The Semantics of Phi
Number Features on Bound Pronouns

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1 Review

- Working hypothesis:
  - Pronouns are variables.
  - Gender features are presupposition triggers.
  - Person features???

(1) *Presuppositional Semantics of Person Features*

a. $[\![\textbf{me}_i]\!]^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is the speaker in } s \\ \text{is undefined} & \text{otherwise} \end{cases}$

b. $[\![\textbf{you}_i]\!]^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is the hearer in } s \\ \text{is undefined} & \text{otherwise} \end{cases}$

- Two problems:

1. Person mismatch

(2) a. *Only one student[6] (namely me) likes **my**$_6$ mother.
b. *Only I[8] like **her**$_8$ mother.

2. Non-universal projection through 'Only DP' (pseudo-problem)

(3) a. Only Mary[9] likes **her**$_9$ mother.
b. Only I[9] like **my**$_9$ mother.

- Solution 1: Minimal pronouns (Kratzer 1998, 2009, Heim 2008a,b, von Stechow 2002 among others).

(4) *Minimal Pronoun*
$[\![\varnothing_i]\!]^{s,g} = g(i)$ (for any $i \in \mathbb{N}$)

(5) *Feature Transmission at PF under Semantic Binding*
Bound pronouns must inherit phi-features from their semantic binders at PF.

- In order to explain (2), we need to assume that Feature Transmission is obligatory at least for person features.
- According to this analysis, only some occurrences of phi-features are semantically interpreted.

2 Potential Challenges for Minimal Pronouns

2.1 Feature Mismatch 1: Grammatical vs. Natural Gender

- Spathas (2010) discusses cases where the binder has a grammatical gender feature that is distinct from the natural gender.

(6) *Greek*

a. Kathe pedhi diakosmise to dhomatio **tu**.
every child.NEU decorated the room its.NEU
'Every child decorated his or her room.'

b. Kathe pedhi diakosmise to dhomatio **tis**.
every child.NEU decorated the room her.FEM
'Every child decorated her room.' (adopted from Spathas 2010:223)

(7) *Greek*

a. Mono to koritsi mas dhiakosmise to dhomatio **tu**.
only the.NEU girl.NEU our decorated the room its.NEU
'Only our girl decorated her room.'

b. Mono to koritsi mas dhiakosmise to dhomatio **tis**.
only the.NEU girl.NEU our decorated the room her.FEM
'Only our girl decorated her room.' (adopted from Spathas 2010:225)

- Verbal agreement obeys the grammatical gender in Greek.

(8) *Greek*

a. To koritsi ine **omorfo**.
the.NEU girl.NEU is pretty.NEU
'The girl is pretty.'

b. *To koritsi ine **omorfi**.
the.NEU girl.NEU is pretty.FEM

- Spathas takes these data to be evidence against the minimal pronoun approach. But one possibility that Feature Transmission is optional for gender features.
- Some complications (problem for everybody): in German, the grammatical gender is the preferred option.

(9) *German*

a. Jedes Kind[3] definierte **seine**$_3$ Ziele.
every.NEU child defined its.NEU goals
'Every child defined his or her goals.'

b. *Jedes Kind[3] definierte **ihre**$_3$ Ziele.
every.NEU child defined her.FEM goals

(Angelika Kratzer, p.c.)

But with feminine nouns there is an option:

(10) *German*

a. Jedes Mädchen[3] definierte **seine**$_3$ Ziele.
every.NEU girl defined its.NEU goals
'Every child defined his or her goals.'

b. Jedes Mädchen[3] definierte **ihre**$_3$ Ziele.
every.NEU girl defined her.FEM goals
'Every child defined his or her goals.' (Angelika Kratzer, p.c.)

In Serbian/Croatian, the natural gender is the preferred option.

(11) *Serbian/Croatian*

a. (Svako) devojče misli da **je/*ga** Jovan voli.
every.NOM.NEU.SG girl.NEU.SG thinks that her/it Johan likes.
'Every/The girl thinks that John loves her.'

b. Johan je rekao (svakom) devojčetu da **je/*ga** voli.
John AUX told every girl.DAT.NEU.SG that her/it likes.
'John told every/the girl that he loves her.' (Wechsler & Zlatić 2003:209)

2.2 Feature Mismatch 2: 'Each of Us', etc.

- Rullmann (2008) points out that first person plural pronouns can sometimes be bound by quantifiers like *each of us* (see Rullmann 2010 for Dutch data).

(12)
a. Each of us has a right to control **our** own body.
b. But each of us, as an individual, faces **our** own edge.
c. Each of us has experienced a strong sense of pride as an educator when a student says that we did an excellent job of teaching and motivating him or her to learn.
d. Each of us has **our** own philosophy regarding how to help India.
(Rullmann 2008)

(13)
a. Most of us as men are experts on women, until **we** marry one.
b. Most of us have moments when we forget where **we** left the car keys or forget what **we** went to the grocery store for.
c. Most of us can point to one individual who has changed **our** life.
(Rullmann 2008)

- According to Rullmann's count, first person plural pronouns are more common as bound pronouns than third person pronouns when the binder is of the form *Q of us*.
- Notice that *each of us* agrees with the verb in [3rd, sg].
- Some examples not containing *of us*.

(14)
a. Most Muslims have no clue what **we**'re saying when **we**'re reciting the Koran in Arabic.
b. Linguists have now hammered many generations of American students with **our** contrary opinions about normal people's linguistic beliefs, without notable success.
c. Thanks to those who have already made **your** card.
(Rullmann 2008)

- Recall that we want to say that Feature Transmission is obligatory for person features, due to data like (15).

(15)
a. *Only I^6 think that **she**$_6$ is smart.
b. *Only one student^9 (namely me) thinks that **I**$_9$ am smart.

2.3 Number Features

- Rullmann (2003) and Rullmann (2004) raise counter-arguments from number features.
- A single plural pronoun can be bound by two quantifiers at the same time.

(16) All of the students^9 asked all of the professors^3 if **they**$_{\{9,3\}}$ could meet next week.

(17) For all students x and for all professors y, x asked if x and y could meet next week.

- A puzzle for minimal pronouns arises when the binders are singular.

(18) Each of the girls^6 asked one of the ladies$_5$ if **they**$_{\{6,5\}}$ could meet next week.

If the bound pronoun has to inherit the number features of its binder or binders, then the pronoun here should be singular. But you cannot use a singular pronoun.

3 A Semantic Account

- Some argue an analysis without minimal pronouns (Spathas 2010, Jacobson 2012).
- The data involving 'only' actually does not compellingly show that minimal pronouns are necessary.
- Review of the'only' data:

(19) Only Mary^7 likes her$_7$ mother.

This sentence has a 'sloppy' reading:

(20) a. Mary likes her mother.
b. John doesn't like his mother.
c. I don't like my mother.

If the predicate has the presupposition triggered by [feminine] that the subject is female, (20b) and (20c) will be undefined. So the phi-features cannot be interpreted.

- Notice that this argument presupposes that the presupposition universally projects through 'only Mary'. That is, it is assumed that 'only Mary VP' presupposes that all the relevant individuals must satisfy the presupposition of the VP.
- This requirement seems to be a natural one given the partial function analysis of presupposition we have been assuming.

(21) $[\![7$ **likes her**$_7$ **mother**$]\!]^{s,g}$ is only defined for female individuals.

- But some presuppositions do not universally project through *only DP*:
  - E.g. singular definite descriptions 'the NP' presuppose that there is only one thing that make the NP true, e.g. 'The picture that I took' presupposes that there is only one picture I took.

    (22) John liked the picture that I took.
  - We say that singular definite descriptions have uniqueness presuppositions.
  - The uniqueness presupposition of a singular definite description does not universally project through 'only DP' (Spathas 2010, Walker 2011).

    (23) Only John^7 liked the picture he$_7$ took.

    This sentence presupposes that John took exactly one picture, but does not presuppose that everybody else took exactly one picture too. (23) could be true in the following scenario.

    (24) a. John took one picture, and liked it.

b. Mary took two pictures, but didn't like them.
c. Bill took three pictures, but didn't like them.

– Side note: Interestingly, not all presuppositions behave the same.

(25) Of the 10 people, only John stopped smoking.
$\rightsquigarrow$ all the 10 people were smoking.

(26) Of the 10 people, only John remembered to call his mother.
$\rightsquigarrow$ all the 10 people were supposed to call their mother.

These presuppositions seem to universally project through 'only DP'.

- If the presupposition of the predicate does not have to universally project through 'only DP', we don't need to say anything about (27).

(27) Only Mary likes her mother.

The relevant presupposition is just that the referent of 'Mary' is female, which is true.

- How exactly this is done of course needs to be worked out. Unfortunately it's too complicated to delve into here (see Spathas 2010, Jacobson 2012, Sudo 2012, 2013).
- An advantage of the semantic account is that it can account for Rullmann's data with some auxiliary assumptions about presupposition projection.

(28) Each of us has a right to control **our** own body.

– Assumption 1: The presupposition of *our* is collective in the sense that it does not apply to each member of a set/plurality, but to the set/plurality as a whole, namely it presupposes that the set/plurality contains the speaker.

(29) $[\![\textbf{our}_8]\!]^{s,g} \begin{cases} = g(8) & \text{if the speaker of } s \in g(8) \\ \text{is undefined} & \text{otherwise} \end{cases}$

(More on plurality tomorrow)

– The predicate 'has a right to control our own body' with a bound pronoun *our* presupposes that the subject contains the speaker.

(30) $[\![8\ \textbf{has a right to control our}_8\ \textbf{own body}]\!]^{s,g}$
$= \lambda X$: the speaker of $s \in X$. 1 iff for each $x \in X$, x has a right to control x's body in s

(Notice that the presupposition is collective but the truth-conditional meaning is distributive)

– Assumption 2: A universal presupposition is that the restrictor of the quantifier, i.e. the meaning of the NP argument, satisfies the presupposition (Sudo 2012, 2013). E.g. the presupposition of (30) is that the referent of 'us' contains the speaker.

- This account can generalize to cases like the following:

(31) Most Muslims have no clue what **we**'re saying when **we**'re reciting the Koran in Arabic.

– The presupposition is that the set of Muslims contains the speaker.
– Yet, the restrictor is often times 'of us', which is presumably for pragmatic reasons. You prefer to use 'us' or something like 'us Muslims', if you will say *our* later on in the same sentence.

- But the semantic account needs to explain the person mismatch:

(32) a. *Only I^{9} like her$_{9}$ mother.
b. *Only one student^{4} likes my$_{4}$ mother.

Let's think about this a bit more.

- Some more data to consider:
  - Same meaning but different number:

    (33) a. More than one boy will call **his** mother.
    b. Two or more boys will call **their** mother.

  - Binding with both natural and grammatical gender:

    (34) *Each yacht^{5} that had lost **its**$_{5}$ way found **her**$_{5}$ destination.(Pollard & Sag 1994:79)

4 Non-Presuppositional Analysis of Person

- Unlike for gender features, there is actually no convincing evidence that person features are presupposition triggers. Maybe person features are special.
- Proposal: number features are features on indices (cf. Cable 2005 for a similar analysis):
  - Indices are not just natural numbers, but come with a person feature.

    (35) a. First person indices: $5[①], 253[①]$, etc.
    b. Second person indices: $6[②], 1[②]$, etc.
    c. Third person indices: $9[③], 45[③]$, etc.

  - Assignment functions are functions from (35) to individuals.

    (36) $g(5[③]) =$ John, etc.

  - Morphology dictates that only first person pronouns can bear first person indices, only second person pronouns can bear second person indices, only third person pronouns can bear third person indices.
  - The semantics of person features are captured by the admissibility condition:

    (37) *Admissibility Condition on Assignment Functions*
    When ϕ is used in situation s, only assignment functions g that satisfy the following three conditions are admissible for interpreting ϕ. (for any $n \in \mathbb{N}$)
    a. $g(n[①]) =$ the speaker of s
    b. $g(n[②]) =$ the hearer of s
    c. $g(n[③]) \neq$ the speaker of s and $g(n[③]) \neq$ the hearer of s

- Semantic binding is possible as long as the binder and bindee have the same index. Since having the same index entails having the same person features, we derive the generalization that the binder and the bindee must have the same person feature.

  (38) a. Only I$^{9[①]}$ like my$_{9[①]}$ mother.
  b. Only I$^{9[①]}$ like her$_{9[③]}$ mother.

  The pronoun in (38b) will not be bound.

- But what about imposters?

  (39) ??To keep **myself** from getting sunburned, Daddy will put on suntan lotion.

- What about 1pl and 2nd pronouns?
  - Rullmann's data suggests that they can be bound by third person quantifiers.
  - In some languages, 1pl and 2pl pronouns are morphologically built from 1sg and 2sg pronouns.

(40) *Japanese*
  a. watashi (1sg)
  b. watashi-tachi (1pl)

(41) *Chinese*
  a. wǒ (1sg)
  b. wǒmen (1pl)

5 Number Features

5.1 Brief Introduction to Plurality

- Plural individuals as sets:
  - Type e elements are *not* simply individuals, but *sets of individuals*.
  - Singular/atomic individuals are singleton sets.

(42) a. $[\![\textbf{John}]\!]^{s,g}=\{\text{John}\}$
  b. $[\![\textbf{John and Bill}]\!]^{s,g} = \{\text{John, Bill}\}$ $(=[\![\textbf{Bill and John}]\!]^{s,g})$

To simplify, let's write 'John' for $\{\text{John}\}$.

- Collective vs. distributive vs. mixed predicates
  - Collective predicates select for plural arguments.[1]

(43) a. #This student gathered.
  b. These students gathered.

(44) a. #This student is a couple.
  b. These students are a couple.

It's evident that it's because of the meaning of these predicates. They describe properties that only make sense for groups of individuals, rather than individuals themselves.

(45) $[\![\textbf{gathered}]\!]^{s,g} = \lambda x\colon |x| > 1.$ 1 iff x gathered in s

  - Distributive predicates, on the other hand, are inherently about single individuals, e.g. 'yawn', 'be sick', etc.

(46) $[\![\textbf{yawned}]\!]^{s,g} = \lambda x\colon |x| = 1.$ 1 iff (the unique member of) x yawned in s

  - But notice that distributive predicates can combine with plural subjects.

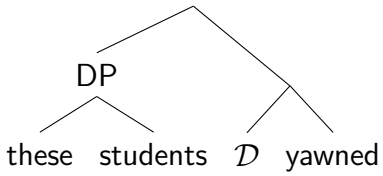
(47) a. This student yawned.
  b. These students yawned.

What (47b) means is that each of the students yawned. In order to account for this, we use the distributivity operator.

(48) $[\![\mathcal{D}]\!]^{s,g} = \lambda P_{\langle e,t\rangle}.\lambda X_e.$ 1 iff $\forall x \in X[P(x) = 1]$

[1] Two well known exceptions: group denoting nouns like 'the committee', 'the team', and the so-called 'involvement' readings (Landman 1989).

(49)



The distributivity operator sometime gets realized as *all, each, both*.

(50) These students all yawned.

– Lastly, other predicates are neutral (mixed predicates), e.g. 'wrote a love song', 'lifted a piano', etc. They describe properties that can be true of singular and plural individuals.

(51) John and Bill wrote a love song.

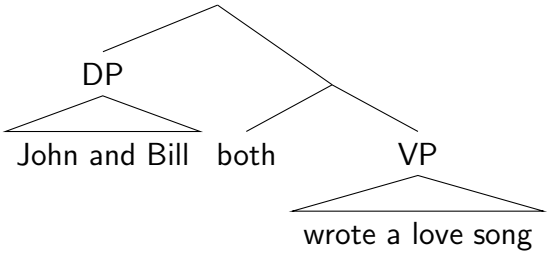
These ones have no restrictions:

(52) $[\![\textbf{wrote a love song}]\!]^{s,g} = \lambda x.$ 1 iff x wrote a love song in s

Notice that *all, each, both*, force a distributive interpretation.

(53) John and Bill both wrote a love song.

(54)



(55) $[\![\textbf{both}]\!]^{s,g} = \lambda P_{\langle e,t\rangle}.\lambda X_e\colon\ |X| = 2.$ 1 iff $\forall x \in X[P(x) = 1]$

5.2 Plural Pronouns

- There are two phenomena to account for.

1. Split antecedents

(56) a. Each of the girls^6 asked one of the ladies$_5$ if **they**$_{\{6,5\}}$ could meet next week.
b. Only I^9 told each professor^2 that **we**$_{\{2,9\}}$ should write a paper together.

This is prima facie problematic for minimal pronouns. It's easier to deal with in a semantic account.

2. Semantically singular plural pronouns

(57) a. The first-year students (all) think that **they** are the smartest student.
b. We (all) think that **we** are the smartest student.

Notice that these pronouns denote singular individuals!

(58) a. #They are the smartest student.
b. #We are the smartest student.

This is straightforward for a minimal pronoun account. A semantic account has to say something

6 Heim's Analysis with Minimal Pronouns

- Heim (2008b) modifies the minimal pronoun account to explain bound plural pronouns.
- In the minimal pronoun approach, the semantically singular plural pronouns are not problematic: the plural features are not semantically interpreted at LF (provided that transmission of number features is obligatory).
- For split antecedents, any account needs to postulate a mechanism for multiple binding.

(59) *Set Index*
$[\![\text{PRONOUN}_I]\!]^{s,g} = \bigcup_{i \in I} g(i)$

When the index is a singleton, e.g. $\{3\}$, we simply write 3.

(60) $[\![\textbf{they}_{\{7,4\}}]\!]^{s,g} = g(7) \cup g(4)$

- Heim proposes that phi-features are not on pronouns themselves, but on indices, and Feature Transmission targets indices.

(61) Each of the girls^6 asked one of the ladies$_5$ if **they**$_{\{6,5\}}$ could meet next week.

Here both 6 and 5 have [3rd, sg] (and maybe [feminine]).

(62) Only I^9 told each professor^2 that **we**$_{\{2,9\}}$ should write a paper together.

In this case, 9 has [1st, sg], while 2 has [3rd, sg].

- Heim proposes the following spell-out rules that decide the form of a pronoun, depending on the feature compositions of the indices on it.

(63) *Spell-Out Rules*
A pronoun with a set index I is realized as
a. 1st person, if some $i \in I$ has [1st]
b. 2nd person, if no $i \in I$ has [1st] and some $i \in I$ has [2nd]
c. 3rd person otherwise;
and
a. singular if $|I| = 1$ and for the unique $i \in I$, $|g(i)| = 1$,
b. plural, otherwise

(English plural pronouns have no gender specifications, but for other languages, you might want to add rules for gender too)

- Heim herself states at the end of the paper that an account that needs to resort to purely morphological rules like (63) that duplicate the semantic restrictions is not entirely satisfactory.

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