Some Reasons to Think that there is a Dedicated Reciprocal Semantics Cross-Linguistically

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February 18, 2009

1 Two Views of Reciprocals

1. The "Null Hypothesis": There is no dedicated reciprocal semantics, meaning is a result of independently needed mechanisms (Heim, Lasnik, and May 1991, henceforth "HLM"; Sternefeld 1998; Beck 2001).

2. Dedicated Reciprocal: There is a dedicated reciprocal semantics, realized in different ways morphosyntactically (Dalrymple, Mchombo, and Peters 1994).

Claims of this talk:

1. There is a dedicated reciprocal semantics; languages do not differ in semantics, despite the wide divergence in morphosyntactic encoding.

2. The attempt to derive the meaning of reciprocals from mechanisms needed for the interpretation of plurals (Sternefeld 1998, Beck 2001) does not work.

3. However, HLM are correct that reciprocals are not monolithic; they have two components, even when monomorphemic.

4. The meaning of reciprocals is Weak Reciprocity (Langendoen 1978); all other meanings derive from this.

2 Background: HLM and Beck 2001

2.1 Heim, Lasnik, and May 1991

Reciprocal sentences break down into four parts:

(1) [The men]$_a$ [saw]$_d$ [each]$_b$ [other]$_c$.
   a. group-denoting antecedent
   b. distributor
   c. reciprocator
   d. predicate

Three instances of quantifier raising put them in the order a–d:

(2) The men saw each other. $\Rightarrow$
   a. [$_S$[$_{NP}$[$_{NP}$ the men]$_1$ each$_2$] [$_{VP}$ saw [$_{NP}$ e_2 other]$_3$]]
   b. [$_S$[$_{NP}$[$_{NP}$ the men]$_1$ each$_2$] [$_S$ e_2 [$_{VP}$ [$_{NP}$ e_2 other]$_3$ [$_{VP}$ saw e_3]]]

- *each* distributes over subject, [$_{NP}$ e_2 other]$_3$ operates over VP;

- Reciprocals involve two operations: universal quantification, and distinctness.

- These two operations are independently done by *each* and *other*, and can be done in isolation.

- "This suggests that, in effect, reciprocal expressions have no semantic properties peculiarly their own and that their meaning instead arises from the compositional interactions of the meanings that their constituent parts have in isolation. The hypothesis we will explore, then, is essentially the null hypothesis, that reciprocal pronouns inherit their semantics from the nonreciprocal usages of *each* and *other*." (p.67)

(3) $\forall x_2(x_2 \cdot \Pi[\![\text{the men}]\!])\forall x_3(x_3 \cdot \Pi[\![\text{the men}]\!] \wedge x_2 \neq x_3)\ \text{saw}(x_2, x_3)$
=Every man saw every other man different from himself.

2.2 Beck 2001

- HLM only allow Strong Reciprocity; one of Beck's concerns is getting weaker readings.

- Readings of reciprocals are identical to readings of definite plurals;

- Can derive reciprocal semantics entirely from mechanisms needed for plurals.

(4) The family members respected each other, and paid their respects at each other's funerals. (Schein 2001, ex.1)
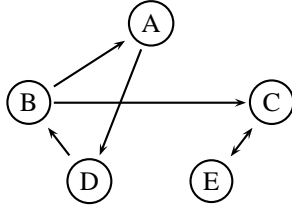
(5) Strong Reciprocity (notation from Dalrymple *et al.* 1998)
$\forall x, y \in A\ (x \neq y\ \rightarrow Rxy)$
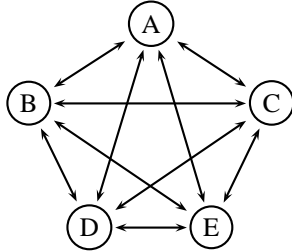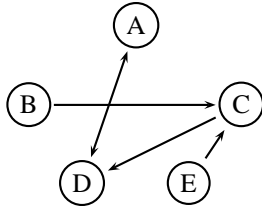

(6) Weak Reciprocity
$\forall x \in A\ \exists y, z \in A\ (x \neq y\ \&\ x \neq z\ \&\ Rxy\ \&\ Rzx)$

(7) One-Way Weak Reciprocity
$\forall x \in A\ \exists y \in A(x \neq y\ \&\ Rxy)$
"The captain!" said the pirates, staring at each other in surprise. (Dalrymple *et al.* 1998, ex.6)

Langendoen (1978) suggests treating reciprocals like relational plurals:

(8) Strong Readings:
  a.   The three children know each other.
  b.   The three children know the two books.

(9) a.   Each of the three children knows each other one of the three children.
  b.   Each of the three children knows each of the two books.

(10) Weaker Readings (cumulative interpretation):
  a.   The children can touch the horses.
  b.   The children can touch each other.

(11) a.   Each child can touch one of the horses, and each horse can be touched by one of the children.
  b.   Each child can touch, and be touched by, one other child.

(12) *Distribution* (Beck ex.38, from Link 1983):
  * is that function: D⟨e, t⟩ → D⟨e, t⟩ such that for any f in D⟨e, t⟩ and any x in D:
  [*f](x) = 1 iff f(x) = 1 or
                    $\exists u, v[x=(u\&v)\ \&\ [*f](u)\ \&\ [*f](v)]$

Beck: Double distribution via QR for one reading of the following sentence:

(13) Sue and Amy read *Fried Green Tomatoes* and *The L-Shaped Room*. (Beck 2001, exx.40–41)

  a. [[Sue and Amy] [*[[1 [FGT and L] [*[2[t_1 read t_2]]]]

  b. $\forall x \leq$S&A: $\forall y \leq$FGT&L: x read y

Cumulative reading of same sentence:

(14) *Cumulation:* (Beck and Sauerland 2000, (3))
      [**R](X)(Y) = 1 if and only if $\forall x \in X \exists y \in Y$ R(x)(y) and $\forall y \in Y \exists x \in X$ R(x)(y)

(15) Sue and Amy read *Fried Green Tomatoes* and *The L-Shaped Room*. (Beck 2001, ex.44)

  a. [[S & A] [[**read] [FGT & L]]]

  b. $\forall x \in$S&A: $\exists y \in$FGT&L: x read y &
      $\forall y \in$FGT&L: $\exists x \in$S&A: x read y

- **No quantification inherent to reciprocal**;

- Reciprocal is a group-denoting expression, not a quantifier;

- Quantification comes from general mechanisms of plural predication.

- *Each other* means 'the other ones among them':

(16) (Beck 2001, ex.76)

  a. each other = the other one(s) among them
          = max(*$\lambda z[\neg z \circ x_1$ & $z \leq x_3$ & Cov(z)])

  b. [max[*[Cov[[other x_1] (of) Pro_3]]]]

(17) The children are touching each other. =
      The children are touching the other ones among them.

- Strong Reciprocity: * operator (independently available);

- Weak Reciprocity: ** operator (independently available).

3   First Problem for the Null Hypothesis

It focuses too narrowly on English.

- For both HLM and Beck (2001) it is crucial that some element like *other* gives rise to distinctness.

- HLM also require a distributive quantifier like *each*.

Problem: Many other languages have no such element(s).

(18) Bimorphemic NP anaphor—English:
          The children helped **each other**.

(19) Monomorphemic NP anaphor—Dutch:
          Hondie, Poes, en   Muisje hebben **elkaar** nat-gespoten.
          Doggie Cat   and Mousie have   Recip wet-squirted
          'Doggie, Cat, and Mouse squirted each other (up).' (Philip 2000, ex.8)

(20) Detransitivizing verbal morpheme—Passamaquoddy-Maliseet:
          Peskh-**utu**-ltuw-ok.
          shoot-Recip-Plural-3P
          'They (more than two) are shooting at each other.' (A. Harnois, p.c.)

(21) Adverb (predicate also detransitivized)—Chinese:

A, B, C, D **huxiang** kaiqiang.
                 Recip   shoot

'A, B, C, and D shot each other.' (Y. Tsai, p.c.)

- If reciprocals are essentially plural NPs, detransitivization is unexpected.

- If there were no dedicated reciprocal semantics, we would expect languages to differ depending on the pieces that go into a reciprocal expression.

3.1   Reciprocals are Interpreted Identically

(See also Philip 2000, who shows that Dutch and Norwegian speakers interpret reciprocals just like English speakers do.)

(22)   Japanese (S. Kotani, Y. Hara, p.c.)

    a.   Otoko-tati-ga uti-**at**-ta.
          man-Pl-Nom shoot-Recip-Past

          'The men shot each other.'

    b.   Otoko-tati-ga **otagai-o**   ut-ta.
          man-Pl-Nom each.other-Acc shoot-Past

    c.   Otoko-tati-ga siri-**aw**.
          man-Pl-Nom know-Recip

          'The men know each other.'

    d.   Otoko-tati-ga **otagai-o**   siru.
          man-Pl-Nom each.other-Acc know

(23)   Chinese (Y. Tsai, p.c.)

    a.   A, B, C, D **huxiang** kaiqiang.
                       Recip   shoot

          'A, B, C, and D shot each other.'

    b.   A, B, C, D **huxiang** renshi.
                       Recip   know

          'A, B, C, and D know each other.'

(24)   Turkish (O. Ozturk, p.c.)

    a.   Dört adam gör-**üş**-tü-ler.
          four man   see-Recip-Past-3P

          'Four men met/saw each other.'

    b.   Dört adam **birbirleri-ni**   gör-dü-ler.
          four man   each.other-Acc see-Past-3P

    c.   Tanı-**ş**-ıyor-lar.
          know-Recip-Pres-3P

          'They know each other.'

    d.   **Birbiri-niz-i**   tani-yor-mu-sunuz?
          each.other-2P-Acc know-Pres-Q-2P

          'Do you (Pl) know each other?'

(25)   Indonesian (Y. Tjung, p.c.)

    a.   A, B, C, D **saling** tembak.
                    Recip shot

          'A, B, C, and D shot each other.'

    b.   A, B, C, D **saling** suka.
                    Recip like

          'A, B, C, and D like each other.'

(26)   Passamaquoddy-Maliseet (A. Harnois, p.c.)

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a.   Peskh-**utu**-ltuw-ok.
       shoot-Recip-Plural-3P
       'They (P) are shooting at each other.'

b.   Kosiciy-**utu**-ltuw-ok.
       know-Recip-Plural-3P
       'They know each other.'

(27) Albanian (Eni Isufi, p.c.)

    a.   Katër burr-at   e   gjuajtën   **njëri-tjetr-in**.
            four   man-Def.P.Nom 3S.CL shoot-3P.Past one.Masc-other-Def.Acc
            'The four men shot each other.'

    b.   Katër burr-at   e   njohin   **njëri-tjetr-in**.
            four   man-Def.P.Nom 3S.CL know-3P one.Masc-other-Def.Acc
   'The four men know each other.'

(28)
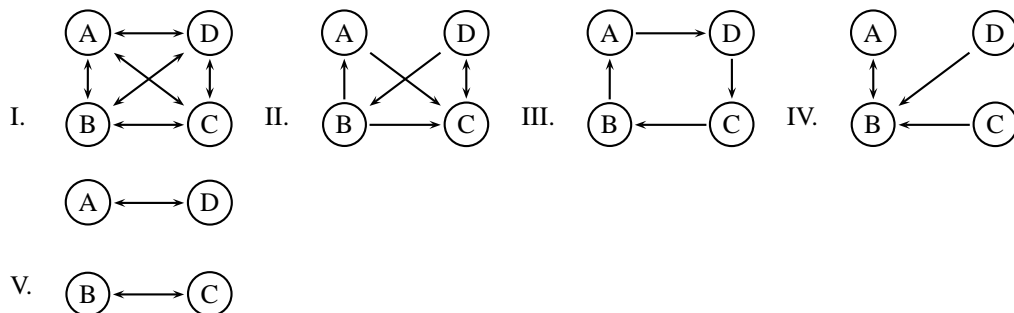
- *A, B, C, and D shot each other:* Speakers of all languages allow I, II, and III as possible situations, exactly the same as English.

- No speaker allows IV for such a sentence, indicating that the truth conditions are not those of One-Way Weak Reciprocity (Dalrymple *et al.* 1998; see also Beck 2001).

- The fact that II and, in particular, III are allowed indicates that Strong Reciprocity is not required, only Weak Reciprocity is.

- All speakers also allow the situation in V, although the Turkish and Indonesian speakers said that they would prefer to express that situation in a different way. (V is allowed by Weak Reciprocity.)

- These results held regardless of the form of the reciprocal.

- If the sentence was stative, such as *A, B, C, and D know each other*, only the situation in I was allowed (Strong Reciprocity). In particular, V was ruled out by everyone.

Linear configurations:

(29)
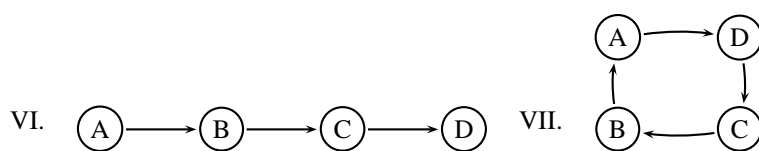
- With a verb like *follow* or *chase*: Variability.

  1. Japanese, Chinese: VI not allowed, only VII (or VIII, not shown, where first A follows B and then B follows A).

  2. Turkish, Indonesian, Passamaquoddy-Maliseet, Albanian: VI and VII can both be described using the reciprocal (VIII too).

- With a stative predicate like *be spaced 500 feet from each other* or *be close to each other*: All languages allow both VI and VII (but with the arrows going both ways, since the predicates are symmetric).

- Japanese: Results are the same regardless of whether the reciprocal is verbal or nominal. (Turkish was difficult to test using the verbal reciprocal, which is not fully productive.)

3.2 Discussion of Results

- Few of these languages have anything that can be identified as a distributor ('each') or a reciprocator ('other').

- Verbal morpheme has no other function in Passamaquoddy-Maliseet.

- Adverbs sometimes translated as 'mutual' in Chinese, Indonesian.

- (Consider other English reciprocal *one another*, which has identical semantics, but no *each*, and use of *mutual* or—as pointed out by S. Tomioka—inherently reciprocal verbs like *kiss*.)

- If reciprocals have to consist of an independently existing distributor and an independently existing reciprocator, these results are surprising.

- Not necessarily an argument against the plural view of reciprocals; presumably all languages have the mechanisms to interpret those;

- What is surprising on that view is that every language has a dedicated form for expressing reciprocals, and many of them do not look like plurals, or even NPs.

3.3 The Meaning of a Reciprocal is Weak Reciprocity

- This investigation shows that eventive reciprocals only ever require weak reciprocity, where every member of the subject set acts on and is acted upon by some other member of the subject set.

- Statives require strong reciprocity universally.

- The stative-eventive distinction appears in every language I have investigated and is distinguished by children as young as four years old (Matsuo 1997).

- I conclude that weak reciprocity is the basic meaning of reciprocals, and the only one we need to postulate, contra most of the literature on reciprocals.

- Following a suggestion by A. Giannakidou (p.c.), I will guess that strong readings come about with statives because of a homogeneity condition on statives (but actually formalizing this is not trivial).

3.4 Scope

(30)   They are taller than each other. (contradictory; HLM ex.68)

(31)   They think they are taller than each other. (noncontradictory; HLM ex.69)
       = They each think they are taller than the other.

Scope seems to be a matter of movement; blocked by non-bridge verbs and islands:

(32)   (HLM exx.82–83)
       a.   * Who did they mutter that they were taller than?
       b.   They muttered that they are taller than each other.

(33)   John and Mary criticized Max when they defeated each other. (HLM ex.84)

(34)   The guy who saw John and Mary thinks they are taller than each other. (HLM ex.88)

Every language where I have asked allows high scope:

(35)   Japanese:

       Ken-to Sachie-wa [**otagai-o**   aisi-teir-u   to]   omotteir-u.
       K.-and S.-Top   **each.other-Acc** love-Prog-Pres Comp think-Pres
       'Ken and Sachie think that they love each other.'
       a.   Ken and Sachie think that Ken and Sachie love each other.
       b.   Ken thinks that Ken loves Sachie and Sachie thinks that Sachie loves Ken.

(36) Passamaquoddy-Maliseet:

Piyel naka Susehp toqi=te litahasuw-ok kisi-tomh-**utu**-wok.
P. and Jos. both=Emph think-3P Perf-defeat-**Recip**-3P

'Peter and Joseph both think that they defeated each other.'

    a.   Peter and Joseph both think: Peter defeated Joseph and Joseph defeated Peter.

    b.   Peter thinks Peter defeated Joseph and Joseph thinks Joseph defeated Peter.

(37) Chichewa (Dalrymple, Mchombo, and Peters 1994, ex.7):

John ndí Bill a-ku-gáníz-a kutí a-na-gónj-éts-**ǎn**-a.
John and Bill SM-Pres-think-FV that SM-Past-lose-Cause-**Recip**-FV

'John and Bill think that they defeated each other.'

(38) Albanian:

    a.   Jemi më të gjatë se **njëri-tjetr-i**.
           be.1P more Det tall than one.M-other-Def.Nom

           'We are taller than each other.' (impossible)

    b.   Mendojmë se jemi më të gjatë se **njëri-tjetr-i**.
           think.1P that be.1P more Det tall than one.M-other-Def.Nom

           'We think we are taller than each other.' (possible)

High scope seems to be about movement in all languages; blocked by islands:[1]

(39) Passamaquoddy-Maliseet

Piyel naka Susehp oc '-tapwotehl-a-wa-l putaya-l [kistoh-uti-htit] .
P. and Jos. Fut 3-open.Dir-3P-Obv bottle-Obv defeat-Recip-3PConj

'Peter and Joseph will open a bottle if they beat each other.'

    a.   Peter and Joseph will open a bottle if Peter beats Joseph and Joseph beats Peter.

    b.   * Peter will open a bottle if Peter beats Joseph and Joseph will open a bottle if Joseph beats Peter.

(40) Albanian

E kundërsht-uam thënie-n që jemi më të gjatë se njëri-tjetr-i.
3S.CL reject-1P.Past claim-Def.Acc that be.1P more Det tall than one.M-other-Nom

'We rejected the claim that we are taller than each other.'

    a.   We rejected the claim [that I am taller than you and you are taller than me].

    b.   * I rejected the claim that I am taller than you, and you rejected the claim that you are taller than me.

3.5 Conclusions So Far

- Scope shows that HLM were right to hypothesize movement of something in reciprocals.

- Everything else shows that they were wrong to try to derive the meaning of reciprocals from independently occurring morphemes like *each* and *other*.

- The fact that every language has a dedicated reciprocal, and that every language interprets them identically, suggests that there is a dedicated reciprocal in universal grammar.

4 More Problems for the Null Hypothesis, and the Plural View in Particular

4.1 The Paraphrase Problem

- HLM: Reciprocal ends up with essentially the same semantics as the *each. . . the other* construction: *Teddy and Johnny each saw the other*.

- Beck (2001): *The boys hit each other* means *The boys hit the other ones among them*.

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[1]Except perhaps in Japanese; see Nishigauchi 1992 vs. Hoji 2006.

- However, as already shown by Schein (2001), reciprocals diverge from both relational plurals and the *each... the other* construction in their interpretations:

(41)   *Situation: A circular feeding frenzy.*
  - a.   The sharks ate each other up. (Schein 2001, ex.89)
  - b.   # The sharks ate the other ones among them up. (Beck)
  - c.   # The sharks each ate the others up. (HLM)

- Problem for HLM: Their analysis only allows the strongest form of reciprocity.

- Beck's actual semantics does get this one right, but it's suspicious that her paraphrase does not mean the same thing.

4.2   Problem for Beck (2001): Islands

- HLM correctly predicted that *each other* would be sensitive to islands, but the *each... the other* construction would not.

- Because Beck only makes use of independently occurring * and ** operators, her analysis should predict island insensitivity, so long as the operator c-commands the reciprocal and its pronominal antecedent:

(42)   a.   The two girls were each revolted by the suggestion that they help the other.
  - b.   The two girls were revolted by the suggestion that they help each other.
  - c.   The two girls were revolted by the suggestion that they help the other one(s) among them.
  - d.   The two girls were revolted by the suggestion that they help the three boys.

- In (42a), Girl 1 is revolted by the suggestion that she help Girl 2, and Girl 2 is revolted by the suggestion that she help Girl 1.

- (42b) cannot mean this; it only means that they are both revolted by a suggestion of reciprocal helping.

- Both (42c) and (42d) can have a distributive reading, where each girl is revolted by the suggestion that she help the other girls or the three boys.

- Both (42c) and (42d) can also have a cumulative reading; (42d) can be true in a situation where Girl 1 received a suggestion that she help Boy 1 and Boy 2, and Girl 2 received a suggestion that she help Boy 3.

4.3   Another Problem: Non-Eventive Predicates

As shown above, in language after language Weak Reciprocity is strengthened to Strong Reciprocity with non-eventive predicates:

(43)   a.   The people in the room shot each other. (eventive: weak)
  - b.   The people in the room know each other. (non-eventive: strong)

(44)   a.   The three girls criticized each other. (eventive: weak)
  - b.   The three girls are as tall as each other. (non-eventive: strong)

This is not true of plurals:

(45)   a.   The three girls shot the two boys. (cumulative reading possible)
  - b.   The three girls know the two boys. (cumulative reading still possible)

(46)   a.   The three girls criticized the two boys. (cumulative reading possible)
  - b.   The three girls are as tall as the two boys. (cumulative reading possible)

4.4 Reciprocals are Always Distributive

- Beck: *Each other* denotes the group A–x.

- Beck: We should find collective readings wrt that group, and we do:

(47)   Our committees are made up of each other.

(48)   ... [a place] where the gravitational fields of the Earth, the Sun, and the Moon cancel each other out. (Dalrymple et al.)

(49)   The forks are propped against each other. (Dalrymple et al.)

"I believe that these data show conclusively that the group that I call A–x is needed and must be a meaning of the reciprocal" (Beck 2001, p.94).

- No. These readings are just compatible with weak reciprocity.

- There is NO need to posit cumulative readings.

Moreover, HLM showed that reciprocals force distributive readings of reflexives, which do not otherwise require them:

(50)   a.   The five boys introduced themselves to the five girls.
       b.   The five boys introduced themselves to each other. (based on HLM's ex.37)

- Reflexive is distributive, at the same time as the reciprocal only requires weak reciprocity:

- Each boy could be introducing himself to his neighbor, in a circle again.

Conclusion: We need distributivity, and do not need cumulativity, so we should do without the latter.

4.5 Overall Conclusion

- Although the semantics of cumulative readings and the semantics of reciprocals are very similar, they do not arise via the same mechanisms.

- HLM were correct to hypothesize movement in reciprocals.

- What is needed is a HLM-type theory with movement of a quantifier, but where the meaning of a reciprocal is weak reciprocity.

5 The Components of Reciprocals

I propose that reciprocals universally consist of two parts:

1. RECIP, an operator taking three arguments:

   (a) A predicate containing two open arguments, f;
   (b) A plural NP Z (HLM's *range* argument);
   (c) An argument x drawn from Z.

2. DIST$_R$, a distributive quantifier particular to reciprocals.

RECIP says that x from Z is argument 1 of f and some distinct member of Z (HLM's *contrast* argument) is argument 2, and x is argument 2 while some distinct member of Z is argument 1.
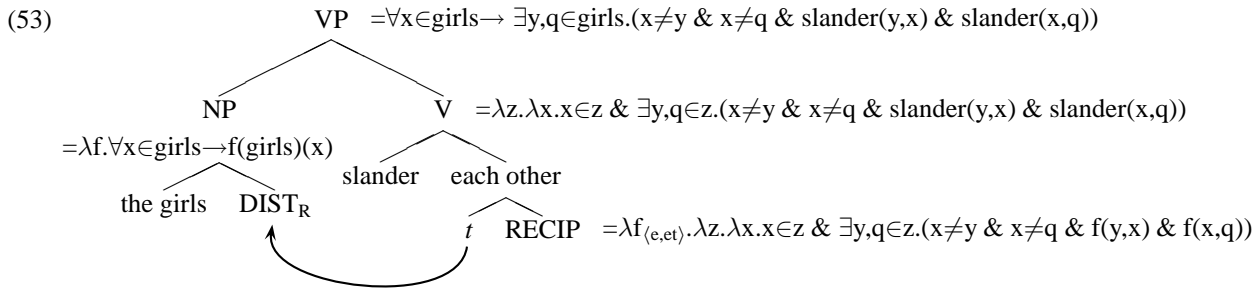
- Languages may spell out both or (more commonly) just one of these pieces;

- Their spellout may be the same as an independently occurring item with a similar but not identical semantics (e.g., English *other*).

5.1 Formalization

(51) $[\![\text{RECIP}]\!] = \lambda f_{\langle e,et\rangle}.\lambda z.\lambda x.x{\in}z \ \& \ \exists y,q{\in}z.(x{\neq}y \ \& \ x{\neq}q \ \& \ f(y,x) \ \& \ f(x,q))$

(52) $[\![\text{DIST}_R]\!] = \lambda x.\lambda f_{\langle e,et\rangle}.\forall y{\in}x{\rightarrow}f(x)(y)$
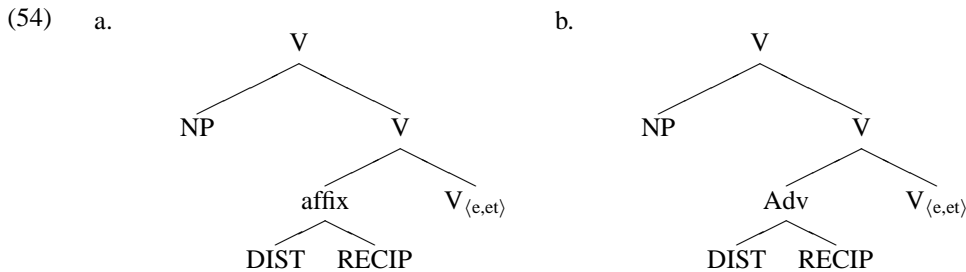
The trace of DIST_R is semantically vacuous:

(53)

VP $=\forall x{\in}\text{girls}{\rightarrow} \ \exists y,q{\in}\text{girls}.(x{\neq}y \ \& \ x{\neq}q \ \& \ \text{slander}(y,x) \ \& \ \text{slander}(x,q))$

NP   V $=\lambda z.\lambda x.x{\in}z \ \& \ \exists y,q{\in}z.(x{\neq}y \ \& \ x{\neq}q \ \& \ \text{slander}(y,x) \ \& \ \text{slander}(x,q))$

$=\lambda f.\forall x{\in}\text{girls}{\rightarrow}f(\text{girls})(x)$

slander   each other

the girls DIST_R

t   RECIP $=\lambda f_{\langle e,et\rangle}.\lambda z.\lambda x.x{\in}z \ \& \ \exists y,q{\in}z.(x{\neq}y \ \& \ x{\neq}q \ \& \ f(y,x) \ \& \ f(x,q))$

5.2 Cross-Linguistic Variation in Morphosyntax

Because RECIP takes a two-place predicate as its second argument, it could take several different morphosyntactic forms:

1. Fills argument position, as in English;

2. Detransitivizing verbal morphology (54a; see Bruening 2004, 2006);

3. Detransitivizing freestanding element (adverb; 54b):

(54)   a.   b.

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        V                              V
       / \                            / \
     NP   V                         NP   V
         / \                            / \
      affix  V⟨e,et⟩                  Adv  V⟨e,et⟩
      / \                            / \
   DIST  RECIP                    DIST  RECIP
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5.3 An Open Problem

Might need to allow three distinct readings of reciprocals:

1. Strong reciprocity, if it proves impossible to derive it from weak reciprocity with statives;

2. Weak reciprocity, the basic meaning;

3. One-way weak reciprocity, for high scope readings and for downward-entailing contexts with certain verbs only:

(55)   a.   If legislators address each other, they must do so indirectly. (one-way weak)
      b.   If the boxers defeat each other, we'll have to have a rematch. (weak)
      c.   If the jockeys weigh the same as each other, we won't have to make any adjustments. (strong, stative)

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