .

Postal argues that the data in (1) could conceivably be explained by ‘the possibility of seeing *were spies*... as some sort of realization of an  $n$ -ad of ATB extracted singulars’, a suggestion

that is difficult to assess since nothing beyond this speculation is offered that would make formal sense of the notion of a filler as an ‘*n*-ad’ of singulars.

Yatabe (2003) and Yatabe (2007) argue from the summative agreement phenomenon that semantic interpretation should be defined on a syntax/phonology interface data structure called the ‘linearization domain’ (which was originally introduced in Reape (1993, 1994), and applied extensively to the analysis of German and a variety of other languages in previous HPSG research) rather than being compositionally determined based on phrase-structural constituency, possibly by additionally employing some form of underspecification as in standard HPSG (cf. Pollard and Sag (1994), Copestake et al. (2005) and most subsequent work). In recent unpublished work, Yatabe and Tam (2017) claim that the pattern exhibited in (1) points to a profound empirical difficulty with the analysis of Right Node Raising (RNR)—and with the treatment of coordination more generally—given in Kubota and Levine (2015). The crux (and apparently the entirety) of their argument is the contrast between the respective patterns in (1) and in (3):<sup>1</sup>

- (3) a.??The pilot claimed that the first nurse, or the sailor proved that the second nurse, were spies.
- b. The pilot claimed that the nurse from the United States, and the sailor also claimed that the nurse from the United States,  $\left\{ \begin{array}{l} \text{?*were spies} \\ \text{was a spy} \end{array} \right\}$ .
- c. The pilot claimed that the nurse from the United States, and the sailor claimed that no one,  $\left\{ \begin{array}{l} \text{*were spies} \\ \text{was a spy} \end{array} \right\}$ .

The reasoning undergirding their argument from (3) is that

When sentences like (70), (72), and (73) are analyzed in a CG-based theory, information about the semantic content of each subject DP in the embedded clauses becomes unavailable before coordination takes place. In each of these three sentences, the expressions that are conjoined would belong to a syntactic category like  $S/VP_{sing}$ , where  $VP_{sing}$  is the category for those VPs that take singular subject DPs. There is nothing in this category that indicates anything about the semantic content of the subject DPs in the embedded clauses, over and above the fact that those DPs must mean something that can be denoted by grammatically singular DPs. Thus, in this line of analysis, there is no grammatical reason to expect there

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<sup>1</sup>Yatabe and Tam (2017) additionally give the so-called right-node wrapping construction (Whitman 2009) and data involving the ‘respective’ readings in disjunction sentences (a phenomenon originally noted in Eggert (2000)) as empirical problems for Kubota and Levine’s analysis of coordination. For right-node wrapping, Yatabe and Tam themselves admit that this may not necessarily be a problem if one assumes that some RNR sentences are derived by an ellipsis mechanism, a possibility entirely consistent with the position of Kubota and Levine (2015).

This leaves only the disjunction ‘respective’ reading data as a possible surviving candidate for a problem for the CG analysis of coordination. We suspect that all such examples involve the alternative-invoking meaning of *or* in English (cf., e.g., Alonso-Ovalle (2006)), rather than boolean disjunction. Once this possibility is recognized, it seems to us to be premature to draw the conclusion that these data pose a problem for the compositional analysis of ‘respective’ readings proposed by Kubota and Levine (2016). However, since the present paper focuses on the issue of summative agreement, we leave a detailed examination of these disjunctive ‘respective’ reading examples to another occasion.

to be any difference between (70) on one hand and (72) and (73) on the other.  
(Yatabe and Tam 2017, 45)

where apparently ‘no grammatical reason’ is intended to refer to a strictly syntactic basis for the judgments in (3).

Readers familiar with Beavers and Sag’s (2004) account of summative agreement will no doubt recall, however, that they provide a very plausible alternative scenario to a purely syntactic treatment of summative agreement, based in part on the work of Solomon and Pearlmuter (2004) on the relationship between pragmatic inference and agreement errors. As noted in Solomon and Pearlmuter (2004), ‘semantic integration, the degree to which two parts of a message are linked within a conceptual representation, has a consistent and substantial influence on subject-verb agreement processes’, specifically, mismatches between the number marking on the VP vis-à-vis the grammatical number marked on subjects. Taking these findings as their point of departure, Beavers and Sag suggest the possibility that

summative agreement as in [(1)] is, strictly speaking, ungrammatical. It is instead explicable as a performance phenomenon, i.e. as a kind of semi-sentence (Katz (1964); Pullum and Scholze (2003)). Performance-based plural agreement is in fact widely attested. . . Solomon and Pearlmuter (to appear) explain the frequent occurrence of such examples in terms of semantic integration, the degree to which two elements (e.g. helicopters and flights) are linked at the message level during production. We may interpret this as near-grammatical variants likely to arise in production due to incrementally constructed aggregate entities.

This view of how the agreement possibilities in the raised VP—or, to adopt Beavers and Sag’s (2004) terms, the Right-Peripheral Element (RPE)—are determined casts a very different light on the examples in (3). In (3a), for example, the speaker is considering which of two alternative propositions to assert: the one concerning the pilot vs. the one about the sailor. Only one of the NP subjects is of interest, and the issue is which one it is; the speaker therefore naturally uses the singular, since whichever the proposition in question is, the RPE is only being predicated of one of them. Similarly, in (3b), there is only a single proposition that is being reported, corresponding to the shared belief of two different belief-holders; hence, the set of individuals corresponding to the subjects of the sentences expressing that proposition is a singleton, and again the singular number on the RPE is the only option. And in (3c), as Beavers and Sag (2004, 65) note, ‘there isn’t necessarily a second entity to form an aggregate with the nurse from the United States’, leading them to conclude that ‘one can argue that part of the licensing of summative agreement is pragmatic in nature’.<sup>2</sup> While (3c) actually requires a bit more discussion, it seems clear that Yatabe and Tam have failed to present an explicit argument that the data in (3) count as critical counterexamples to the possibility of a CG account of summative agreement facts.

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<sup>2</sup>On this analysis, the agreement morphology reflected in the RPE VP is a constructional property of RNR reflecting the role of the speaker’s point of view ‘summarizing’ the reported speech, as it were. Note that this report does not necessarily entail an endorsement of the truth of the reported statements, as can be clearly seen from the fact that example like the following are possible:

- (i) The pilot claimed that the first nurse, and the sailor insisted that the second nurse, were spies, and then everybody got terrified, but it later turned out that both reports were unfounded rumors.

Somewhat mysteriously, Yatabe and Tam (2017) repeat the data in (3) from Yatabe (2003) while altogether ignoring Beavers and Sag’s response to the latter. There does, however, appear to be a background assumption that can be identified as the sole basis for this implicit dismissal of Beavers and Sag’s semantic/pragmatic account of the data in (3). Yatabe and Tam offer what is in effect a paraphrase of Beavers and Sag’s extrasyntactic account of summative agreement (without actually referencing Beavers and Sag’s original statement of that account), observing that

It might seem that a purely semantic theory of subject-verb agreement would make it unnecessary to say anything special about summative agreement and thus make it possible to maintain a CG-based theory of non-constituent coordination. More specifically, it might seem possible to capture the observed patterns of summative agreement as well as non-summative agreement by saying that the plural form of a verb phrase is used if and only if that verb phrase is predicated of two or more objects. For instance, the example in [(1)] states that there are two people who were either claimed or proven to be spies, and this semantic fact could be taken to be the reason why the verb appears in the plural form. If such a semantic account turns out to be appropriate in all cases, then it will not even be necessary to distinguish summative agreement from non-summative agreement.

But the only objection to this line of analysis that they offer is that in certain kinds of examples, e.g., (4), ‘the singular form of the verb is used despite the fact that the sentence claims that the number of students who have passed the exam is two or more’ (Yatabe and Tam 2017, 46), along with similar observations about quantified NPs with the determiner *no*.

(4) More than one student has/\*have passed the exam.

Yatabe and Tam take this datum—their example (78)—to be self-evident support for the treatment of agreement as a *syntactic* fact which must be explicitly specified for each class of subject expressions, evidently reasoning that if the number of individuals denoted by the subject are the same, subject NPs (regardless of their type) should exhibit exactly the same morphological agreement pattern.

Thus, Yatabe and Tam’s (2017) dismissal of Beavers and Sag’s (2004) account of summative agreement rests on the assumption that morphological agreement reflects nothing more than the cardinality of the subject NP. We demonstrate below that this assumption is too simplistic, and that it corresponds to no robust account of the semantics of plurality that we are aware of. As we show below, a more standard (and independently motivated) account of number marking and semantic plurality takes into account the semantic type of the expression denoted by the subject NP. And in such an account, summative agreement patterns in (2) and (3) are straightforwardly accounted for without predicting the ungrammatical pattern in (4).

## 2 Some corroborating evidence for the right-node raised VP’s sensitivity to ‘speaker’s perspective’

Before examining the semantics of number agreement in more detail, however, it is worth noting, in support of a pragmatic/semantic account of summative agreement along the lines

of Beavers and Sag (2004), that we have prima facie evidence for this ‘speaker’s perspective’ interpretation available to—and perhaps preferred for—the RPE. Note the following examples exhibiting the effect of this interpretation on the form of the pronominal determiners in the latter:

- (5) a. Mr.  $J_1$  sent a Christmas card, and Mrs.  $J_2$  sent a party invitation, to their $_{1+2}$  next-door neighbors.  
 b. \*Mr. J sent a Christmas card to their next-door neighbors $_{1+2}$ , and Mrs. J sent a party invitation to their $_{1+2}$  next-door neighbors.
- (6) a. John $_1$  sent a Christmas card, and Mary $_2$  sent a party invitation, to each other’s $_{1+2}$  bosses.  
 b. \*John $_1$  sent a Christmas card to each other’s $_{1+2}$  bosses, and Mary $_2$  sent a party invitation to each other’s $_{1+2}$  bosses.

It is evident that in such cases, the RPE contains a determiner which does not reflect anaphoric reference to the relevant NP in either of the conjoined clauses, but rather receives an interpretation reflecting the speaker’s retrieval of these NPs and their referents, to form a set which the anaphoric operators apply. This retrieval is possible in contexts embedded under propositional attitude predicates:

- (7) John first realized that Mr.  $J_1$  had sent a Christmas card, and only later that Mrs.  $J_2$  had sent a party invitation, to their $_{1+2}$  next-door neighbors.
- (8) a. John suspected that Mary, and Bill thought that Ann, were  $\left\{ \begin{array}{l} \text{each} \\ \text{both} \end{array} \right\}$  involved in the robbery.  
 b. John suspected that Mary, and Bill thought that Ann, were respectively the Irish Prime Minister and the Queen of Belgium.

In (8), it is the *speaker* who identifies the neighbors in question as the joint neighbors of Mr. And Mrs. J.; conceivably, John discovered that the Christmas card was sent to the Smiths, and subsequently that the invitation was sent to the Johnsons, without knowing that ‘Johnson’ is an alias that the Smiths use. In this scenario, there is a perfectly acceptable interpretation of (7) in which the speaker is in effect including his or her own knowledge of the identity of the Smiths and the Johnsons, rather than reflecting the content of John’s own understanding of events.

The pattern reflected in (3c) is particularly interesting, and reflects a pattern which is not exhaustively explained by Beavers and Sag’s account, since the same singular agreement pattern appears in (9):

- (9) The pilot claimed that the nurse from the United States, and the sailor claimed that every nurse from Scotland,  $\left\{ \begin{array}{l} ?*\text{were spies} \\ \text{was a spy} \end{array} \right\}$ .

The pattern in (3c) and (9) is in fact characteristic of a much broader class of coordination phenomena involving singular determiners corresponding to universal quantification. Even with a background assumption that the set of nurses from Scotland is non-empty, a singular

VP agreement pattern is mandated for (9). To provide a complete answer to the apparent problem posed by (3c) and (9), therefore, we need to determine just what underlies the singular agreement pattern associated with singular universals, and how it impacts the agreement patterns associated with coordination.

The most basic morphosyntactic fact about universal singular determiners is that they require a singular-marked VP argument:<sup>3</sup>

- (10)  $\left\{ \begin{array}{l} \text{Every} \\ \text{Each} \end{array} \right\}$  submission was/\*were sent to the referees.

The morphological marking on the determiner's nominal argument suggests that *every/each* do not permit interpretation of the subject in such examples as a plural/aggregate/collective object, in contrast to the plural determiner *all*, a suggestion strongly supported by other data. Consider the difference between the cases displayed in (11):<sup>4</sup>

- (11) a. All (the) participants will meet in the park.  
 b.  $\left\{ \begin{array}{l} \text{John and Mary} \\ \text{An author and an editor} \\ \text{The author and the editor} \end{array} \right\}$  met in the park.  
 c. #Every/each man and every/each woman met in the park.

These examples show that a coordination of atomic individuals can be assessed, in effect, as a collective object (see, e.g., Link (1983), where these collective objects are treated as sums). For notational convenience, we introduce two subtypes for the type  $e$ :  $e_i$  for atomic individuals and  $e_\sigma$  for sums. What (11c) shows is that coordination of 'quantified NPs' cannot undergo this collective interpretation when the determiner is a singular universal GQ. The predicate **meet** (i.e. the denotation of *meet*) can only hold of entities with aggregate structure, and evidently the coordination of *each/every* subjects does not yield a functor which can apply to **meet**. This conclusion is made more or less explicit by the parallel contrast in the agreement facts:

- (12) a. All (the) participants are getting an award.  
 b.  $\left\{ \begin{array}{l} \text{John and Mary} \\ \text{An author and an editor} \\ \text{The author and the editor} \end{array} \right\}$  are getting an award.  
 c. Every/each mathematician and every/each physicist  $\left\{ \begin{array}{l} \text{*are} \\ \text{is} \end{array} \right\}$  getting an award.

It thus appears to be the case that the morphological number marking displayed in the VP corresponds to the properties of the subject along the following lines:<sup>5</sup>

- The subjects of plural-marked VPs are also possible subjects of VPs which can combine to give a semantically well-formed result only with collectivities, e.g., *meet*, *gather*, *assemble*, *interact*, etc.

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<sup>3</sup>But see footnote 10 below.

<sup>4</sup>The issues on collective interpretation raised in the following discussion have a long history in the formal semantics literature; see, e.g., Bennett (1974), Scha (1981), Dowty (1987).

<sup>5</sup>See the discussion of the distributivity of *each/every* in Beghelli and Stowell (1997) and Winter (2001) in this connection.

- The subjects of singular-marked VPs (including quantifiers with *each/every*, which invariably contain a singular nominal, even when two or more such quantified phrases are conjoined) cannot, as a rule, combine with VPs which denoted properties of collectivities.

The foregoing represents what we take to be the critical facts whose explanation will, as we argue below, account for the summative pattern of number marking exhibited in (1).

### 3 The semantics of agreement

Our analysis in the following discussion combines several aspects of Winter’s (2001) account of collectivity, based on an extensive survey of predicate types and classes of quantified expressions, with Link (1983) identification of plural nominals as sums, and with the typology of determiner + N constructions proposed by Steedman (2012). The gist of Winter’s account, based on the analysis of collective NPs in Bennett (1974), are the following robust generalizations (Winter 2001, 207):

singular nouns range over atoms. The same holds for all other singular intransitive predicates (verbs and adjectives in the singular). Plural nouns, and all other plural one-place predicates, range over *sets* of atoms.

In what follows, we recast Winter’s analysis in Linkean terms, replacing sets of atomic individuals with sums.<sup>6</sup> We also follow Winter in taking indefinites to be NPs with semantic type  $e$ , an analysis that can be implemented in various different ways (e.g., via choice functions (Winter 2001), or via Skolem functions (Steedman 2012)).<sup>7</sup> But, following Link (1983), supported by the arguments in Gil (1995), Haspelmath (1995), and Steedman (2012), we also treat plural quantifiers, in particular *all (the)*, as individuals as well: whereas singular determiners combine with nominals as choice functions returning individual atoms, certain determiners taking plurals (sets of sums) return individual sums. Finally, following Link, we assume that there is an interpretation of *and* as a sum constructor whose domain is the set of individuals (of subtype  $e_\iota$  or  $e_\sigma$ ).

With this background, the following interpretations follow immediately:<sup>8</sup>

- (13) a.  $\llbracket \text{John} \rrbracket = \mathbf{j}$   
 b.  $\llbracket \text{John and Mary} \rrbracket = \mathbf{j} \oplus \mathbf{m}$ .

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<sup>6</sup>Our choice in this matter is based on expository convenience. Winter (2001, 48) himself notes that his own set-theoretic treatment of plurality and one employing a Linkean sum are interconvertible, citing van der Does (1992) and Landman (1989).

<sup>7</sup>The analysis of indefinites as denoting functionally determined atomic entities, rather than generalized quantifiers, originates early in the Montagovian tradition (see, e.g., Karttunen 1976; Kamp 1981; Heim 1982), and is further developed both in the dynamic semantics literature in formal semantics and the P&P proposals for the syntax of Logical Form, e.g., Reinhart (1992, 1997); Chierchia (2001), *inter alia* (see also Steedman 2012).

<sup>8</sup>We assume that distributivity effects in examples such as *John and Mary are going to the movies* are the result of entailment relations determined by the semantics of VP interpretations; one way to capture this would be to posit a distributivity operator optionally associated with verbs denoting actions or events which do not have an inherently aggregate meaning. See Winter (2001, Sect. 6.4.1) for some discussion about distributivity, where he argues that the distributivity entailment in such sentences is more apparent than real.

- c.  $\llbracket \text{student} \rrbracket = \mathbf{student}$
- d.  $\llbracket \text{students} \rrbracket = \mathbf{students} = *mathbf{student}$  (where  $*P$  ‘generates all the individual sums of members of the extensions of  $P$ ’ (Link 1983: 130))
- e.  $\llbracket \text{all students} \rrbracket = \mathbf{sup}(*mathbf{students})$ , i.e., the supremum ( $\mathbf{sup}$ ) of the set  $*mathbf{students}$ .
- f.  $\llbracket \text{every student} \rrbracket = \lambda P.\forall y[\mathbf{student}(y) \rightarrow P(y)]$

It follows then that in a sentences such as *All (the) participants met in the park*, the characteristic function of the set of sums denoted by *met in the park* takes  $\mathbf{sup}(*mathbf{participant})$  As its argument. Thus, so-called ‘agreement’ morphology reflects the semantic compatibility between the classes of objects appearing as subjects vis-à-vis the type-theoretical requirements of the predicates which (in the case of individuals) take them as arguments or which (in the cases of true GQs) they serve as arguments for.

It follows from the analysis in (13) that (11)–(12) reflect the restrictions on forming sums out of conjunctions of (sums of) atoms, blocking the interpretation of conjunctions of *every/each*-quantified expressions via *and* as sums, thereby ensuring that such conjunctions are the result of the other meaning of *and*, namely, boolean conjunction. We notate boolean conjunction *and* as  $and_{\sigma}$ , and the sum-forming *and* as  $and_{\cap}$ . Names, (in)definites and *all (the)* plurals, which denote individual objects, can form sums under coordination:

$$(14) \left\{ \begin{array}{l} \text{a. John and Mary} \\ \text{b. An/some editor and a/some publisher} \\ \text{c. All (the) editors and all (the) publishers} \end{array} \right\} \left\{ \begin{array}{l} \text{are happy with the new guidelines} \\ \text{met at the faculty club} \end{array} \right\}.$$

*Each/every* + N expressions, denoting the ultrafilter of the set denoted by N, on the other hand, cannot form sums under  $and_{\sigma}$  conjunctions, but can be coordinated under boolean conjunction  $and_{\cap}$  to yield the intersection of the ultrafilters of the two (or more) N-sets in the coordination.<sup>9,10</sup>

<sup>9</sup>See Hoeksema (1983), van Eijck (1983), Roberts (1990) for motivation for this distinction, though they have somewhat different characterizations of the source of the difference in semantic action.

<sup>10</sup>One might wonder at this point why the individual variables bound by these singular universals cannot be summatively conjoined under  $and_{\sigma}$ ; after all, they are of type  $e$ , and there appears to be no bar to coordination of the  $\lambda$ -bound variables under summative conjunction as in (ii):

- (i) (??)Every student and every professor are meeting one-to-one.
- (ii)  $\mathbf{V}_{\mathbf{student}}(\lambda x.\mathbf{V}_{\mathbf{professor}}(\lambda y.\mathbf{meet121}(x \oplus y)))$

We have in fact found informants who find examples such as (i) acceptable. One possible explanation for this speaker variability is that examples like (i) are semantically well-formed but (most often) pragmatically infelicitous, unless one can implicitly eliminate implausible scenarios, so to speak. (ii) literally means that all possible pairings of student and professor satisfy the relation ‘meet one-to-one’. With most types of semantic relations and in most ordinary circumstances, this type of universal quantification over collective predication is just pragmatically highly infelicitous if one takes it meaning literally. However, it may be that some speakers can ‘get’ the intended readings by ‘reading in’ some appropriate implicit domain restriction (in such a way that the universal quantification is understood to hold only of the *relevant* pairings of students and professors, e.g., all phonology students will meet with all phonology professors one-to-one, and all syntax students will meet with all syntax professors one-to-one). Another possibility is that while  $x$  and  $y$  are variables over atomic individuals, they are not themselves taken to be such individuals by most speakers, hence for most (but not all) speakers the formula in (ii) is just uninterpretable, although it is logically well-formed.



We now return to the last of the supposedly problematic examples in (3). The overall patterning of *no* with *each/every* offers a priori evidence that, like the other singular universals, *no* expressions are generalized quantifiers which do not form sums, and thus can only combine distributively under *and*.<sup>11</sup> Note, for example, the impossibility of coordinating atoms with sums to obtain a sum (as vs. *Some nurse and all the patients met on Saturday*, whose subject, as predicted by the analysis in (13), is a semantical object acceptable as an argument to *met on Sunday*):

- (15) Some nurse and  $\left\{ \begin{array}{l} \text{someone} \\ *_{\text{noone}} \end{array} \right\}$  from the United States met on Sunday.

Exactly the same considerations apply to (9), determining that only distributive conjunction is possible in the latter example.

In summary: on Winter’s analysis, singular and plural number marking on verbs correspond not to the cardinality of the set denoted by the subject arguments that those verbs take, but rather to the *semantic type* of the (model-theoretic) objects denoted by those subjects. Singular predicates (*is sleeping*) take atoms as their arguments, hence are of type  $e_i \rightarrow t$ ; plural predicates, on our version of this analysis, take sums as arguments, hence are of type  $e_\sigma \rightarrow t$ . A clear diagnostic for the semantic type of quantified expressions is the possibility of combining with collectivity-seeking verbs: *All (the)/most/few participants met during the reception* vs. *#Each/every/many an editor met at the reception*.

## 4 Semantic agreement and summative agreement

Let us now revisit summative agreement, adding to the examples given above the data in (16):

- (16) a. John thinks that every mathematician, and Mary is sure that every physicist, **has** been assigned to the same project.  
 b. John thinks that all mathematicians, and Mary is sure that all physicists, **have** been assigned to the same project

We now show that, with the semantics for morphological number marking introduced above, the summative agreement facts in question fall readily into place.

Suppose that RNR is licensed by the grammar by a special entry for *and* with the syntactic type  $((S/VP_{sg}) \setminus (S/VP_{pl})) / (S/VP_{sg})$ , which comes with the additional pragmatic condition for its felicitous use: the summative agreement *and* is possible only when the speaker can entertain a perspective (which he does not necessarily endorse) which guarantees the existence of some plural entity (of type  $e_\sigma$ ) of which the RPE VP predicate can be appropriately predicated. We have seen clear independent evidence for the sensitivity of the RPE material to the speaker’s perspective, in, e.g., (5): in these examples, the RPE contains anaphoric elements reflecting the speaker’s assessment of the relationship between the neighbors in question on the one hand and the set of individuals comprising the respective attitude holders in the two clauses of the RNR construction.

<sup>11</sup>However, there seems to be some variability in the data. Google searches reveal examples with subjects of the form *No N<sub>1</sub> and no N<sub>2</sub>* which take both plural and singular VPs.

Summative agreement can then be taken to be a grammaticalized extension, as it were, of this anaphoric possibility sensitive to the speaker’s perspective. When the subjects of the two clauses corresponding to the reported propositions are denoted by, e.g., definite descriptions, the speaker can *construe* the ‘referents’ of the embedded subjects in the two clauses (i.e. *the first nurse* and *the second nurse*) as forming the sum **nurse1**  $\oplus$  **nurse2**, which is appropriate as an argument of plural predicates, e.g., *were spies*, since this semantic object is of the right type to serve as an argument to a sum-seeking plural VP. The same holds for other singular existentials, e.g., names and *a/the* terms, and for certain plural universals as well. But when these subjects are represented by singular universals, no appropriate plural individual (i.e. sum) can be constructed within the speaker’s perspective to support agreement with a plural VP, paralleling the judgment patterns of the simpler non-RNR examples of conjoined singular quantifiers in (10).

Thus, all we need assume in order to account for summative agreement in RNR is the existence of the syntactic type  $((S/VP_{sg}) \setminus (S/VP_{pl})) / (S/VP_{sg})$  for *and* and the following three, independently motivated assumptions:

- names, definites, indefinites, and plural expressions of the form *all (the) Ns* denote individuals, all of which can be conjoined by  $and_{\sigma}$  to form an individual of type  $e_{\sigma}$
- singular quantifiers of the form *each N*, *every N* and *no N* all denote generalized quantifiers of type  $(e_i \rightarrow t) \rightarrow t$
- the RPE can reflect a speaker’s perspective in which the separate arguments of the single RPE predication are in effect retrieved by the speaker from their separate  $S/VP_{sg}$  clauses and thrown together by the speaker’s construal of them as forming a single plural entity to which the RPE predication applies just in case it can take such arguments.

The three principles itemized—each of which, as noted earlier, is separately supported—interact to yield (1) as a straightforward consequence. On our Linkean analysis, definite descriptions such as *the first nurse* and *the second nurse* can form plural objects under implicit summative conjunction, and hence are legitimate antecedents for plural anaphoric elements such as personal pronouns, reflexives, reciprocals—and, in the case of verbal morphology, the plural number marking that reflects summative agreement. This combination of pragmatic assumptions (needed in order to understand data such as (5)) and the behavior of coordinate subjects of explicitly plurality-seeking VPs suffices to account for the summative agreement facts. The syntactic type  $((S/VP_{sg}) \setminus (S/VP_{pl})) / (S/VP_{sg})$  may well have the status of an emergent category, accessible for certain speakers under certain pragmatic conditions, but not representing an ‘established’, canonical type available to English speakers.<sup>12</sup>

By this point, it should be clear that Yatabe and Tam’s claim rests crucially on a too simplistic conception of the semantics of number agreement which is not in line with current

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<sup>12</sup>In this connection, it is worth recalling the point made in Beavers and Sag (2004) that ‘Yatabe’s work with native speaker informants reveals that such sentences [as (1)] are of intermediate acceptability (only 7 of the 23 subjects he studied found this sentence to be perfectly acceptable)’. This suggests a variability that, as is typical in such cases, argues for a difference in speakers’ flexibility in allowing extragrammatical factors to ameliorate apparent deviations from canonical dependency patterns, and Beavers and Sag in fact themselves cite Solomon and Pearlmutter (2004), whose work we alluded to above, in connection with such possibilities. It is of course possible, though, that such a type has been fully grammaticalized in the syntax/semantic interface of other languages.

approaches to the singular/plural number distinction in the formal semantics literature. Note in this connection that by taking agreement to be a syntactic fact disjoint from semantic plurality (which seems to be Yatabe and Tam’s own position), it is unclear how contrasts like the following can be accounted for:

- (17) a. \*More than one student met.  
 b. Two or more students met.
- (18) a. \*No student met.  
 b. No students met.

By contrast, on the Bennett/Winter analysis, the above facts are straightforward. Quantifiers formed out of singulars (such as the subjects in (17a) and (18a)) denote GQs over atomic individuals (of type  $(e_t \rightarrow t) \rightarrow t$ ) whereas quantifiers formed out of plurals (such as the subjects in (17b) and (18b)) denote GQs over plural individuals (of type  $(e_\sigma \rightarrow t) \rightarrow t$ ). It immediately follows from this simple assumption that (17a) and (18a) are ungrammatical whereas (17b) and (18b) are grammatical.

To conclude, once the too simplistic assumptions about agreement is replaced by a more adequate analysis of the relationship between semantic plurality and morphological number marking, summative agreement facts cease to pose a problem for the CG analysis of coordination. We therefore continue to hold that the CG analysis still remains to be the simplest and empirically most robust analysis of the coordination facts in English.

## References

- Alonso-Ovalle, Luis. 2006. *Disjunction in Alternative Semantics*. Ph.D. thesis, University of Massachusetts at Amherst.
- Beavers, John and Ivan A. Sag. 2004. Coordinate ellipsis and apparent non-constituent coordination. In S. Müller, ed., *The Proceedings of the 11th International Conference on Head-Driven Phrase Structure Grammar*, 48–69. Stanford: CSLI.
- Beghelli, Fillipo and Tim Stowell. 1997. Distributivity and negation: The syntax of *each* and *every*. In A. Szabolcsi, ed., *Ways of Scope Taking*, 71–107. Kluwer.
- Bennett, Michael. 1974. *Some Extensions of a Montague Fragment of English*. Ph.D. thesis, UCLA.
- Chierchia, Gennaro. 2001. A puzzle about indefinites. In C. Cecchetto, G. Chierchia, and M. T. Guasti, eds., *Semantic Interfaces: Reference, Anaphora and Aspect*, 51–89. Stanford: Center for the Study of Language and Information.
- Copestake, Ann, Dan Flickinger, Carl Pollard, and Ivan A. Sag. 2005. Minimal recursion semantics: An introduction. *Research on Language and Computation* 4(3):281–332.
- Dowty, David. 1987. Collective predicates, distributive predicates, and *all*. In F. Marshall, A. Miller, and Z. sheng Zhang, eds., *Proceedings of the 1986 Eastern States Conference on Linguistics (ESCOL)*, 97–115.
- Dowty, David. 1988. Type raising, functional composition, and non-constituent conjunction. In R. T. Oehrle, E. Bach, and D. Wheeler, eds., *Categorial Grammars and Natural Language Structures*, 153–197. Dordrecht: D. Reidel Publishing Company.

- Eggert, Randall. 2000. Grammaticality and context with respect to *and...* and *or...* respectively. In *Proceedings of the Thirty-Sixth Annual Meeting of the Chicago Linguistics Society*, 93–107.
- Gil, David. 1995. Universal quantifiers and distributivity. In E. Bach, E. Jelinek, A. Kratzer, and B. Partee, eds., *Quantification in Natural Languages*, 321–362. Dordrecht: Kluwer.
- Haspelmath, Martin. 1995. Diachronic sources of *all* and *every*. In E. Bach, E. Jelinek, A. Kratzer, and B. Partee, eds., *Quantification in Natural Languages*, 363–382. Dordrecht: Kluwer.
- Heim, Irene. 1982. *The Semantics of Definite and Indefinite Noun Phrases*. Ph.D. thesis, University of Massachusetts, Amherst.
- Hoeksema, Jack. 1983. Plurality and conjunction. In A. ter Meulen, ed., *Studies in Model-Theoretic Semantics*, 63–84. Dordrecht: Foris.
- Kamp, Hans. 1981. A theory of truth and semantic representation. In J. A. Groenendijk, T. Janssen, and M. Stokhof, eds., *Formal Methods in the Study of Language*. Dordrecht: Foris.
- Karttunen, Lauri. 1976. Discourse referents. In J. D. McCawley, ed., *Syntax and Semantics*, vol. 7, 363–385. New York: Academic Press.
- Katz, Jerrold J. 1964. Semi-sentences. In J. Fodor and J. J. Katz, eds., *The Structure of Language*, 400–416. Englewood Cliffs, NJ: Prentice Hall.
- Kubota, Yusuke and Robert Levine. 2015. Against ellipsis: Arguments for the direct licensing of ‘non-canonical’ coordinations. *Linguistics and Philosophy* 38(6):521–576.
- Kubota, Yusuke and Robert Levine. 2016. The syntax-semantics interface of ‘respective’ predication: A unified analysis in Hybrid Type-Logical Categorical Grammar. *Natural Language and Linguistic Theory* 34(3):911–973.
- Landman, Fred. 1989. Groups, I & II. *Linguistics and Philosophy* 12:559–605, 723–744.
- Link, Godehard. 1983. The logical analysis of plurals and mass terms: A lattice-theoretical approach. In R. Bäuerle, C. Schwarze, and A. von Stechow, eds., *Meaning, Use, and Interpretation of Language*, 302–323. Berlin: Walter de Gruyter.
- Pollard, Carl J. and Ivan A. Sag. 1994. *Head-Driven Phrase Structure Grammar*. Studies in Contemporary Linguistics. Chicago and London: University of Chicago Press.
- Postal, Paul M. 1998. *Three Investigations of Extraction*. Cambridge, Mass.: MIT Press.
- Pullum, Geoffrey K. and Barbara Scholze. 2003. Foundations of model-theoretic syntax. Course notes from ESSLLI 2003, University of Vienna.
- Reape, Mike. 1993. *A Formal Theory of Word Order: A Case Study in West Germanic*. Ph.D. thesis, University of Edinburgh, Edinburgh.
- Reape, Mike. 1994. Domain union and word order variation in German. In J. Nerbonne, K. Netter, and C. J. Pollard, eds., *German in Head-Driven Phrase Structure Grammar*, No. 46 in CSLI Lecture Notes, 151–197. Stanford: CSLI Publications.
- Reinhart, Tanya. 1992. *Wh*-in-situ: an apparent paradox. In *Proceedings of the Amsterdam Colloquium*, 483–491. University of Amsterdam.
- Reinhart, Tanya. 1997. Quantifier scope: How labor is divided between QR and choice functions. *Linguistics and Philosophy* 20(4):335–397.
- Roberts, Craige. 1990. *Modal Subordination, Anaphora and Distributivity*. New York: Garland. Outstanding Dissertations in Linguistics; revised version of the author’s 1987 UMass

- Amherst doctoral dissertation.
- Scha, Remko. 1981. Distributive, collective and cumulative quantification. In J. Groenendijk, T. Janssen, and M. Stokhof, eds., *Formal Methods in the Study of Language*, 483–512. Amsterdam: Universiteit Amsterdam, Mathematical Center.
- Solomon, Eric. S. and Neal. J. Pearlmutter. 2004. Semantic integration and syntactic planning in language production. *Cognitive Psychology* 49(1):1–46.
- Steedman, Mark. 1985. Dependency and coordination in the grammar of Dutch and English. *Language* 61(3):523–568.
- Steedman, Mark. 2012. *Taking Scope*. Cambridge, Mass.: MIT Press.
- van der Does, Jaap. 1992. *Applied Quantifier Logics: Collectives, Naked Infinitives*. Ph.D. thesis, University of Amsterdam.
- van Eijck, Jan. 1983. Discourse representation theory and plurality. In A. G. ter Meulen, ed., *Studies in Model Theoretic Semantics*. Dordrecht: Foris.
- Whitman, Neal. 2009. Right-node wrapping: Multimodal categorial grammar and the ‘friends in low places’ coordination. In E. Hinrichs and J. Nerbonne, eds., *Theory and Evidence in Semantics*, 235–256. Stanford: CSLI Publications.
- Winter, Yoad. 2001. *Flexibility Principles in Boolean Semantics*. Cambridge, Mass.: MIT Press.
- Yatabe, Shūichi. 2003. A linearization-based theory of summative agreement in peripheral-node raising constructions. In J.-B. Kim and S. Wechsler, eds., *Proceedings of the 9th International Conference on Head-Driven Phrase Structure Grammar*, 391–411. Stanford: CSLI. <http://csli-publications.stanford.edu/HPSG/>.
- Yatabe, Shūichi. 2007. Evidence for the linearization-based theory of semantic composition. In S. Müller, ed., *The Proceedings of the 14th International Conference on Head-Driven Phrase Structure Grammar*, 323–343. Stanford: CSLI Publications.
- Yatabe, Shūichi and Wai Lok Tam. 2017. In defense of an HPSG-based theory of non-constituent coordination: A reply to Kubota and Levine. MS., available at <http://ling.auf.net/lingbuzz/003152>.