

The others, each other, and the Strongest Meaning Hypothesis

1. Sentences containing reciprocals (henceforth reciprocal sentences, RS) notoriously allow a plethora of different readings in different contexts (Fiengo and Lasnik, 1973; Langendoen, 1978; Dalrymple et al., 1998, a.o.). Two distinct theoretical strategies have been pursued in response to that conundrum. **S1)** After Langendoen (1978), several proposals strive to reduce semantic variability of RS to the variety of readings observed in sentences with plural arguments, viz. collective, distributive, cumulative and other construals. On these proposals, *each other* is taken to be an anaphoric plural DP. **S2)** After Dalrymple et al. (1998), other proposals seek to reduce such semantic variability to interlocutors' world knowledge about possible denotations for the transitive verb relation R (Sabato and Winter, 2005) with a reciprocal being a polyadic quantifier taking R as an argument. We argue that S1 should be abandoned in the domain of reciprocals, but that it leads to an elegant account for *the others*. We argue for a version of S2 for reciprocals where the effects of the *Strongest Meaning Hypothesis* (SMH, Dalrymple et al.) is derived by *anti-exhaustivity* as used in the domain of Free choice Items by e.g. Kratzer and Shimoyama (2002); Chierchia (2006).

The others on its bound construal (henceforth *the others bound*, TOB) can sometimes be substituted for *each other* without forcing a change in meaning (1), though this is not always possible (2). The latter example shows that the antecedent of the reciprocal can be a group argument of a collective predicate, while this is impossible for antecedents of TOB. To facilitate bound construals of *the others*, all sentences in this abstract should be interpreted in the context of three sailors, John, Bill, and Jack, who are stranded on a deserted island.

- (1) The sailors are all jealous of each other. = The sailors are all jealous of the others.
 (2) a. The sailors have all worked together on each other's ships.
 b. \neq The sailors have all worked together on the others' ships.

Our argument runs as follows: *each other* and *the others*, though overlapping in meaning, are systematically different, so they can't be analyzed in identical ways. The relevant properties of *the others* can be elegantly derived by closely following S1 analyses of *each other*, in particular Beck (2001). Hence, in fact, Beck's analysis can't apply to *each other*.

2. The semantics of *the others* One of the readings of RS, so-called *strong reciprocity* can be paraphrased as shown below, where S is *sailor'* and K is *know'*:

- (3) The sailors all know [each other/the others] = $(\forall x, y \in S)(x \neq y \rightarrow Kxy)$

A popular account for this reading involves distributivity operators on both arguments of the verb: $[_{CP} [\text{the sailors}] *_i [[\text{each other}] *_j [x_i \text{ knows } x_j]]]$.¹ However, in (2a), we see that *each other* is licensed in the absence of $*$, while (2b) shows that TOB is not. Thus, reciprocity does not *require* distribution over the antecedent, while TOB does.

In an online questionnaire involving more than 1200 Dutch speakers, we found that DP conjunctions and definite plurals were significantly worse antecedents for TOB than distributive quantifiers like (the Dutch cognates of) *each/every/no_{sg}*.² Crucially, the same split between conjunctions and definite plurals versus the quantifiers *each/every/no_{sg}* was observed for subjects of distributive predicates like *[the boys/every boy] lost a tooth*. This strongly supports the contention that bound readings of *the others* depend on distributivity. Therefore we suggest that the meaning *the others* is as follows:

- (4) $[[\text{the others}]] = \iota X.X = Z - \{y\}$

Z is a free variable ranging over pluralities, referred to henceforth as the *range argument* of *the others*. y is a free variable over singularities, the *contrast argument*. y can be bound by a c-commanding $*$ operator and Z can be bound by the set denoted by the antecedent argument.

¹For any predicate P , individual x , $*Px = 1$ iff $Px = 1$ or $\exists y, z(y \oplus z = x \wedge *Py \wedge *Pz)$

²The findings are all significant at the $p < .01$ level using Wilcoxon's ranked sum test and logistic regression.

Such binding of the variables yields TOB. Our semantics for *the others* is virtually identical to Beck’s proposal for *each other*. This setup derives the existence of “strongly reciprocal” readings of TOB (3), and the absence of TOB with collectively predicated antecedents (2).

In another online questionnaire involving 40 speakers of English, we found that TOB was judged significantly worse than *each other* in scenarios that would require the weaker among the reciprocal readings discussed in Dalrymple et al. For example, the version of (5) with TOB was judged false significantly more often than the version with *each other* in a situation that would require Dalrymple et al.’s *intermediate reciprocity* ($p < .01$).

(5) All the pyramides are 10m from [each other/the others].

Such readings of reciprocals is obtained by Sternefeld (1998); Beck (2001) by invoking the cumulativity operator $**$ of Krifka (1986).³ Since $**$ operates on a *relation*, it would have to be applied to the transitive verb before the object is merged. But this would render it unable to bind the contrast argument of *the others*. Alternatively, as suggested by Beck, $**$ could apply to the VP out of which the range argument of *the others* would QR. This would derive the relevant reading, but would involve extraction out of a definite island created by *the others* itself. We suggest that this is why the reading is unavailable for *the others*. Finally, since we adopt the same mechanism for binding of the range and contrast arguments of *the others* as the standard treatment of bound pronouns, we correctly expect such binding to be possible across syntactic islands, again contrasting with reciprocals.

3. The semantics of *each other* Proponents of S2 for reciprocity often make use of the SMH to explain which contexts allow which readings of reciprocals. As formulated by Dalrymple et al., negated reciprocals are predicted to get exceedingly weak readings, however: They would expect a sentence like *John, Bill, and Jack don’t respect each other* to be true in a scenario where John does respect Bill, and Jack respects John. A similar problem can be seen to obtain for the proposal in Sabato and Winter (2005).

We treat *each other* as an existential polyadic quantifier whose domain restriction triggers alternatives interacting with an anti-exhaustivity operator (Chierchia 2006). In positive contexts, this gives rise to a “universal flavor” of the sort regularly observed with *free choice items*. As shown by Chierchia, this effect vanishes in DE environments. For any expression α , let Θ_α be the set of possible, non-empty denotations for α that conforms to our world knowledge. For any set of relations Γ , $\mathcal{K}(\Gamma)$, the *cardinal ranking* of Γ , is defined as $\{\mathcal{R} \subseteq \Gamma : (\forall r, r' \in \mathcal{R})(|r| = |r'|)\}$. Intuitively, $\mathcal{K}(\Theta_V)$ measures the relative strengths of the possible denotations of a verb V . For any set of relations Γ , and any set A , let $\Gamma^A = \{R \cap A^2 \setminus Id : R \in \Gamma\}$, Id the identity relation.

(6) a. $\llbracket eachother(V) \rrbracket = \lambda A. (\exists \mathcal{S} \in \mathcal{K}(\Theta_V^A)) (\exists s \in \mathcal{S})(s \subseteq \llbracket V \rrbracket)$

b. $\llbracket eachother(V) \rrbracket^{ALT} = \{\lambda A. (\exists \mathcal{S} \in \Gamma) (\exists s \in \mathcal{S})(s \subseteq \llbracket V \rrbracket) : \Gamma \subseteq \mathcal{K}(\Theta_V^A)\}$

The generated alternatives will interact with Chierchia’s anti-exhaustivity operator O_C^- where $O_C^-(p) = p \wedge (\forall q, q' \in C)(q \rightarrow q')$, where the domain of q' is included in the complement of the domain of q (see Chierchia, 2006, for details). Consider the *stare* relation. It is only possible to stare at one thing at any given time, so Θ_{stare} contains a set of (partial) functions. (6a), applied to a 5-member set A , leads to the assertion that there is some non-empty interpretation for *stare*, restricted to that set, containing between 1 and 5 pairs. O_C^- and the projected alternatives will generate the implicature that the *stare* relation contains sub-relations restricted to A of every cardinality between 1 and 5. Hence it must denote a *total* function on that set. Under negation, the implicature ceases to have an effect, so the assertion will be that there is *no* relation of any of the relevant cardinalities that can serve as the denotation of *stare* restricted to A .

³For any relation R and pair of individuals x, y , $**Rxy = 1$ iff $Rxy = 1$ or:
 $\exists x_1 x_2 y_1 y_2 ((x_1 \oplus x_2 = x) \wedge (y_1 \oplus y_2 = y) \wedge (**Rx_1 y_1 = 1 \wedge **Rx_2 y_2 = 1))$