

Distance distributivity and the interpretation of *each other*

V. Gast & M. Zimmermann (FU Berlin & U Potsdam)
Conference *Reciprocals Cross-linguistically*, FU Berlin, 30.11.2007

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 each to other.DAT.SG

‘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 other.ACC.SG.MASC to good with good example
‘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 othre: ‘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*]]. → *each*][*other* (‘discontinuous *each other*’)



(6) *The knights* [_{VP} *unhorsed* [_{DP} *eche other*]]. → [*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).

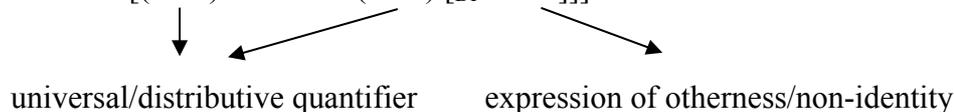
- Note: the Binding Theory also regards *each other* as a constituent of category DP ('anaphor'; cf. Reuland forthcoming on the status of *each other* as an anaphor).
- **[each other] acquires a different (wider) distribution than each][other**
- Some types of contexts where *each other* can only be 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 [eche 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 [[eche other]'s proceedings] 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 vulgarism 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]

4 Semantic Reanalysis: An Intuitive Approximation

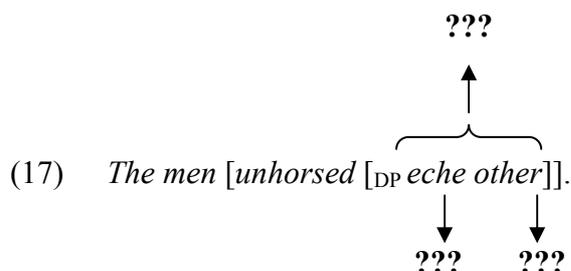
- *Important question:*

What type of *semantic* reanalysis accompanied the process of *syntactic* reanalysis?

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



- form-to-function mapping after reanalysis:



- *Three questions:*

- i. What does [each other] mean?
- ii. What does *each* in [each other] (*each_{RECP}*) 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, $\forall\forall$)

- (19) *The three students looked at each other.* (also weak reciprocity, e.g. $\forall\exists$)

- *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*?

5 Towards a Hypothesis: Comparative and Diachronic Evidence

- *Hypothesis:*

each_{RECP} 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 *each_{RECP}*, 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]

(22) *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.*
[\[http://www.4ni.co.uk/news.asp?id=43179\]](http://www.4ni.co.uk/news.asp?id=43179)

- Even more similarity/parallelism: each_{RECP} 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.*
 b. *Die Studenten trafen [des jeweils anderen] Frau.*

(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.*
 b. *Das Paar rief [des jeweils anderen] Namen.*

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

(28) *Marivaux’ Stücke tragen Titel wie Man spielt nicht mit der Liebe oder Das Spiel von Liebe und Zufall – in dem das „Hohe Paar“ ohne Wissen des jeweils anderen mit Diener und Zofe die Kleider tauscht, um die wahren Gefühle zu ergründen.*
[\[http://www.festspielfreunde.at/deutsch/frames/200312/gf_200312_22.htm\]](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.* [\[http://www.intro.de/news/23007237\]](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”...*
[\[http://www.20min.ch/unterhaltung/people/story/25510332\]](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.*
[\[http://hermes.zeit.de/pdf/archiv/2006/40/Science-of-sleep.pdf\]](http://hermes.zeit.de/pdf/archiv/2006/40/Science-of-sleep.pdf)

- Hypothesis:

English	German:
each][other	≅ jed-][ander-
[each other]	≅ [jeweils ander-]

(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*]_i likes *him*_{i,j}-self
- (37) a. *Der Mann mag ihn selbst.*
 b. *Der Mann mag sich selbst.*

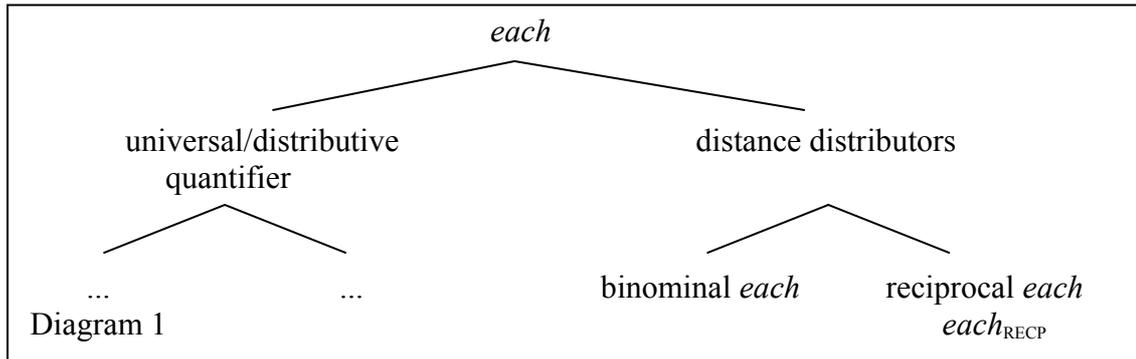
6 A Diachronic Hypothesis

- 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):



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

7 The Basic Idea

- Central Claim:

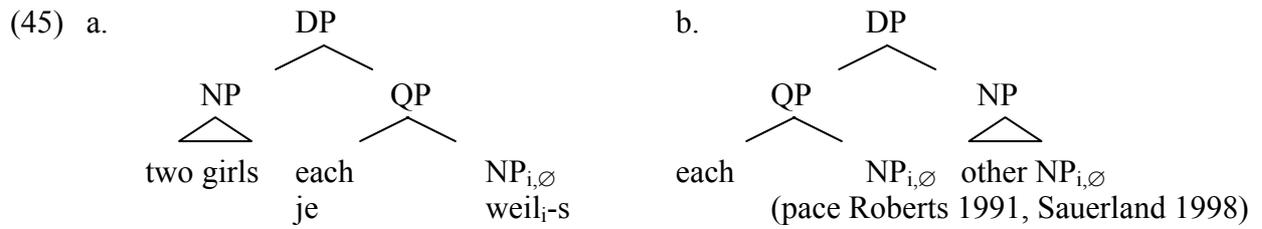
Semantics of reciprocal *each other* is a special instance of distance-distributivity as observed with binominal *each* and German (non-adverbial) *jeweils*.

- (43) a. *The boys invited* [_{DP} ***each other***]
 b. *The boys invited* [_{DP} *two girls each*]
 c. *Die Jungen haben* [_{DP} ***jeweils zwei Mädchen***] *eingeladen*.

- 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. ⇒ *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. ⇒ *each other*
- iii. DD-DPs have a weakly distributive reading: $\forall \exists$ ⇒ *each other*
- iv. DD-DPs are interpreted in situ, they do not move at LF. ⇒ *each other*
- v. Sentential scope of the universal quantifier is achieved by semantic binding of the quantifier's NP-restriction by its plural antecedent. ⇒ *each other*
- vi. Distance-distributivity is clause-bound (for semantic reasons: interpretability); possible exceptions: logophoric contexts ⇒ *each other*



- *A caveat:*

The syntactic distribution and semantic behaviour of *each*_{RECP} 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_i-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 R_j 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. $[[each]] = \lambda Q \in D_{\langle e, t \rangle}. \lambda P \in D_{\langle e^*, t \rangle}. \forall z [z \in Q \rightarrow \exists x [P(x) \wedge R_j(x)(z)]]$
 b. $[[each NP_{\emptyset, i}]] = \lambda P \in D_{\langle e^*, t \rangle}. \forall z [z \in Z_i \rightarrow \exists x [P(x) \wedge R_j(x)(z)]]$

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

- *Deriving the meaning of the DD-DP:*

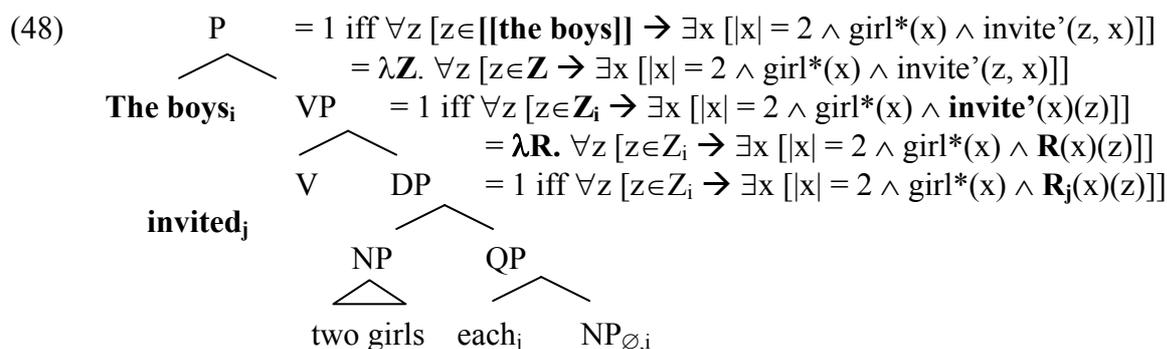
The semantic value of the entire distance-distributive DP is achieved by functional application of (46)b. to the meaning of an indefinite XP, e.g. *two girls*:

(47) $[[[two girls] each NP_{\emptyset, i}]]$
 $= [\lambda P \in D_{\langle e^*, t \rangle}. \forall z [z \in Z_i \rightarrow \exists x [P(x) \wedge R_j(x)(z)]]] (\lambda y. |y| = 2 \wedge girl^*(y))$
 $= 1 \text{ iff } \forall z [z \in Z_i \rightarrow \exists x [|x| = 2 \wedge girl^*(x) \wedge R_j(x)(z)]]$

→ DD-DPs are of semantic type $\langle t \rangle \approx$ 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 R_j and Z_i 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 R_j is provided by the semantic value of the transitive verb, and the value for Z_i is provided by the plural subject antecedent.



→ (48) is true iff it holds for each z of a specific group of boys that there is a plurality of two girls x such that z invited x .

→ Sentential scope of the distributive quantifier is due to the fact that its restriction variable Z_i is bound by the plural subject DP in SpecTP.

9 Extending the Analysis to *each other*

- *Syntactic Structure:*

Reciprocal *each other* forms a complex DP consisting of a QP headed by *each* and an indefinite NP modified by *other*, cf. (45)b. The NP-complements are covert NP-proforms and carry the same index (to be bound by the same antecedent):

(49) [DP [QP *each* NP_{∅,i}] [NP *other* NP_{∅,i}]]

- Both *each* and *other* allow for NP-deletion (cf. Elbourne 2005):

(50) a. *The boys came to the party. Each gave a present to the birthday girl.*
 b. *John took this book and Peter took the other* [NP _] / *another* [NP _]

- The semantics of *other* (HLM 1991, Sauerland 1998)

Other is an NP-modifier: It indicates that any entity x instantiating the NP-predicate is different from another entity z which also instantiates the same NP-predicate.

- The denotation of modifier *other* is of type $\langle et, et \rangle$ and contains an unbound variable:

(51) [[*other*_n]] = $\lambda P \in D_{\langle et, et \rangle}. \lambda x \in D. P(x) \wedge x \neq z_n$, defined iff $P(z)$ (Sauerland 1998)

- The variable z can be existentially or contextually bound.
- The presupposition $P(z)$ blocks sentences with *other* from being trivially true under contextual binding in case there is a discourse salient non-P entity.

- *The semantics of other plus NP-complement:*

The NP-complement of *other* is typically overtly expressed and provides a value for the predicate variable P .

(52) a. [[(an)*other*_n book]] = $\lambda x \in D. \text{book}'(x) \wedge x \neq z_n$

b. [[*the other*_n book]] = $\iota x. \text{book}'(x) \wedge x \neq z_n$
 = the unique book x , such that x differs from a contextually given book z

- c. [[*every other*_n book]] = $\lambda P \in D_{\langle e, t \rangle}. \forall x [\text{book}'(x) \wedge x \neq z_n \rightarrow P(x)]$
 = the set of properties shared by any book different from a contextually given book z .

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

(53) $[[\text{other NP}_{\emptyset,i}]] = \lambda x \in D. x \in Z_i \wedge x \neq z_n$

- *The semantics of eachNP_{∅,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) $[[\text{each}_{\text{RECP}} \text{NP}_{\emptyset,i}]] = \lambda \mathfrak{R} \in D_{\langle \text{eet} \rangle}. \forall z [z \in Z_i \rightarrow \exists x [\mathfrak{R}(z)(x) \wedge R_j(x)(z)]]$

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

- Combining *each* and *other*: Deriving the reciprocal reading

(55) $[[\text{each}_n \text{NP}_{\emptyset,i} [\text{other}_n \text{NP}_{\emptyset,i}]]]$

- a. index n on *each NP* triggers λ -abstraction over z_n in $[[\text{other}_n \text{NP}_{\emptyset,i}]]$:

$\lambda z_n. \lambda x. x \in Z_i \wedge x \neq z_n$

- b. $[[\text{each}_n \text{NP}_{\emptyset,i} [\text{other}_n \text{NP}_{\emptyset,i}]]] =$ (per functional application)

$[\lambda \mathfrak{R} \in D_{\langle \text{eet} \rangle}. \forall z [z \in Z_i \rightarrow \exists x [\mathfrak{R}(z)(x) \wedge R_j(x)(z)]]] (\lambda z_n. \lambda x. x \in Z_i \wedge x \neq z_n) =$

- c. $\forall z [z \in Z_i \rightarrow \exists x [x \in Z_i \wedge x \neq z \wedge R_j(x)(z)]]$ (per λ -conversion)

- *Deriving the meaning of transitive reciprocal clauses:*

(56) $\text{TP} = 1 \text{ iff } \forall z [z \in [[\text{the boys}]] \rightarrow \exists x [x \in [[\text{the boys}]] \wedge x \neq z \wedge \text{invite}'(z, x)]]$

$= \lambda Z. \forall z [z \in Z \rightarrow \exists x [x \in Z \wedge x \neq z \wedge \text{invite}'(z, x)]]$

The boys_i VP $= 1 \text{ iff } \forall z [z \in Z_i \rightarrow \exists x [x \in Z_i \wedge x \neq z \wedge \text{invite}'(x)(z)]]$

$= \lambda R. \forall z [z \in Z_i \rightarrow \exists x [x \in Z_i \wedge x \neq z \wedge R(x)(z)]]$

invited_j V DP $= 1 \text{ iff } \forall z [z \in Z_i \rightarrow \exists x [x \in Z_i \wedge x \neq z \wedge R_j(x)(z)]]$

$= 1 \text{ iff } \forall z [z \in Z_i \rightarrow \exists x [x \in Z_i \wedge x \neq z \wedge R_j(x)(z)]]$

QP NP

$\text{each}_{j,n} \text{NP}_{\emptyset,i} \text{ other}_n \text{NP}_{\emptyset,i}$

→ (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.

→ 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:*

⇒ 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.

⇒ 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:*

⇒ Follows from lexical semantics of the distributive quantifier *each*: $\forall \exists$

- iii. *Wide scope of distributive quantifier:*

⇒ Follows from binding of the NP-restriction by plural antecedent. ⇒ No LF-movement

- *Similarities and differences to alternative accounts of reciprocal each other:*

DD-analysis of each other	Others YES	Others NO
morpho-syntactically complex	HLM (1991)	Sauerland (2007)
hidden NP-proforms	HLM (1991), Sauerland (1998, 2007)	
compositional	HLM (1991)	Brüning (2007)
distributive quantifier	HLM (1991), Brüning (2007)	Sauerland (1998, 2007), Beck & Sauerland (2000), Beck (2001)
weakly distributive readings	Langendoen (1978), Dalrymple et al. (1998)	HLM (1991)
no long LF-movement, local evaluation	Beck (2001)	HLM (1991)
Reciprocal element requires a relation and a plural NP	Brüning (2007)	
Reciprocal phrase clause-like <t>	Sevcenko (2007)	HML (1991), Sauerland (1998), Beck & Sauerland (2000), Beck (2001)

11 Problems and open questions

- i. Type flexibility: $each-NP_{BINOM} \Rightarrow \langle et, t \rangle$ vs. $each-NP_{RECIP} \Rightarrow \langle ett, t \rangle$
⇒ **Appendix A**
- ii. Genitive reciprocals in Spec,DP: *each other's*
⇒ **Appendix B**
- iii. Long dependencies across clause boundaries
⇒ **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

$each-NP_{RECIP}$ 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)
[[[no-one [nobody]]]] = $\lambda R \in D_{\langle eet \rangle}. \neg \exists x, y [R(x)(y)]$
- 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. $\forall z [z \in [\text{the knights}]] \rightarrow \text{invite}'(z, \lambda x. [\text{knight}'(x) \wedge x \neq z])$, defined iff $\text{knight}'(z)$
- This reading can be derived by means of the lexical entry for *jeweils*_{DP} in (59)b. *after short LF-movement of jeweils to the left edge of DP*, cf. (59b).

- (59) a. $[[\text{jeweils}]] = \lambda f_{\langle e, e \rangle}. \forall z [z \in Z \rightarrow R_j(f(z))(z)] \Rightarrow \langle \langle e, e \rangle, t \rangle$
- 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 $\langle et, t \rangle$:

- (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. $*\forall \text{student} \gg \exists_2 \text{ teachers} \gg \exists \text{ friend}$

→ 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: $\exists_2 \text{ teachers} \gg [\forall \text{student} \gg \exists \text{ friend}]$
 inverse scope: $[\forall \text{student} \gg \exists \text{ friend}] \gg \exists_2 \text{ teachers}$

→ 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. No_i girl said that she_i would come to the party.
- b. $*[[\text{No}_i \text{ girl}]'s \text{ father}]$ said that she_i 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 $[_{DP} \text{every student}]_i [_{DP} t_i \text{'s painting}]$

→ If the entire DP is of type $\langle et, t \rangle$, then $\text{TYPE}(\text{every student}) = \langle \langle e, e \rangle, \langle et, t \rangle \rangle$

(64) $[[\text{every student}_{\text{GEN}}]] = \lambda f_{\langle e, e \rangle}. \lambda P_{\langle et \rangle}. \forall z [\text{student}'(z) \rightarrow P(f(z))]$
(e.g., with $f = \lambda y \in D. \text{the unique } x \text{ such that } x \text{ is a painting painted by } y$)

- *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 *jewels* 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 $[_{DP} \text{eachNP}_{\emptyset}]_i [t_i \text{ other's girlfriend}]$

b. $[[\text{eachNP}_{\emptyset}]] = \lambda f_{\langle e, e \rangle}. \forall z [z \in Z_i \rightarrow R_j(f(z))(z)]$

c. $[[t_i \text{ other's girlfriend}]] = \iota x. \text{girlfriend}'(x) \wedge R_{\text{GEN}}(\iota y. y \in Z_i \wedge y \neq z)(x)$

d. $[[[_{DP} \text{eachNP}_{\emptyset}]_i [t_i \text{ other's girlfriend}]]] =$
 $\forall z [z \in Z_i \rightarrow R_j(\iota x. \text{girlfriend}'(x) \wedge R_{\text{GEN}}(\iota y. y \in Z_i \wedge y \neq z)(x))(z)]$

⇒ feeding in the denotations of *invited* for R_j and *the boys* for Z_i :

e. $\forall z [z \in [[\text{the boys}]] \rightarrow \text{invite}'(\iota x. \text{girlfriend}'(x) \wedge R_{\text{GEN}}(\iota y. y \in [[\text{the boys}]] \wedge y \neq z)(x))(z)]$

= 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 thought 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]₁ were the linguists delighted [when t₁ were rejected]?

b. *[Which country]₁ did [a tourist from t₁] 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.

- (73) a. ?Die Jungen nehmen an, dass [jeweils zwei Mädchen] zur Party kommen (werden).
 = 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:*

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

References

- Beck, Sigrid (2001). Reciprocals are Definites. *Natural Language Semantics* 9: 69–138.
- Brüning, Benjamin (2007). There is a dedicated reciprocal semantics cross-linguistically. Presentation, this conference.
- Büring, Daniel (2004). Crossover Situations. *Natural Language Semantics* 12.1: 23-62
- Dalrymple, Mary, Makoto Kanazawa, Yookyung Kim, Sam Mchombo, and Stanley Peters (1998). Reciprocal Expressions and the Concept of Reciprocity. *Linguistics and Philosophy* 21: 159–210.
- Dowty, David and Belinda Brodie (1984). The semantics of ‘floated’ quantifiers in a transformationless grammar. In M. Cobler, S. Mackaye and M. T. Westcoat (eds), *WCCFL* 3, 75-90.
- Elbourne, Paul (2005). *Situations and Individuals*. Cambridge, Mass.: MIT Press.
- Gast, Volker (2006). *The Grammar of Identity. Intensifiers and Reflexives in Germanic Languages*. London: Routledge.
- Haas, Florian (2007a). The development of English *each other*: grammaticalization, lexicalization, or both? *English Language and Linguistics* 11.1: 31-50.
- Haas, Florian (2007b). Reciprocity in English. Historical development and synchronic structure. *Doctoral Dissertation*, FU Berlin.
- Heim, Irene, Howard Lasnik, and Robert May (1991). Reciprocity and Plurality. *Linguistic Inquiry* 22: 63–101.
- Huddleston, R. and G. Pullum (2002). *The Cambridge Grammar of the English Language*. Cambridge: Cambridge University Press.
- König, E. & V. Gast (eds.). *Reciprocals and Reflexives. Typological and Theoretical Explorations*. Berlin: Mouton de Gruyter.
- König, E. & P. Siemund (2000). The development of complex reflexives and intensifiers in English. *Diachronica* XVII: 39-84.
- Langendoen, D. Terence (1978). The Logic of Reciprocity. *Linguistic Inquiry* 9: 177–197.
- Larson, Richard (1985). Quantifying into NP. Ms.
- Lasnik, Howard (2007). Some Milestones in the Development of Binding Theory. Ms., University of Maryland/Nanzan University. <http://www.nanzan-u.ac.jp/GENGOKAGAKU/gp/i-aegs/ronbun/pdf/HowardLasnikCoursecorrected.pdf>
- Maslova, E. (forthcoming). *Reflexive encoding of reciprocity: cross-linguistic and language-internal variation*. In König & Gast (eds.).
- Matthewson, Lisa (1998). *Determiner Systems and Quantificational Strategies. Evidence from Salish*. Holland Academic Graphics, The Hague.
- Plank, Frans. (forthcoming). Thought on the origin, progress and pronominal status of reciprocal forms in German, occasioned by those of Bavarian. in König & Gast (eds.).
- Quirk, R., S. Greenbaum, G. Leech and J. Svartvik (1985). *The Comprehensive Grammar of the English Language*. London: Longman.
- Raumolin-Brunberg, Helena. 1997. Reciprocal pronouns: from discontinuity to unity. *Studia Anglica Posnaniensia* 31:227–236.

- Reuland, E. (forthcoming). Anaphoric dependencies: How are they encoded? Towards a derivation-based typology. In König & Gast (eds.).
- Roberts, Craige (1991). Distributivity & Reciprocal Distributivity. In Proceedings of SALT I. Ithaca: DMLL Publications. 209-229.
- Sauerland, Uli (1998). Plurals, derived predicates, and reciprocals. In U. Sauerland & O. Percus (eds.), *The Interpretive Tract*. MITWPL, Cambridge, Mass. 177-204.
- Sauerland, Uli (2007). Focus and the semantic typology of reciprocals. Presentation, this conference.
- Safir, Ken & Timothy Stowell (1988). Binominal *each*. *Proceedings of NELS* 18. 426-450.
- Sevcenko, Anca (2007). Focus and the semantic typology of reciprocals. Presentation, this conference.
- Zimmermann, Malte (2002). Boys Buying Two Sausages Each. On the Syntax and Semantics of Distance-Distributivity. PhD Dissertation. University of Amsterdam. LOT Publication: Utrecht.
- Zimmermann, Malte (2003). Pluractionality and Complex Quantifier Formation. *Natural Language Semantics* 11.3: 249-321.