



Thematic Roles and the Interpretation of *one-another* Reciprocals

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Abstract. This paper proposes a novel neo-Davidsonian semantics of *one another*-reciprocals that appear in several Indo-European languages. Arguments are presented that suggest that such expressions be treated as compositionally complex, in contrast to standard approaches that treat them as primitive polyadic quantifiers. A theory of logical form for *one another*-reciprocals is developed that can account for a non-trivial range of their syntactic distribution as well as a wide range of the attested readings of reciprocal sentences.

1 Introduction

This paper addresses the logical form of reciprocal sentences containing one-another reciprocals (OARs), a common type reciprocal expression found in many Indo-European languages. After considering some empirical facts about OARs in the languages where they are found, I will argue that we must view the OAR as a complex expression, contrary to the standard assumption that argument reciprocals (reciprocals that can appear in argument positions) are primitive semantic elements; more specifically, that they are polyadic quantifiers (see Dalrymple *et al.* 1998 and much subsequent work). I will show that with a certain neo-Davidsonian decomposition, it is possible to treat OARs as being composed of essentially the same *one* and *other* that occur outside of OAR constructions, while also accounting for a large amount of the polysemy known to be associated with reciprocals. This will require us to consider some developments of recent work in event semantics, which has already shown to be useful in analyses of reciprocity (Schein 2003, Dimitriadis 2008, Dotlačil 2010) and other issues concerning plurality in general (Schein 1993, Lasersohn 1995, Landman 2000, Pietroski 2005, Zweig 2008).

The paper will be organized as follows. In the second section, I will highlight some descriptive facts about the distribution of OARs that not only suggest that they are compositionally complex, but also that each part of the OAR (*one* and *other*) is associated with thematic content distinct from the

other part. In the third section, I will review some of the relevant parts from the reciprocal and event semantics literature, and propose a novel logical decomposition for sentences involving OARs. I will show that the proposals offered here, guided by the empirical facts of section 2, can account for a large portion of the range of attested reciprocal readings. The final section will summarize the results of the paper.

2 The Complexity of OARs

In this section I will argue that OARs are structurally complex in that each of its elements, *one* and *other*, are separate nominal expressions. While a treatment of this kind might seem obvious, the standard in the reciprocal literature for the past fifteen years or so has been to treat reciprocals expressions like *each other* and *one another* as polyadic quantifiers.¹

I do not doubt that it is possible for theoreticians to represent the meaning of reciprocal sentences in terms of polyadic quantification. The issue that I am concerned with is if this is the best way that we can model how meaning is represented in the minds of speakers. I believe that we should be wary about including in our model higher order relations like polyadic quantifiers *if* there is only one family of phenomena (anaphors) that seems to call for such a device. If there is a possibility of accounting for the same facts without climbing dangerously high up the Fregean hierarchy of types, then I believe that possibility should be explored. That is what I intend to do in the rest of the paper.

2.1 Empirical Arguments for Complexity

I will show that the empirical facts presented below not only pose serious problems for analyses that treat OARs as primitive, non-decomposable expressions, but they also suggest an idea that will form the basis of the analysis in Section 3: if *one* and *other* are distinct nominals, then perhaps they are associated with distinct thematic roles.

Let us first consider the distribution of article determiners within OARs. Articles within OARs can be found in the Romance languages (Spanish (1), French (2), and Romanian (3)), as well as in Bulgarian (4).

¹ A type $\langle 1,2 \rangle$ quantifier in Generalized Quantifier Theory (see Peters and Westerståhl 2005). In Generalized Quantifier Theory, run-of-the-mill quantificational determiners are classified as type $\langle 1,1 \rangle$ quantifiers, because each argument to the determiner has an adicity of one; each one on its arguments is a monadic predicate. Reciprocals have been treated as polyadic quantifiers of type $\langle 1,2 \rangle$ in GQT, labeled as such since one of this quantifier's arguments is a polyadic predicate (the verb).

- (1) Los estudiantes se seguían **los unos tras los otros.**
the students CL follow the ones behind the others
 ‘The students are following one another.’
- (2) Les étudiants se sont frappé **les uns les autres.**
the students CL AUX hit the ones the others
 ‘The students hit one another.’
- (3) Băieții s-au urmărit **unul pe celălalt.**
boys.DEF CL have followed one.DEF ACC-PART other.DEF
 ‘The boys followed one another.’
- (4) Gostite tancuvaha **edin-ija s drug-ija.**
guests.DEF danced one.DEF with other.DEF
 ‘The guests danced with one another.’

What is important for us is that it is possible to have article morphology appear on each part of the OAR simultaneously. Though some languages allow multiple articles per nominal (such as the Scandinavian double-definiteness languages), the languages reported above do not allow this and we can take the simultaneous occurrence of two articles as evidence for two distinct noun phrases.

Next we will consider the placement of prepositions that interact with OARs. In Germanic OAR constructions, prepositions are generally placed before the OAR complex, as in English (5) and German (6).

- (5) They danced with one another.
- (6) Sie erzählten **voneinander.**
they talk about-one-another
 ‘They talk about one another.’

It seems however that preposition placement in Germanic OARs is the exception to a general pattern. In all the non-Germanic Indo-European languages where I found OARs to be a productive, the preposition always intervenes between *one* and *other*.²

² It is also possible in some contexts, and with certain prepositions, that Germanic OARs can show the one-P-other word order that we find to be pervasive in Indo-European languages.

- (i) I put the books ones on top of another

Below, we see this in French (7), Spanish (8), Romanian (9), Bulgarian (10), Serbo-Croatian (11), and Ukrainian³ (12).

- (7) Les étudiants se sont donné des livres **les uns aux autres**.
the students CL AUX gave some books the ones to-the others
 'The students gave books to one another.'
- (8) Los estudiantes presentaron los profesores **el uno al otro**.
the students introduced the professors the one to-the other
 'The students introduced the professors to one another.'
- (9) Oaspeții au dansat **unul cu celălalt**.
guests.the have danced one.the.NOM with other.the.ACC
 'The guests danced with one another.'
- (10) Te stojať **edin do drug**.
they stand one beside other
 'They are standing beside one another.'
- (11) Gosti su plesali **jedni s drugima**.
guests AUX danced one with other
 'The guests danced with one another.'
- (12) Divčata hovoryly **odna pro odnu**.
girls talk one.NOM about one.ACC
 'The girls are talking about one another.'

If the OAR were a primitive expression, it should come as a surprise that it is possible to break it up with prepositions, though this is what we find in a majority of languages that have OARs. Furthermore, if we can assume that it is the complements of prepositions that receive the thematic role associated with that preposition, then it is possible to attribute thematic distinctness to each element of an OAR since only one of them appears to be the complement of the preposition in these languages, the *other* element.⁴

The last empirical phenomena that I will discuss concerns case morphology within the OAR. In certain Slavic languages that use OAR constructions, each element of the OAR inflects for case. Interestingly, the

³ Notice that Ukrainian OARs are actually of the form one-one. I will assume that the second one forms a DP with a covert other adjective.

⁴ Of course this would require us to say something about the Germanic cases where the whole OAR linearly follows the preposition. I suspect that there is either a transformation deriving the Germanic word order from the standard *one-P-other* order, or that the Germanic order came about by some form of diachronic univerbation.

case of *one* and the case of *other* are generally different. Consider the Serbo-Croatian (13) and Ukrainian (14).

- (13) Studenti su udarali **jedan drugog**.
students.NOM AUX hit one.NOM other.ACC
 ‘The students hit one another.’

- (14) Studenty vdaryly **odyn odnoho**.
students.NOM hit one.NOM one.ACC
 ‘The students hit one another.’

Considering just these “elementary reciprocal sentences” as they are often called (beginning with Langendoen 1978), it seems that the case of *one* must be nominative and the case of *other* must be accusative. However, when we look beyond these simple cases, we see that a deeper generalization can be made. Below are ditransitive construction in Serbo-Croatian (15a) and (16a), and Ukrainian (15b) and (16b) where the OAR is an indirect object. In (15), the interpretation is one where the students introduced the professors to other students (among *the* students), where in (16) the interpretation is where the students introduced the professors to other professors (among *the* professors).

- (15) a. studenti su predstavili profesore **jedni drugima**.
students.NOM AUX introduced professors.ACC one.NOM other.DAT
 ‘The students introduced the professors to one another.’
 b. Studenty predstavlyly profesoriv **odni odnym**.
students.NOM introduced professors.ACC one.NOM one.DAT
 ‘The students introduced the professors to one another.’
- (16) a. Studenti su predstavili profesore **jedne drugima**.
students.NOM AUX introduced professor.ACC one.ACC other.DAT
 ‘The students introduced the professors to one another.’
 b. Studenty predstavlyly profesoriv **odnyx odnym**.
students.NOM introduced professors.ACC one.ACC one.DAT
 ‘The students introduced the professors to one another.’

The English sentences that comprise the translations for (15) and (16) are ambiguous. Serbo-Croatian and Ukrainian have no such ambiguity because of the case morphology within the OAR. Based on the meaning differences between the two pairs of sentences, in (15), it is the subject that appears to act as the antecedent for the OAR, while in (16) it appears that the direct object is the antecedent. This fact is reflected by the case morphology of the OAR. In (15), where the subject acts as the reciprocals antecedent, the case of *one* is nominative, the case typical of subjects. In (16), where the objects as

antecedent, the case of *one* is accusative, the case typically associated with direct objects. Notice that in each example in (15) and (16), the case of *other* does not vary. The proper descriptive generalization of these case facts seems to be that (i) the case of *one* will always match the case of the OAR's antecedent, and (ii) the case of *other* will always be the case that we would expect based on the position of the OAR. In (13), since the OAR is in direct object position, the case of *other* is accusative. In (15) and (16), the OAR appears in indirect object position, thus the case of *other* is dative, the case typical of indirect objects. To the best of my knowledge, this is a novel observation.

The facts presented here call for a complex treatment of OARs. While each argument alone might not be enough to convince one of this, taken together I believe that we have enough reason to seriously consider treating OARs as non-primitive. The data concerning preposition placement and (especially) case distribution not only call for a complex treatment, but also suggest that each element comprising the OAR be associated *somehow* with thematic content different from the other element. My proposal for exactly how this works will be the topic of 3.3. But before shifting to more formal matters, I want to conclude this section with a discussion of some relevant properties of *one* and *other* that are easily observable in their non-OAR uses.

2.2 Anaphoric Properties of *one* and *other*

In the introduction, I said that we should not only view OARs as complex, but also that we should view that as being composed from essentially the same *one* and *other* that we find outside of OAR constructions. In this subsection, I will discuss the relevant properties of these elements as they appear in cases of cross-sentential anaphora. In 3.3, the specific proposals about OARs will encode the same relevant anaphoric properties of these elements as they appear outside of reciprocal constructions.

Consider first the use of *other* as a cross-sentential anaphor. We can see from sentences like (17) that it is impossible for *other* to refer to the individuals denoted by its antecedent. Rather, it must refer to something other than what its antecedent refers to, *and* other than the parts that comprise what its antecedent refers to.

(17) Three boys wore hats. Another wore a sweater.

On the other hand, *one* does have the ability to refer to an individual that is a part of the plurality denoted by the antecedent. (18), on this interpretation, has the same meaning as (19), with an overt partitive phrase.

(18) Three boys wore hats. One (also) wore a sweater.

(19) Three boys wore hats. One of them (also) wore a sweater.

Although it is possible for *one* to refer to a boy other than one that is part of the plurality that its antecedent refers to, this is not always the case; see (20).

(20) Three boys walked in. One walked out.

What is important for us is that *one* can, on some occasions, be used as a sort of partitive anaphor, referring to a proper part of what its antecedent refers to. When *one* is used this way, it can act as an antecedent for *other* so that otherness can be determined with regards to something *within* a plurality, an option that is not available in (17). We can see this in (21), where *other* is linked indirectly to *three boys* by having *one* as its antecedent, and this in turn acts as a partitive anaphor directly anteceded by *three boys*.

(21) Three boys wore hats. One wore a sweater. Another wore a scarf.

I believe that the “anaphoric chain” that we see here is exactly what is at work in OARs. This means that in OARs, *other* inherits *one*’s partitivity, and as a result otherness is determined by what *one* picks out. (22) shows a schematic representation about the structure of OARs under this approach.

(22) [_S ...Antecedent_i... [_{DP} ...one of them_i...]_k... [_{DP}...other than that_k...]...]

3 The Logical Form of OARs

The last section has outlined facts that any theory of (*one-another*) reciprocals should address. I see no way of seriously maintaining a primitive, polyadic analysis of OARs given the data from 2.1. This, however, puts us in a quandary. Polyadic quantifier analyses have been so popular as of late because they capture facts about reciprocity better than earlier theories advocating a complex treatment. However, as Schein (2003) notes, these earlier theories assume a logical syntax where verbs are understood as relational predicates. Like him, I believe that it is possible to revive the goals of these earlier approaches with the tools of neo-Davidsonian semantics. Before reviewing the relevant event literature and stating my own proposals, I think it is prudent to discuss at least one of the problems that have been at the forefront of the reciprocal literature, which I turn to immediately.

3.1 Polysemy and Reciprocity

While reasons of space prevent me from reviewing all of the aspects of the reciprocal literature that I believe bear on the issues raised here, I will at least

outline what I take to be one of the most central problems for the semantics of reciprocity that nearly the entire literature attempts to address in one way or another. The problem is summarized as such: how is it the case that the sentence in (23) can be true in so many different situations?

(23) The dots are pointing at one another.

This problem has been addressed as early back as Lasnik and Fiengo (1973). However, it was not until work of Langendoen (1978) that we first had an explicit typology of the different readings associated with (23). Langendoen classified these readings according to reciprocal “strength” (borrowing this term from Fiengo and Lasnik). For example, Strong Reciprocity (the strongest of reciprocal readings) is associated with the reading where every dot is pointing at, and is pointed at by, every other dot. In (Fig. 1), I have included a modern typology of these readings, taken from Beck (2001). Let A denote the plurality associated with the reciprocal antecedent, and R the verbal predicate.

(Fig. 1)

I. Strong Reciprocity (SR):

$\forall x \in A: \forall y \in A [x \neq y \rightarrow xRy]$

II. Partitioned Strong Reciprocity (PartSR):

There is partition PART of A such that $\forall X \in \text{PART}$:

$\forall x \in X: \forall y \in X [x \neq y \rightarrow xRy]$

III. Intermediate Reciprocity (IR):

$\forall x \in A: \forall y \in A: [x \neq y \rightarrow \exists z_1 \dots z_n \in A [x = z_1 \& y = z_n \& z_1Rz_n \& \dots z_{n-1}Rz_n]]$

IV. Weak Reciprocity (WR):

$\forall x \in A: \exists y \in A [x \neq y \rightarrow xRy] \& \forall y \in A: \exists x \in A [x \neq y \rightarrow xRy]$

V. One-way Weak Reciprocity (OWR):

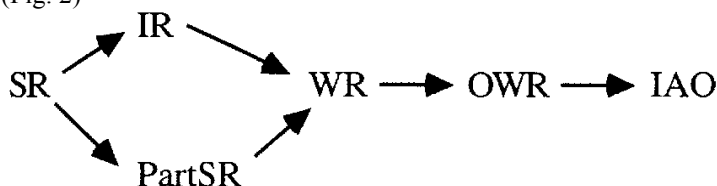
$\forall x [x \in A \rightarrow \exists y [y \in A \& x \neq y \& xRy]]$

VI. Inclusive Alternative Ordering (IAO):

$\forall x [x \in A \rightarrow \exists y [y \in A \& x \neq y \& (xRy \vee yRx)]]$

Interestingly, as Langendoen noticed, there are certain entailment relations that hold among the possible reciprocal readings. (Fig. 2) shows these entailments, again taken from Beck (2001).

(Fig. 2)



Because of these entailments, Langendoen suggested that we take reciprocal expressions as having one meaning, and that meaning should be weak. His reasoning was that if a reciprocal sentence is judged true where the truth conditions are those of a strong type of reciprocity, then the sentence will also be true when the truth conditions are those of a weaker type of reciprocity. For example, if we judge (23) to be true where truth is evaluated in terms of SR, then it will also be true when evaluated in terms of WR. Therefore, if we view the reciprocal as having a weak interpretation, then we can use that single interpretation in accounting for the truth-conditional meaning of all reciprocal sentences, even if such sentences are used to describe situations where a stronger type of reciprocity holds.

This elegant solution to the polysemy problem was called into question by Dalrymple et al. (1998). They raised the concern that such an underspecification analysis makes incorrect predictions with regard to sentences like (24).

(24) Alvin, Simon, and Theodor know one another.

An account like Langendoen's would predict (24) to be felicitous in a situation where there is less than full mutual acquaintance among the individuals mentioned in (24); say, where Alvin and Simon know one another, and Simon and Theodor know one another, but Alvin and Theodor never met. However, (24) cannot be used in such a situation. As Fiengo and Lasnik (1973) were the first to suggest, this infelicity seems to come about because stative verbs appear to require strong reciprocity.

I believe the issue raised by Dalrymple et al. as a criticism of underspecification analyses for reciprocity should be dismissed. My reason for this is that it can be shown that stative verbs impose the same strength requirements even in non-reciprocal sentences.

(25) John and Mary know Bill and Sue.

It is not possible to have an interpretation of (25) where John and Bill know one another, and Mary and Sue know one another, and that is all the knowing involved. Thus, we should not let the idiosyncratic properties of certain verbs influence theories of reciprocity, since these idiosyncratic properties have shown not to have anything to do with reciprocity in particular.⁵

The account that I will give below follows in the spirit of Langendoen. Like him, I will propose that OARs have a single weak interpretation. In particular, the interpretation I give is analogous to the fifth reading above, OWR. This means that the conditions imposed by the proposed logical form schema will be met in situations that validate OWR and any stronger type of reciprocity, except in cases where there are independent restrictions on interpretation such as the idiosyncratic properties of certain lexical items as observed in (24) and (25). I say that the proposed interpretation is *analogous* to OWR because I will use a different metalanguage than what we see in (Fig. 1); a language that has higher-order variables that can range over both individuals and events, and where verbs are not represented as relations. In the next section, I will explicate my metalanguage assumptions.

3.2 Events and Plurality

I will assume familiarity with some basic tenets of neo-Davidsonianism, and take it as uncontroversial that an object language sentence like (26) can be represented as (27).

(26) [s John drank the coffee quickly]

(27) $\exists e\{\text{AGENT}(e, \text{John}) \ \& \ \text{DRANK}(e) \ \& \ \text{THEME}(e, \text{the coffee}) \ \& \ \text{QUICK}(e)\}$

Notice that, in contrast to logical forms like those in (Fig. 1), the verb is represented as a monadic predicate of events, which is related to its arguments indirectly by thematic relations which share the same event parameter as the verbal predicate. It is assumed that all (declarative) sentences are existentially closed by tacit event quantifiers. For discussion of the many benefits of this type of approach, see Davidson 1967, Casteneda 1967, Carlson 1984, Higginbotham 1985, Taylor 1985, Parsons 1990, Schein 1993, Kratzer 2002, Pietroski 2005, and Williams 2007, among many others.

⁵ See Kerem et al. (2010) for an account of reciprocals that reaches a similar conclusion. For them, strength is attributed to the notion of typicality; e.g., (23) and (24) sound bad when used in the relevant situations because the verb *know* is typically used in situations of full mutual acquaintance.

Schein (1993) has urged that the variables used in logical forms like (27) be construed as higher-order variables, in particular, plural variables that can have many values. As an illustration, we can represent (28) as (29).

(28) The boys kissed the girls.

(29) $\exists ee\{\text{AGENT}(ee, \text{the boys}) \ \& \ \text{KISS}(ee) \ \& \ \text{THEME}(ee, \text{the girls})\}$

If we can interpret the singular quantifier $\exists e$ in (27) into English as “there exists *an* event, *e*”, then we can interpret the plural quantifier $\exists ee$ in (29) as “there exists one ore more events, the *ee*-s”. Crucially, as will be discussed more below, plural variables are number-neutral: their values can be one or many things. Schein has shown that modifying traditional neo-Davidsonian logical forms with higher-order variables accounts for many of the problems that are addressed in the literature on semantic plurality. The work of Landman (2000) reaches similar results, and even though his particular construal of higher order variables differs from Schein’s (Landman would have the variables in (29) range over sums or Groups), the central idea seems to be shared between these authors. For the purposes of this paper, I will follow Schein and use plural variables, though this is only a personal preference. As far as I can tell, variables ranging over sums or Groups work just as well, so long as these variables remain number-neutral.⁶

I will take the rest of this section to outline the *plural first-order* language that I will use to represent sentences with OARs; for a more detailed exposition of these types of languages, I refer the reader to Schein (1993), and Linnebo (2008). This language can be seen as having everything that the language of first-order predicate calculus has (which I will not include here for purposes of space), plus the plural machinery I will describe below.

As for terms in our language, in addition to familiar singular terms, such as singular variables *x, e*, and singular constants *a, b*, we have their corresponding number-neutral plural counterparts, *xx, ee, aa*, and *bb*. One of the central properties of plural languages is that plural terms can have *many* values, though they are just as happy with having a single value (Boolos 1984). This number-neutral aspect of plural variables will be important for the present account of OARs.

⁶ Landman himself makes a distinction between variables that can have just one value and variables that can have a sum as a value. However, as Zweig (2008) shows, it is possible to have number-neutral variables in a Landman-type semantics for plurality.

There are three types of predicates in this language. First, there is the logical predicate $\leq$, which we can interpret as *is one of*; we can translate $x \leq yy$ into English as “ x is one of the yy ”. We also have singular and plural monadic predicates. Following Pietroski (2005), I will assume that at least the members of the open-class lexical categories can be represented as *plural* monadic predicates; e.g. $\llbracket \text{dog}_N \rrbracket = \text{DOG}(xx)$; $\llbracket \text{kiss}_V \rrbracket = \text{KISS}(ee)$; $\llbracket \text{smart}_{\text{Adj}} \rrbracket = \text{SMART}(xx)$; $\llbracket \text{quickly}_{\text{Adv}} \rrbracket = \text{QUICK}(ee)$. As an idealization, sufficient for the purposes of this paper, assume the following interpretive axiom for plural monadic predicates.⁷

$$(30) P(xx) \text{ iff } \forall x: x \leq xx[P(x)]$$

Exceptions to the monadic trend are certain open-class morphemes that are inherently relation. These include *same*, *different*, and of particular interest for us, *other*. I will treat these as formally dyadic, though in this paper, we will only consider cases when these predicates have singular arguments such as $\text{OTHER}(x,y)$, which are interpreted as a simple first-order relation. See Moltmann (1992).

The last type of predicate in our plural first-order language is dyadic thematic predicates. Aside from the logical predicate $\leq$, and the special relational open-class morphemes (*same*, *different*, *other*, *etc.*), these are the only non-monadic predicates in the language that I will consider here. These predicates represent the interpretation of thematic roles. Again, I will assume an idealized interpretive axiom for these predicates when they appear with plural arguments⁸ (cf. Schein 2005).

$$(31) \Theta(ee, xx) \text{ iff } \forall x: x \leq xx [\exists e: e \leq ee [\Theta(e,x)]] \\ \& \forall e: e \leq ee [\exists x: x \leq xx [\Theta(e,x)]]$$

All of these predicates alone count as formulas of the language. If two non-logical predicates share a common parameter, such as $P(ee)$ and $Q(ee,xx)$, then the conjunction of these formulas, $P(ee) \& Q(ee,xx)$, is also a formula. The plural quantified expressions $\exists vv.F$, $\forall v: v \leq vv.F$, and $\exists v: v \leq vv.F$ are formulas if F is a formula. I intentionally leave out discussion of reciprocals with quantificational antecedents since there is not enough space here to discuss treatments of quantificational determiners; however, when necessary

⁷ Certain plural monadic predicates are taken to be collective; for example, $\text{three}(xx)$ can be true of some things taken together, even though it does not hold of any one x such that $x \leq xx$. I will put aside this possibility and treat monadic predicates as being distributive in the sense of (30).

⁸ Outlier effects are pervasive with plural DPs, especially when large pluralities are involved. Again, I will stick to the idealized interpretive axiom, though we will see exceptions to (31) even in this paper.

I will sometimes use the following notation of Schein's when representing the content of determiners, and assume that the resulting constituent in logical form is a formula of the language that can be appended to other formulas in the same manner as the previously mentioned quantifiers.

(32) The boys slept.

(33) $\exists ee \{ \llbracket \text{the } xx: \text{BOY}(xx) \rrbracket \text{AGENT}(ee, xx) \ \& \ \text{SLEEP}(ee) \}$

Having outlined a suitable metalanguage, I will now turn to my specific proposals for OARs.

3.3 Interpreting OARs

The goal of this section is to put forth of theory of the interpretation of OARs, and the sentences in which they are embedded, in a way that not only respects the empirical facts from Section 2, but also captures a wide range of the attested readings from 3.1 in a straightforward manner.

I want the logical forms of these sentences to not only reflect that OARs are complex, as argued for in 2.1, but as being composed of the same *one* and *other* that we saw in instances of cross-sentential anaphora (Section 2.2). This means that the analysis should include the following two things: (i), that *one* of OARs is inherently partitive, and (ii) that anaphora in OARs is linked in exactly the same way as it is in (21) and (22), specifically that the antecedent of OARs is only the antecedent to *one*, and *other* is indirectly related to this antecedent by being anteceded by *one*. And since *one* antecedes *other*, *other* inherits *one*'s partitivity.

I will also propose some additions to the logical form, which are also guided by the facts from Section 2; additions that are necessary for explaining the range of polysemy discussed above. First, I propose that the case facts we saw at the end of section 2.1 reflect the thematic properties of both *one* and *other*. I believe that *one* inherits not only morphological case from its antecedent, but also that it inherits its antecedent's thematic role. When interpreted, *one* is associated with whatever thematic relation in logical form that its antecedent is (e.g., $\text{AGENT}(e,x)$), modulo specific values of variables. As for *other*, I suggest that its thematic role, like its case, be the one typical of the position where the OAR finds itself: if the OAR is a direct object, *other* will be interpreted as a Theme; if an indirect object, *other* will be interpreted as a Goal.

I also propose that the DP containing *one* has a covert distributive quantifier.⁹ Much work in the event semantics literature have shown that it is useful to view distributive quantifiers as being immediately followed by sub-event quantifiers in logical form (see, for example, Pietroski and Hornstein 2002; Schein 1993 and elsewhere; Taylor 1985), and I will adopt this view here. There are several benefits to this approach to distributivity. For example, it allows us to apportion different adverbial modifiers to different event arguments, as shown in (34), an example from Taylor (1985).

(34) Gracefully, Sally ate every crisp quickly.

We can interpret this sentence as meaning that the entirety of the eating was graceful, but as far as the eating of each crisp is concerned, this happened quickly. This is represented in (35).

(35) $\exists ee\{\text{GRACEFUL}(ee) \ \& \ \text{AGENT}(ee, \text{Sally}) \ \& \ \text{EAT}(ee)$
 $\ \& \ [\text{every}(y): \text{CRISP}(y)] \ \exists e': e' \leq ee \ \{\text{THEME}(e', y) \ \& \ \text{QUICK}(e')\}\}$

From (35), we can see that it is possible to construe some event predicates as being associated with subevents, and others as being associated with the “larger event”. Schein (1993) has shown that this apportionment applies not only to adverbial predicates, but also verbal predicates and thematic relations; an assumption that forms the basis for his argument for thematic separation (see Schein 1993: Ch 4; Kratzer 2003). Observe (36), where the relevant reading is one where the two brothers did all the making, and for each customer, that customer received three slices of pizza.

(36) Two brothers made every customer three slices of pizza.

Schein captures this reading by representing (36) as (37), where the thematic predicate associated with *three slices of pizza* has its event variable bound by the sub-event quantifier introduced by the distributive DP, *every customer*.

(37) $\exists ee\{\text{AGENT}(ee, \text{two brothers}) \ \& \ \text{give}(ee) \ \& \ [\text{every } x: \text{customer}(x)]$
 $\ \exists e': e' \leq ee\{\text{Goal}(e', x) \ \& \ \text{THEME}(e', \text{three slices of pizza})\}\}$

⁹ Several authors have proposed that some things that are apparently indefinite (such as *one* here), can sometimes receive a universal interpretation. Consider (i)

(i) Three students drank a bottle of beer

Covert distributivity has been proposed to account for cases like (i) not only by those working in the plural event literature (Schein 1993, Landman 2000), but also in the DRT framework (Kamp and Reyle 1993).

I will implement this approach to distributivity in the case of OARs as follows. Assuming that *other* is interpreted within the scope of *one*, and that *one* is interpreted distributively (as “each one”), then the event variable within *other*’s corresponding thematic relation in logical form will be bound by the sub-event quantifier introduced by the distributive quantifier, in much the same way as the thematic predicate associated with *three slices of pizza* has its event variable bound in (37).

With these points in mind, I propose (38) as the interpretation of *one another*. The thematic predicate Θ_{xx} is meant to represent the thematic relation inherited from the reciprocal antecedent, i.e., the same thing whose values form the whole from which the *one*’s partitivity is determined. The thematic predicate Θ_C is meant to represent the “canonical” thematic role associated with the position where the OAR. As the logical form shows, this thematic role is associated with whatever the value of *other* is, in accord with my proposals above.

- (38) $\llbracket \text{one another} \rrbracket =$
 $\forall x': x' \leq xx [\exists e': e' \leq ee \{ \Theta_{xx}(e', x') \} \& \quad \leftarrow \text{contribution of one}$
 $[\exists x'': x'' \leq xx \& \text{OTHER}(x', x'') \& \Theta_C(e', x'')]] \quad \leftarrow \text{contribution of}$
other

We can see that (38) also encodes the relevant properties that we observed at work in the cases of cross-sentential anaphora we saw in 2.2. Specifically, *one*’s partitivity is represented as $x' \leq xx$, where xx picks out the values associated with the antecedent; and *other* inherits this partitivity ($x'' \leq xx$) and determines distinctness with regard to what *one* picks out ($\text{OTHER}(x', x'')$). We can also see the work of the sub-event quantifier introduced by the distributive quantifier that I claimed is part of $[\text{DP} \dots \text{one} \dots]$. The sub-events are such that each individual value of *one*, x' , has its own subevent e' , where $it_{x'}$ act as a Θ_{xx} , and in that e' something other than $it_{x'}$ acts as a Θ_C .

Let us now apply the schema in (38) to actual sentences with OARs. Consider first an elementary reciprocal sentence.

- (39) The boys hit one another.

- (40) $\exists ee \{ [\text{the } xx: \text{BOY}(xx)] \text{AGENT}(ee, xx) \& \text{HIT}(ee)$
 $\& \forall x': x' \leq xx [\exists e': e' \leq ee \{ \text{AGENT}(e', x')$
 $\& [\exists x'': x'' \leq x \& \text{OTHER}(x', x'') \& \text{THEME}(e', x'')]] \}$

We can see here how specific values of Θ_{xx} and Θ_C are determined. Since the OARs antecedent has the Agent role, the value of Θ_{xx} is Agent in (40). And

since the OAR is a direct object, the role of *other* (40) is the role typical of direct objects, i.e., Theme.

Turning now to more complicated cases, consider when the OAR is an indirect object, in which case it has multiple potential antecedents.

(41) The students introduced the professors to one another.

These are the cases discussed at end of 2.1, where Serbo-Croatian and Ukrainian show different case morphology on *one*, depending on the intended meaning. As I am claiming that *both* case and thematic role of *one* is dependant on the reciprocal antecedent, then we should expect that when *one* is nominative, it is associated with the thematic relation AGENT in logical form, and when *one* is accusative, it is associated with THEME. The logical forms below show that this association gives the correct interpretations.

Consider first the reading of (41) where the professors are introduced to students. This is the reading that is represented in (42); where the case of *one* is nominative (cf. 15). Since the antecedent to *one* here is the subject, *one* gets interpreted as an Agent, and the whole from which *one*'s partitivity is determined by what the subject denotes, in this case, the students.

(42) $\exists ee \{ [\text{the } xx: \text{STUDENT}(xx)] \text{AGENT}(ee, xx) \ \& \ \text{HIT}(ee)$
 $\& \ [\text{the } yy: \text{PROFESSOR}(yy)] \text{THEME}(yy)$
 $\& \ \forall x': x' \leq xx [\exists e': e' \leq ee \{ \underline{\text{AGENT}}(e', x') \}$
 $\& \ [\exists x'': x'' \leq xx \ \& \ \text{OTHER}(x', x'') \ \& \ \text{GOAL}(e', x'')] \} \}$

Consider now the reading where the professors are introduced to professors (cf. 16). Here, *one* gets interpreted as a Theme, and its partitivity is determined with regards to what the direct object picks out, in this case, the professors.

(43) $\exists ee \{ [\text{the } xx: \text{STUDENT}(xx)] \text{AGENT}(ee, xx) \ \& \ \text{HIT}(ee)$
 $\& \ [\text{the } yy: \text{PROFESSOR}(yy)] \text{THEME}(yy)$
 $\& \ \forall y': y' \leq yy [\exists e': e' \leq ee \{ \underline{\text{THEME}}(e', y') \}$
 $\& \ [\exists y'': y'' \leq yy \ \& \ \text{OTHER}(y', y'') \ \& \ \text{GOAL}(e', y'')] \} \}$

In both readings, *other* is interpreted as a Goal, which is expected since the OAR is an indirect object.

Admittedly, there are certain situations that this approach predicts to be false, but are not. This concerns situations described by the following sentences.

(44) The students are following one another.

(45) The plates are stacked on one another.

Imagine that the situations are such that there is a student at the front of the line that is not following anyone, and a plate at the bottom of the stack that is not stacked on anything. My proposed logical form would predict (44) and (45) to be false in these situations, because of the universal force associated with *one*. However, most people, including myself, would judge these sentences to be fine in such situations. But before trying to save myself from this problem, let me first consider how the slightly flawed present approach fairs against other proposal to deal with this issue. And to consider this, let us reflect on a bit on the present methodology. I have tried here to revive Langendoen's underspecification approach for the reasons discussed in 3.1. Why is it then that I proposed something analogous to Reading 5 (OWR) and not the weakest reading, Reading 6 (IAO)? Something like IAO is able to capture the truth (44) and (45) as true in the relevant situations, and there exist accounts, such as Dalrymple et al's (1998), that take IAO to be a possible interpretation. However, this comes at a price: while approaches that include IAO as a possibility can account for the "edge" cases in (44) and (45), they make bad predictions with regard to comparative sentences like (46) and (47).

(46) #The students are taller than one another.

(47) #The students exceed one another (in height).

A theory with IAO would predict sentences like (46) and (47) to be true just as long as one individual is taller than the rest. The approach outlined in this paper predicts these sentences to be contradictory, and this prediction is borne out, as we can see from the logical form of (47)¹⁰ in (48).

(48) $\exists ee \{ [\text{the } xx: \text{STUDENT}(xx)] \text{AGENT}(ee, xx) \ \& \ \text{EXCEED}(ee)$
 $\& \ \forall x': x' \leq xx [\exists e': e' \leq ee \{ \text{AGENT}(e', x')$
 $\& \ [\exists xx'': x'' \leq x \ \& \ \text{OTHER}(x', x'') \ \& \ \text{THEME}(e', x'')] \} \}$

This states, roughly, that every individual is associated (through an event of exceeding) with another individual such that the former is taller than the latter. This is something that cannot be true of every individual, hence the infelicity of (47). So we are left with a choice between two flawed theories, the current one, where we have to make exceptions for "edge" effects, or a theory with IAO, which runs into problems with comparatives. Sauerland (1998) has previously suggested in his work on reciprocals that there is a pragmatic principle, which he calls Benevolence, that allows for a certain

¹⁰ I am giving the logical form of (47), and not (46), since they illustrate the same thing, but interpreting (46) would require to me to discuss a neo-Davidsonian treatment of comparative constructions, a digression that unfortunately cannot fit in this paper.

degree of exception when judging a sentence to be true. If we allow for such a device, then that seems like a step toward saving the present approach in the face of these “edge” cases. Lastly, on par with the discussion above of the strength imposed by stative verbs, notice that it appears we must make exceptions for edges even in cases where reciprocals are not involved, suggesting that theories of reciprocity should not have to worry about accommodating a more general problem.

(49) The plates are stacked.

I want to close this discussion by briefly mentioning an extension of the current approach. As we know, there are more than just elementary reciprocal sentences that a theory of reciprocity has to account for. We have already looked at non-elementary sentences where the OAR is in indirect object position. I want now to consider OARs as they appear *within* noun phrases, as in (50).

(50) I enjoyed the artists’ pictures of one another.

We can interpret this sentence with the current approach by modifying (38) so that the existential quantifier introduced by distributive *one* be of a polymorphic type. That is, in some cases, it will range over events, and other cases, it will range over individuals. This modified version of (38) is shown below in (51). I will use *u* and *uu* as singular and plural metavariables, where specific instances of the OAR will dictate whether these variables range over events (*e* and *ee*) or individuals (*x* and *xx*).

(51) $\llbracket \text{one another} \rrbracket =$
 $\forall x': x' \leq xx \ [\exists u': u' \leq uu \ \{ \Theta_{xx}(e', x') \ \& \$
 $[\exists x'': x'' \leq xx \ \& \ \text{OTHER}(x', x'') \ \& \ \Theta_C(e', x'')] \}]$

With (51) as our rule for interpreting OARs, the logical form for (50) would be as in (52). In what follows, I will simplify the logical forms for clarity, and only explicitly state the interpretation of nominals when necessary, and when not, I will just provide subscripted variable names. As for the existence nominal thematic roles, and for the specific ones used here, I refer the reader to Barker (1991) for POSS and Barker and Dowty (1993) for OF.

(52) $\exists ee \{ \text{AGENT}(ee, I_{xx}) \ \& \ \text{ENJOY}(ee)$
 $\ \& \ \exists yy [\text{POSS}(yy, \text{the artists}_{zz}) \ \& \ \text{PICTURE}(yy)$
 $\ \& \ \forall z': z' \leq zz \ [\exists y': y' \leq yy \ \{ \text{POSS}(y', z')$
 $\ \& \ [\exists z'': z'' \leq zz \ \& \ \text{OTHER}(z', z'') \ \& \ \text{OF}(y', x'')] \}]$

The only change that we had to make (38) to account for such constructions was to allow the relevant quantifier to range over different types of things; everything else stays the same, such as how thematic roles are apportioned and how antecedence works. We still need to elucidate exactly what determines what the quantifier will range over, but roughly, I believe that this is determined by the type of constituent that *one* is (immediately) embedded in. If it occurs within a sentence, the quantifier will range over events, as in (41)-(48); if it occurs within a nominal, it will range over individuals, as in (50) and (52). For a more detailed account of this, see LaTerza (2011).

4 Conclusion

In this paper I have argued that OARs should be treated as compositionally complex expressions, where each element contributes essentially the same meaning here as in their non-OAR occurrences. I claimed that the only differences in this regard is that the *one* of OARS is always a partitive anaphor, and that it also contains a covert distributive quantifier. We have seen in 3.3 that a neo-Davidsonian theory designed to reflect the observable distributional properties of OARs (and the relevant cases of cross-sentential anaphora) can account for a wide range of the attested reciprocal readings, regardless of where the reciprocal appears in the sentence. Furthermore, it does so without positing any sort of ambiguity in reciprocal expressions, and also without resorting to polyadic quantification. I am not aware of any other approach that can accommodate such a wide range of readings *and* syntactic distribution with a uniform semantics for OARs (as we saw in (51)). While reasons of space prevent me from explicating how the logical forms discussed here are composed from smaller meaningful units, I refer the reader to LaTerza (2011) for the details of a recursive specification of semantic values, where I also provide proposals about the LF phrase markers that are interpreted.

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