Distance distributivity and the interpretation of each other
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1 Introduction

- ‘Interdisciplinary’ project: combination of comparative/historical research (Part I) with formal semantics (Part II).
- Role of distance distributivity in the historical development of each other.
- New perspective on a synchronic analyses of each other (largely compatible with existing analyses).

Part I: The Historical Development of each other

2 Historical Origin: Q-Float

- Historical development of each other (cf. Haas 2007a,b; Plank forthcoming): starts out as a combination of Q-float with pronominal other (cf. [1]).
- Old English: ælc- as a quantifier (sometimes a subject, cf. [2]), oðer- as a pronoun:

(1) Hi ... cwædon ælc to oðrum
‘They spoke to each other.’ [a1000, OE Gospels, Mk 4, 41]

(2) & tihte ælc oðerne to gode mid godre gebisnunge
and persuade.SBJ.3SG each.ACC.SG.MASC to good with good exam ple
‘and may everyone stimulate another/the other to good by good example.’
[c900, Ælfr. Hom. 1, 10]

- Middle English: ech(e)...other(e) can still be regarded as a Q-float + pronoun:

(3) Thei seiden...eche until otthe: ‘What is this?’
[a1393; MED, s.v. ech]

- Q-floating past the finite verb: ech[e] and other stand side by side:

(4) They rode togydyrs and unhorsed eche other. [a1500; MED, s.v. ech]

- Process of reanalysis: eche is reanalyzed as forming part of the DP

(5) a. The knights [VP each unhorsed [DP other]].
    b. The knights [VP unhorsed eche [DP other]]. \(\rightarrow\) each][other (‘discontinuous each other’)

(6) The knights [VP unhorsed [DP eche other]]. \(\rightarrow\) [each other] (‘continuous each other’)

- cf. OED (s.v. each):
Originally this was a phrase construed as in 4, each being the subject, and other (inflected in OE. oðerne, oðres, oðrum, etc.) being governed in acc., genit., or dat. by a verb, prep., or n. This use still occurs arch. or poet. (each to other, etc.). The words have however long become a compound (cf. Du. elkander), so that we can say to each other, of each other, etc.

3 Consequences of Syntactic Reanalysis

- After reanalysis, each other is a constituent of category DP, often treated as a pronoun (e.g. in reference grammars such as Quirk et al. 1985, Huddleston & Pullum 2002).
Note: the Binding Theory also regards each other as a constituent of category DP (‘anaphor’; cf. Reuland forthcoming on the status of each other as an anaphor).

- [each other] acquires a different (wider) distribution than each other
- Some types of contexts where each other can only be of category DP (i.e., Q-float analysis is not possible):
  
  i. Each other within PPs:
   - Found from the sixteenth century onwards (still exceptional; [7] is the earliest example mentioned in the pertinent literature):
     (7) *I praie God send them comfort [of [each other]].*  
     (1546, John Johnson; quoted from Raumolin-Brunberg 1997: 230)
   
  ii. Each other in prenominal genitives:
     (8) *They enjoy [each other]'s company.*  
     - The first attested instance of this structure comes from the same source as the one illustrated in (7) (letters of the ‘Johnson’-brothers, mid-sixteenth century):
     (9) *...wryte to me perfaictly from tyme to tyme, for ellis (perchaunce) for lakke of knowlege often of [[each other]'s procedings] we may entre into a confusion of our thinges...*  
     (1547, Otwell Johnson; quoted from Raumolin-Brunberg 1997: 230)
   
  iii. Each other after quantifying antecedents:
     (10) a. Everyone likes each other.  
        b. *Everyone each likes the other.
   
  iv. Each other after collective antecedents:
     (11) a. One couple clearly hated each other’s guts. (Huddleston & Pullum 2002: 1501)  
         b. *One couple clearly each hated the other’s guts.
   
  v. Each other in coordination with another DP:
     (12) *They hated both [their neighbours] and [each other].*
   
- Possible additional consequence of reanalysis: each other in subject position of embedded clauses; but: these uses are still frowned upon / regarded as sub-standard:
  
  (13) a. We know what each other went through.  
       [news.bbc.co.uk/1/hi/world/americas/2248717.stm]  
       b. Chat programs allow you and your friends to communicate by instantly viewing what each other types onto the screen from different computers.  
       [www.bbc.co.uk/webwise/course/welcome/thenet/thenet_text.shtml]
   
- Structure is relatively old (17th century), but has always been considered sub-standard:
  
  (14) OED (s.v. each): To use the word as a nom. (‘We know what each other are doing.’) is a vulguslarm occasionally heard.
   
- Earliest example documented in the relevant literature:
  
  (15) Be not angry my dear, if thou hast not a Smock to thy back I would have thee, but in knowing what each other hath, we shall know the better how to improve it, do thou the same by me. [1685; quoted from Haas 2007a: 45]
Semantic Reanalysis: An Intuitive Approximation

Important question:
What type of semantic reanalysis accompanied the process of syntactic reanalysis?

(16) The men [(eche) unhorsed (eche) [DP other]].

universal/distributive quantifier expression of otherness/non-identity

form-to-function mapping after reanalysis:

(17) The men [unhorsed [DP eche other]].

Three questions:

i. What does [each other] mean?
ii. What does each in [each other] (‘eachRECP’) mean?
iii. What does other in [each other] mean?

Note: each][other and [each other] are not fully equivalent: [each other] allows for weaker readings than each][other (cf. Haas 2007a,b; Maslova forthcoming, etc.):

(18) The three students each looked at the others. (only strong reciprocity, ∀∀)
(19) The three students looked at each other. (also weak reciprocity, e.g. ∀∃)

Three hypotheses:

i. each other still has a compositional structure;
ii. other is an expression of otherness/non-identity;
iii. each is an expression of distributivity.

Central question:
What type of ‘distributivity’ is expressed by each?

Towards a Hypothesis: Comparative and Diachronic Evidence

Hypothesis:

eachRECP expresses a type of distribution that is similar to the one expressed by ‘binominal each’ (cf. Stowell & Safir 1998, Zimmermann 2002) and German jeweils:

(20) He allowed the guests to drink [one glass each].

Important: just like eachRECP, binominal each takes clausal scope, even though it forms a constituent with the object:

(21) It also turned out that the only alcohol available to parishioners (in spite of Teague's well-stocked private liquor cabinet), was weak and vinegary communion wine, and even then only [one glass each] was allowed.[http://www.thesleaze.co.uk/godbotherers.html]
There were also no bitterns found in Wales, Kent and Somerset this year – last year [one bird each] was found in Wales and Somerset, while three were discovered in Kent.

[http://www.4ni.co.uk/news.asp?id=43179]

- Even more similarity/parallelism: each and (the German distance distributor) jeweils:

  (23) each other in PPs:
  a. The men looked at [ each other].
  b. Die Männer blickten auf [den jeweils anderen].

  (24) each other in genitives:
  a. The students met [ each other]’s wives.

  (25) each other as embedded subject:
  a. They did not know what [ each other] thought.
  b. Sie wussten nicht, was [(der) jeweils andere] dachte.

  (26) each other after quantifying antecedents:
  a. Everyone likes [ each other].
  b. Jeder mag [den/die jeweils anderen]. (*sich, *einander)

  (27) each other after collective antecedents:
  a. The couple called [ each other]’s names.

- Better examples of collective antecedents for ‘DET jeweils ander-’:

  [http://www.festspielfreunde.at/deutsch/frames/200312/gf_200312_22.htm]

  (29) Das Paar gab bekannt, die Initialien des jeweils anderen bereits als Tattoo stechen gelassen zu haben.
  [http://www.intro.de/news/23007237]

  (30) Das Ende des Urlaubs, der eigentlich ihre Beziehung retten sollte, verbrachte das Paar "an der Gurgel des jeweils anderen"...
  [http://www.20min.ch/unterhaltung/people/story/25510332]

  (31) In seinem Spielfilm Eternal Sunshine of the Spotless Mind spielen Kate Winslet und Jim Carrey ein Paar, das den jeweils anderen mit einer Art Gehirnwäsche aus dem Bewusstsein löschen will, auf Gedächtnisreisen jedoch wieder zueinander findet.

- Hypothesis:

<table>
<thead>
<tr>
<th>English</th>
<th>German:</th>
</tr>
</thead>
<tbody>
<tr>
<td>each][other</td>
<td>jed-][ander-</td>
</tr>
<tr>
<td>[each other]</td>
<td>[jeweils ander]-</td>
</tr>
</tbody>
</table>

(32) The men unhorsed eche [DP other].
Die Männer entsattelten jeder [DP (den/einen) anderen].

(33) The men unhorsed [DP eche other].
Die Männer entsattelten [DP jeweils (den/einen) anderen].
Note: [DET jeweils anderen] and [jeweils DET anderen] are basically equivalent:

(34) a. Die beiden Studenten haben [jeweils einen anderen (Studenten)] beleidigt.

b. Die beiden Studenten haben [einen jeweils anderen (Studenten)] beleidigt.

Possible objections:

i. Assumption of a silent determiner in each other which is overt in den jeweils anderen may seem arbitrary;

ii. the German sentences in (23)-(27) have a broader range of interpretation than their English counterparts, especially because they also allow non-reciprocal readings.

Ad i. The presence of a silent determiner in the Middle English word other is not a theoretical assumption, but a historical fact: Old English oðer- → ‘the other’, ‘another’. Even in Middle and Early Modern English, other is often used without a determiner:

(35) Twey men han euerich wounded oother. (a1400; Chaucer, MED, s.v. other)

Ad ii. The loss of non-reciprocal readings for each other can be regarded as a standard case of specialization. Cf. the grammaticalization of reflexive pronouns in Middle English; non-bound readings were lost (cf. König & Siemund 2000, Gast 2006):

(36) [The man], likes him, i.e. self

(37) a. Der Mann mag ihn selbst.

b. Der Mann mag sich selbst.

6 A Diachronic Hypothesis

Parallelism between each_{RECP} and binominal each/jeweils is suggestive; is there a direct historical relationship between the emergence of each_{RECP} and ‘binominal each’?

Temporal parallelism: both phenomena seem to have emerged roughly simultaneously (with distance distributivity perhaps slightly predating pronominal each other); cf. also Germ. jeweils, which emerged about the same time, i.e. in the 17th century.

Shakespeare: [each other] is attested, though rare; in most cases, each][other is used:

(38) He whined and roar’d away your victory,  
    That pages blush’d at him and men of heart  
Look’d wondering each [at other]. [All’s well that ends well IV, 3]

Exceptionally also [each other]:

(39) And from [each other] look thou lead them thus,  
    Till o’er their brows death-counterfeiting sleep  
With leaden legs and batty wings doth creep:… [Midsummer Night’s Dream III, 2]

[each other] in prenominal genitives:

(40) Nor never look upon [each other]’s face. [Richard II, 1,3]

Binominal each: seems to have been well established at the time of Shakespeare, though floated quantifiers can also be found in the relevant contexts:

(41) It is now two o’clock: but, let me see, by ten  
    We shall have each a hundred Englishmen. [Henry V 3,7; 1599]

(42) By my troth, sir, if I were to live this present hour, I will tell true. Let me see: Spurio, a hundred and fifty; Sebastian, so many; Corambus, so many; Jaques, so many; Guiltian, Cosmo, Lodowick,
and Gratii, two hundred and fifty each; mine own company, Chitopher, Vaumond, Bentii, two hundred and fifty each: so that the muster-file, rotten and sound, upon my life, amounts not to fifteen thousand poll;... [All’s well that ends well IV, 3; 1602/3]

- **Diachronic hypothesis:**

  The development of both binominal *each* and reciprocal *each* reflects the emergence of ‘distance distributivity’ in English; a new family of uses of *each* with specific semantic and syntactic properties was created (without binominal *each* and reciprocal *each* being fully identical):

![Diagram 1](image)

**Part II: A Formal Semantic Analysis of *each other***

7 **The Basic Idea**

- **Central Claim:**

  Semantics of reciprocal *each other* is a special instance of distance-distributivity as observed with binominal *each* and German (non-adverbial) *jeweils*.

(43) a. *The boys invited [DP each other]*
b. *The boys invited [DP two girls each]*

- **Corollary:**

  Reciprocal *each other* shows characteristic (morpho)syntactic and semantic properties of distance-distributive (DD-)DPs (Stowell & Safir 1988, Zimmermann 2002):

(44) i. DD-DPs are morpho-syntactically complex: They contain (a) a *distributive universal quantifier*, (b) an overt or covert NP-*proform* that relates them to a plural antecedent, and (c) an indefinite XP, cf. (45)a. \( \Rightarrow \) *each other*

ii. The meaning of a DD-DP is derived compositionally from the meaning of its elementary parts: The NP-proform serves as the restriction and the indefinite XP serves as the second argument of the distributive quantifier. \( \Rightarrow \) *each other*

iii. DD-DPs have a weakly distributive reading: \( \forall \exists \) \( \Rightarrow \) *each other*

iv. DD-DPs are interpreted in situ, they do not move at LF. \( \Rightarrow \) *each other*

v. Sentential scope of the universal quantifier is achieved by semantic binding of the quantifier’s NP-restriction by its plural antecedent. \( \Rightarrow \) *each other*

vi. Distance-distributivity is clause-bound (for semantic reasons: interpretability); possible exceptions: logophoric contexts \( \Rightarrow \) *each other*
A caveat:
The syntactic distribution and semantic behaviour of each appears in some respects more similar to that of German DD jeweils, which has a wider distribution and a greater range of interpretations than English binominal each.

8 The Semantics of Distance-Distributivity: Background (Zimmermann 2002)

- The lexical semantics of distance-distributive eachNP∅,i and je-weil-s:
  - Distance-distributive elements consist of a distributive universal quantifier and an NP-proform. The latter provides the quantifier with a restriction in the form of a set variable.
  - In addition, the denotation of the quantifier contains a relation variable Rj that must receive a value in the course of the derivation.
  - The presence of the relation variable is overtly indicated by genitive morphology in German je-weil-s.

(46) a. \[
\lambda Q \in D_{<e,t}. \lambda P \in D_{<e^*,t}. \forall z [z \in Q \rightarrow \exists x [P(x) \land R_j(x)(z)]]
\]

b. \[
\lambda P \in D_{<e^*,t}. \forall z [z \in Z_i \rightarrow \exists x [P(x) \land R_j(x)(z)]]
\]

⇒ DD-quantifiers differ from distributive determiner quantifiers only in the presence of the additional restriction Rj(z,x) in their semantic representation.

- Deriving the meaning of the DD-DP:
The semantic value of the entire distance-distributive DP is achieved by functional application of (46)b. to the meaning of an indefinite XP, e.g. two girls:

(47) \[
\lambda P \in D_{<e^*,t}. \forall z [z \in Z_i \rightarrow \exists x [P(x) \land R_j(x)(z)]] \rightarrow \text{DD-DPs are of semantic type } <t> \approx \text{Small Clauses}
\]

- Deriving the meaning of the entire clause (neglecting event structure):
  - The semantic value of the clause containing a DD-element is determined by assigning the variables Rj and Zi a concrete value. This happens under co-indexation with semantically appropriate clausemate constituents (binding).
  - In a transitive clause with a DD-DP in object position, cf. (43)bc, the value for Rj is provided by the semantic value of the transitive verb, and the value for Zi is provided by the plural subject antecedent.
\[ P = 1 \text{ iff } \forall z \left[ z \in \text{[the boys]} \Rightarrow \exists x \left[ |x| = 2 \land \text{girl}^*(x) \land \text{invite}'(z, x) \right] \right] \]

\[ \text{two girls each}_j \text{ NP QP} \]

\[
\begin{array}{c}
\text{The boys}_i \\
\text{VP} \\
\text{DP}
\end{array}
\]

\[ \text{invited}_j \text{ NP QP} \]

\[ \text{two girls each}_j \text{ NP}_\varnothing,i \]

\[ \text{VP} = 1 \text{ iff } \forall z \left[ z \in Z_i \Rightarrow \exists x \left[ |x| = 2 \land \text{girl}^*(x) \land \text{invite}'(z, x) \right] \right] \]

\[ \forall \lambda Z \in \text{Z}_i, \forall z \in Z_i, \exists x \in \text{X} \left[ |x| = 2 \land \text{girl}^*(x) \land \text{invite}'(z, x) \right] \]

\[
\begin{array}{c}
\text{VP} \\
\text{DP}
\end{array}
\]

\[ \text{two girls each}_j \text{ NP}_\varnothing,i \]

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with reciprocal each other, the NP complement is a covert variable proform, which receives its value from an antecedent under co-indexation:

\[(53) \quad [[\text{other NP}]] = \lambda x \epsilon D. \ x \epsilon Z_i \land x \neq z_n\]

- The semantics of eachNP\(_{\emptyset, i}\):

  The meaning of the distributive universal quantifier in reciprocal constructions differs from that of binominal each: It requires a 2-place-predicate as argument.

\[(54) \quad [[\text{each RECP NP}]] = \lambda \mathcal{R} \epsilon D_{\text{D-rect}}. \ \forall z [z \epsilon Z_i \rightarrow \exists x [\mathcal{R}(z)(x) \land R_j(x)(z)]]\]

\(\rightarrow\) reciprocal each is a binary <type 2> quantifier (Keenan 1992), cf. SECTION 5.1

- Combining each and other: Deriving the reciprocal reading

\[(55) \quad [[\text{each and other}]] = [\text{per functional application}]\]

a. index on each NP triggers \(\lambda\)-abstraction over \(z_n\) in [[other NP \(_{\emptyset, i}\)]]:

\(\lambda z_n. \ \lambda x. x \epsilon Z_i \land x \neq z_n\)

b. \([\text{per functional application}]\)

\(\lambda z_n. \ \lambda x. x \epsilon Z_i \land x \neq z_n\) =

c. \(\forall z [z \epsilon Z_i \rightarrow \exists x [x \epsilon Z_i \land x \neq z \land R_j(x)(z)]]\)

\(\rightarrow\) (56) is true iff it holds for each \(z\) of a specific group of boys that there is an \(x\) of the same group of boys that differs from \(z\) and \(z\) invited \(x\).

\(\rightarrow\) Sentential scope of the reciprocal is due to the fact that the restriction variable \(Z_i\) is bound by the plural subject DP in SpecTP.

10 Evaluating the Analysis

- Accounting for the properties of reciprocal each other:

  i. Dependence on (local) plural antecedent:

  \(\Rightarrow\) Follows from the fact that each and other come with covert NP-proforms that contribute a set variable \(Z_i\), which takes a plural antecedent.

  \(\Rightarrow\) Binding of \(Z_i\) by this antecedent (under co-indexation) plus subsequent functional application is the only way to integrate its denotation semantically.

  ii. Weakly distributive readings:

  \(\Rightarrow\) Follows from lexical semantics of the distributive quantifier each: \(\forall \exists\)

  iii. Wide scope of distributive quantifier:

  \(\Rightarrow\) Follows from binding of the NP-restriction by plural antecedent. \(\Rightarrow\) No LF-movement
- Similarities and differences to alternative accounts of reciprocal each other:

<table>
<thead>
<tr>
<th>DD-analysis of each other</th>
<th>Others YES</th>
<th>Others NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reciprocal element requires a relation and a plural NP</td>
<td>Brüning (2007)</td>
<td></td>
</tr>
</tbody>
</table>

11 Problems and open questions

i. Type flexibility:  
  \[ \text{each-NP}_{\text{BINOM}} \Rightarrow <\text{et},t> \quad \text{vs.} \quad \text{each-NP}_{\text{RECIP}} \Rightarrow <\text{ett},t> \]
  \[ \Rightarrow \text{Appendix A} \]

ii. Genitive reciprocals in Spec,DP: each other’s
  \[ \Rightarrow \text{Appendix B} \]

iii. Long dependencies across clause boundaries
  \[ \Rightarrow \text{Appendix C} \]

12 Conclusions

i. The analysis of each other as a special instance of distance-distributivity (DD) is possible in principle, but it requires a special semantic type for the distributive operator.

ii. As a result of syntactic and semantic reanalysis, each and other always form part of the same (possibly complex) DP.

iii. DD-analysis of each other accounts for diachronic and comparative parallels: In particular it gives an explanation for the observed parallels between each other and DD-expressions such as binominal each and jeweils.

iv. each other not fully identical to binominal each, but has more in common with G. jeweils.

Appendices

Appendix A: Type Flexibility

\text{each-NP}_{\text{RECIP}}\text{ takes a relation-denoting expression as argument and is thus lexically specified as a binary <type 2> quantifier.}

- Binary quantifiers are not uncommon in natural language, though typically they are formed by absorption from unary <type 1> quantifiers (Keenan 1992).

(57) a. No-one loves nobody. \( \Rightarrow \) a loveless world  
   (van Benthem 1983, May 1985)
   \[ [[ \text{no-one [nobody]] ]] = \lambda R \in D_{\text{ett}}. \neg \exists x,y [R(x)(y)] \]

b. Different pupils answered different questions.  
   (Keenan 1992: 203)

- Type flexibility must be assumed for DP-internal reciprocal jeweils in German:
(58) a. *Die Ritter haben [DP den jeweils anderen (Ritter)] eingeladen.
   the knights have the respective other knight invited
b. ∀z [z∈[[the knights]]] → invite’(z, tx. [knight’(x) ∧ x ≠ z], defined iff knight’(z)
   → This reading can be derived by means of the lexical entry for jeweilsDP in (59)b. after
   short LF-movement of jeweils to the left edge of DP, cf. (59b).
(59) a. [[[jeweils]]] = λf<e,e>. ∀z[z∈Z → Rj(f(z))(z)] ⇒ <<e,e>,t>
b. LF: Die Ritter haben [DP jeweils1 [DP den t1 anderen (Ritter)]] eingeladen.
   → Alternatively, (59)b. can also be derived in the overt syntax.
   → (59)b. would form an instance of DP-quantification in Matthewson’s (1998) Q-typology.
   → Parallel instances of short DP-internal movement of functional adnominal categories
   across D, such as individual in (60), have been argued for on independent grounds
   (Zimmermann 2003)
(60) The dean looked at [the individual students].
   = The dean looked at the students individually
   • Type flexibility must also be assumed for possessive QPs in Spec,DP in English, if these
   QPs do not extract from the DP:
(61) Some teacher admired [ [every student]’s painting]
   → LF-movement of QP would allow for it being of type <et,t>:
(61’) LF: [every student]1 some teacher admired [t1’s painting]
BUT: Two arguments against LF-raising of QP from Spec,DP:
   i. Scopal facts:
   The QP does not seem to move on its own and take scope over other scope bearing
   elements (see Larson 1985 on inverse linking constructions). The predicted LF in (62b)
   with the scope reading in (62c) unavailable:
(62) a. Two teachers admired [ [every student]’s portrait of some friend of hers].
   b. LF: [every student]1 two teachers admired [t1’s portrait of some friend of hers].
   c. *∀student >> ∃2 teachers >> ∃ friend
   → the only readings available for (62a) are those with the scope of every student and some
   friend of hers not interrupted by two teachers; i.e. every student only painted a picture of
   one friend.
   d. surface scope: ∃2 teachers >> [∀student >> ∃ friend]
   inverse scope: [∀student >> ∃ friend] >> ∃2 teachers
   → The QP every student does not extract from the complex DP, but at best adjoins to DP.
   ii. Binding facts:
   QPs in Spec,DP do not semantically bind pronouns outside the DP, (63)b. (Büring 2003):
(63) a. Noi girl said that shei would come to the party.
   b. *[Noi girl]’s father] said that shei would come to the party.
   → The QP no girl does not leave the complex DP, but at best adjoins to DP.
A possible (surface) structure for (61) is (61’’) (cf. Larson 1985):

(61’’) some teacher admired [DP [every student]1 [DP t1’s painting]]

If the entire DP is of type <et,t>, then TYPE(every student) = <<e,e>, <et,t>>

(64) [[ every studentGEN ]] = λf<e,e>. λP<et>. ∀z [student'(z) → P(f(z)) ]

(e.g., with f = λy∈D. the unique x such that x is a painting painted by y)

Conclusion:

Type flexibility not restricted to reciprocal eachNP∅, but also necessary with other QPs that form a syntactic part of a complex DP.

Appendix B: Genitive reciprocals in Spec,DP

The in situ analysis of each other requires for genitive occurrences of each other in Spec,DP the semantic type of DP-internal jeweils in (59)a.

(65) a. The boys invited [each other’s girlfriend] for dinner. ( | [[the boys]] | = 2)
b. Die Jungen haben [des jeweils anderen (Jungen) Freundin] zum Essen eingeladen.

Analysis:

(66) a. LF: The boys invited [DP [eachNP∅]1 [t1 other’s girlfriend]]
b. [[eachNP∅]] = λf<e,e>. ∀z [z∈Zi → Rj(f(z))](z)]
c. [[t1 other’s girlfriend]] = tx. girlfriend’(x) ∧ RGEN( ty. y∈Zi ∧ y ≠ z)(x)
d. [[ [eachNP∅]; [t1 other’s girlfriend] ]] =
   ∀z [z∈Zi → Rj(tx. girlfriend’(x) ∧ RGEN( ty. y∈Zi ∧ y ≠ z)(x))(z)]

⇒ feeding in the denotations of invited for Rj and the boys for Zi :

e. ∀z [z∈[[the boys]] → invite’(tx. girlfriend’(x) ∧ RGEN( ty. y∈[[the boys]] ∧ y ≠ z)(x))(z)]

= 1 iff for each of the boys z, z invited the unique girlfriend x that stands in the genitive relation GEN (here: being a couple) with the unique boy y that is different from z

Appendix C: Long distance reciprocity

The in situ analysis of each other does not directly account for long distance reciprocity of embedded each other to a matrix antecedent.

(67) [John and Mary] think that they are taller than each other [HLM 1991]

i. distant construal:
John thinks that he is taller than Mary and Mary thinks that she is taller than John.

ii. local construal (contradictory):
#Both John and Mary think that John is taller than Mary and Mary taller than John.

⇒ (67)i. does not follow directly on the in situ account without additional assumptions.
⇒ HLM (1991): LF-movement of each

Problems with LF-movement approaches to reciprocal each other:

i. LF-movement accounts overgenerate:
The possibility of LF-movement does not license occurrences of each other in embedded clauses with no local plural antecedent:

(68) *John and Bill thought that Mary liked each other. (Lasnik 2007: 28)

INTENDED: John thought that Mary liked Bill, and Bill though that Mary liked John.

→ Why can’t both range and the contrast argument be bound by plural antecedent?

→ Divergence between semantic binding (long distance) and syntactic binding (local) (Sauerland 1998: 194)?

ii. LF-movement accounts undergenerate:

If reciprocals move to their antecedent at LF, they are predicted not to occur in syntactic islands (Brüning 2007), contrary to fact:

(69) The rival linguists were delighted [when each other's articles] were rejected].

- Extraction of each (other) to the matrix would violate the condition on extraction domains twice: the extraction site is the subject of an adjunct.

(70) a.*[Whose articles] were the linguists delighted [when t were rejected]?

b. *[Which country] did [a tourist from t] lose all his money?

- Long distance construal not possible with all matrix predicates:

(71) *?Peter and John complained that they were shorter than each other.

• Intermediate Conclusion:

LF-accounts of long distance reciprocity are also problematic, motivating the search for an alternative solution (which would also account for the graded and varying judgments for the long distance readings).

• An alternative (in situ) approach to apparent long-distance reciprocity?

The Idea:

With attitude verbs and verba dicendi, each other may be taken to distribute not over a plural matrix antecedent, but over an abstract plural object consisting of attitude holders plus their respective attitudes (whose precise value is determined by the antecedent).

→ Long-distance reciprocity should be impossible with plural antecedents that cannot be construed as attitude holders:

(72) *?Peter told [John and Bill] that they were taller than each other.

INTENDED: Peter told John that he was taller than Bill, and Peter told Bill that he was taller than John.

→ The need for the construal of an abstract plural object may be responsible for the gradience and variance in judgments of long-distance reciprocity.

→ The ability of each other to distribute over abstract plural objects of attitude holders and attitudes is shared by German distance-distributive jeweils, which allows for distribution over abstract or contextually given objects (Zimmermann 2002) ⇒ (73)a.

It is not shared by binominal each, which requires a DP-antecedent to distribute over for reasons of feature checking (Zimmermann 2002). ⇒ (73)b.
   = For each boy-assumption pair, there are two girls that will come to the party.

b. *The boys assume that [two girls each] will come to the party.

• Conclusions:

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<td>i. Apparent instances of long-distance reciprocity may come about by distributing over an abstract plurality construed from material in the matrix clause.</td>
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<td>ii. No LF-movement necessary.</td>
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<td>iii. reciprocal each (other) ≠ binominal each</td>
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</tbody>
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