

The Semantics of Phi

Phi-Features on Pronouns and Presuppositions

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ACTL Day 2
 June 25, 2013
 UCL

- Yesterday we introduced the semantics of pronouns as variables.
- Key components:
 - Indices on pronouns (natural numbers)
 - Assignment functions (functions from indices to individuals)
 - Bound uses via binding indices and the Binding Rule

SUMMARY OF DAY 1

- Declarative sentences denote truth-values, 1 (TRUE) or 0 (TRUE), in a given situation s with respect to an assignment function g .

(1) $\llbracket \text{John smokes} \rrbracket^{s,g} = 1$ iff John smokes in s

- **Compositionality Principle:**

The meaning of a complex phrase is determined by the syntax and semantics of its parts.

- Two components:

1. Lexicon

For any situation s , for any assignment function g , and for any $i \in \mathbb{N}$,

- (2)
- a. $\llbracket \text{John} \rrbracket^{s,g} = \text{John}$ (type e)
 - b. $\llbracket \text{smokes} \rrbracket^{s,g} = \lambda x_e. 1$ iff x smokes (type $\langle e, t \rangle$)
 - c. $\llbracket \text{likes} \rrbracket^{s,g} = \lambda y_e. [\lambda x_e. 1$ iff x likes y in $s]$ (type $\langle e, \langle e, t \rangle \rangle$)

- (3) *Pronoun*
 $\llbracket \text{he}_i \rrbracket^{s,g} = g(i)$ (type e)

- (4) *Quantifiers*
- a. $\llbracket \text{every boy} \rrbracket^{s,g} = \lambda P_{\langle e, t \rangle}. 1$ iff for every boy x , $P(x) = 1$ (type $\langle \langle e, t \rangle, t \rangle$)
 - b. $\llbracket \text{no boy} \rrbracket^{s,g} = \lambda P_{\langle e, t \rangle}. 1$ iff for no boy x , $P(x) = 1$ (type $\langle \langle e, t \rangle, t \rangle$)

2. Compositional Rules

- (5) *Functional Application*
- $$\left[\begin{array}{c} \wedge \\ \mathbf{A} \quad \mathbf{B} \end{array} \right]^{s,g} = \llbracket \mathbf{A} \rrbracket^{s,g}(\llbracket \mathbf{B} \rrbracket^{s,g}) \text{ or } \llbracket \mathbf{B} \rrbracket^{s,g}(\llbracket \mathbf{A} \rrbracket^{s,g}), \text{ whichever is appropriate.}$$
- (provided that \mathbf{A} is not a binding index)

- (6) *Binding Rule*
- $$\left[\begin{array}{c} \wedge \\ i \quad \mathbf{A} \end{array} \right]^{s,g} = \lambda x_e. \llbracket \llbracket \mathbf{A} \rrbracket^{s,g[i \rightarrow x]}(x) \rrbracket$$

1 Presupposition

- We talked about two kinds of semantic intuitions:

- **Truth-Conditional Judgment**

If you are given sufficient information about a situation s , you can tell if a given declarative sentence ϕ is true or false in s .

- (7) SITUATION: We know that John lives in Paris with his wife and three kids.
- a. 'John lives in France' is true.
 - b. 'John lives in Tokyo' is false.

- **Referential Judgment**

We can tell the referents of proper names and definite descriptions in situations (provided that they have referents in s).

- (8) SITUATION: John Smith is the only person around us whose name is John. He is dating a girl named Mary.
- a. 'John' refers to John Smith.
 - b. 'The man who is dating Mary' refers to John Smith.

- Today, we'll discuss another kind of semantic intuition: **Felicity Judgment**

Given a situation s and a sentence ϕ , we can tell if ϕ is felicitous in s or not.

- (9) SITUATION: We know that Mary is single and not dating anybody.
#The man that Mary is dating now is a philosopher.
- (10) #I have three sisters, and both of them have kids.

- Felicity judgments are also part of our semantic knowledge. We'll account for them with the kind of meaning called **presupposition**.

1.1 Presuppositions and Felicity Conditions

- Presuppositions impose felicity conditions on the use of the sentences. Simplifying a bit,

- (11) In order for a sentence ϕ to be felicitous in a given utterance context C , the presuppositions of ϕ must be true in C .

- This is a very broad characterization of presupposition (sometimes called 'pragmatic presupposition'). Sentences can be infelicitous in many different ways (e.g. you cannot say irrelevant things).

- We are mostly interested in presuppositions as semantic properties of sentences.

- Sentences containing certain words and phrases have presuppositions.

- (12) 'The NP' with a singular NP presupposes that there is a unique NP (see above).

- (13) 'Both of the NPs VP' presupposes that there are exactly two (relevant) NPs.
- a. Both of the philosophers are Americans.
 - b. #Both of my biological fathers are smokers.

- One useful way of identifying presuppositions is **projection tests**: Presuppositions are known to behave in a certain way with respect to logical operators.

– Negation fails to negate presuppositions:

- (14) a. I don't think that the man that is dating Mary now is a philosopher.
b. I don't think that both of John's sisters are coming to see me.

– Presuppositions cannot be questioned:

- (15) a. Is the man that is dating Mary now a philosopher?
b. Are both of John's sisters coming to see me?

– *If* fails to conditionalize the presupposition:

- (16) a. If the man that is dating Mary now is a philosopher, I want to meet him.
b. If both of John's sisters are coming to see me, we should make a reservation at the restaurant.

All of these sentences have the same presuppositions as the atomic sentences.

- We adopt the **partial function theory of presuppositions** (Heim & Kratzer 1998; see Heim 1983, Beaver 2001 for more sophisticated versions).¹

– Partial functions are those functions that are undefined for some inputs.²

– Recall that $\llbracket \]^{s,g}$ is a function (it takes a LF representation and returns its truth-conditional meaning). The idea is that presuppositions make $\llbracket \]^{s,g}$ partial.

– Illustration: Sentences with no presuppositions are defined for $\llbracket \]^{s,g}$ with any s and g .

- (17) For any situation s and for any assignment function g ,
 $\llbracket \text{It is raining} \rrbracket^{s,g} = 1$ iff it is raining in s

Sentences with presuppositions are not defined for certain situations.

- (18) a. s_1 : Mary is dating John.
b. s_2 : Mary is not dating anybody.

- (19) a. $\llbracket \text{The man that Mary is dating is a philosopher} \rrbracket^{s_1,g} = 1$ iff John is a philosopher.
b. 'The man that Mary is dating is a philosopher' is undefined for $\llbracket \]^{s_2,g}$.

- According to the partial function analysis of presuppositions, presuppositions are part of the truth-conditional meanings of sentences in the sense that they specify when the sentences fail to denote 1 or 0.

- A given declarative sentence ϕ for a situation s and an assignment function g either denotes 1 (true), denotes 0 (false), or undefined (infelicitous/presupposition failure). To be more explicit,

(20) *Pragmatic Bridging Principle*

Declarative sentence ϕ is infelicitous with respect to situation s and assignment function g , if ϕ is undefined for $\llbracket \]^{s,g}$ ($\phi \notin \text{dom}(\llbracket \]^{s,g})$; we'll write ' $\llbracket \phi \rrbracket^{s,g}$ is undefined').

(the defined-ness is evidently only a necessary condition for the felicity of ϕ : ϕ can be infelicitous in many other ways)

¹There are many other theories of presuppositions where presuppositions do not make functions partial. Beaver (2001:Part I) and Beaver & Geurts (2011) are comprehensive overviews of different theoretical frameworks.

²Technically, functions are special cases of partial functions that are defined for all elements in the domain, but in our loose talk, we say 'partial functions' to mean functions that are not defined for all elements in the domain.

1.2 Presuppositions in Compositional Semantics

- Our semantic theory should capture the fact that certain presuppositions are associated with items like 'the' and 'both'. We call them **presupposition triggers**.
- In particular, we want to capture how presuppositions of complex phrases depend on the syntax and semantics of their sub-constituents (the problem of **presupposition projection**).
- We make a very simple assumption.

(21) In order for ϕ to be defined for $\llbracket \cdot \rrbracket^{s,g}$, all sub-constituents of ϕ must be defined for $\llbracket \cdot \rrbracket^{s,g}$.

- E.g. in order for $\llbracket \text{The man that Mary is dating is a philosopher} \rrbracket^{s_2,g}$ to be defined, $\llbracket \text{the man that Mary is dating} \rrbracket^{s_2,g}$ must be defined.
- What's the referent of 'the man that Mary is dating'? It does not have a referent in s_2 !
- Analysis: $\llbracket \text{the man that Mary is dating} \rrbracket^{s_2,g}$ is not defined.
- As a consequence $\llbracket \text{The man that Mary is dating is a philosopher} \rrbracket^{s_2,g}$ is not defined.

- We analyze the meanings of presupposition triggers as **partial functions**.

LAMBDA NOTATION FOR PARTIAL FUNCTIONS

- We extend the lambda notation for partial functions:

1. λ +variable (α), representing the INPUT
2. A colon
3. Restrictions on the input (ϕ)
4. A period
5. A description of the OUTPUT (β)

$$\lambda \underbrace{\alpha}_{\text{INPUT}} : \underbrace{\phi}_{\text{RESTRICTION}} . \underbrace{\beta}_{\text{OUTPUT}}$$

- (22) a. $[\lambda x: x > 5. 3/x]$ (only defined for numbers greater than 5)
 b. $[\lambda x: x \text{ is married in } s. x\text{'s partner in } s]$ (only defined for married people)

- In order to avoid complications, let's analyze the presuppositional predicate 'stopped smoking', instead of 'the'.

- 'A stopped smoking-ing' presupposes that A was smoking.

- (23) 'John stopped smoking' presupposes that John was smoking.
- a. I don't think John stopped smoking.
 - b. Did John stop smoking?
 - c. If John stopped smoking, he will live longer.

All of these sentences presuppose that John was smoking.

- The denotation of 'stopped smoking':

- (24) $\llbracket \text{stopped smoking} \rrbracket^{s,g}$
 $= \lambda x_e: x \text{ is an individual who was smoking in } s. 1 \text{ iff } x \text{ is not smoking in } s$

(Because we won't talk about tense, we won't analyze this into 'stop' and 'smoking')

– $\llbracket \text{stopped smoking} \rrbracket^{s,g}$ is only defined for individuals who were smoking.

- (25) a. s_0 : John was smoking and still is.
 b. s_1 : John never smoked.
 c. s_2 : John was smoking but not any more.

- (26) a. $\llbracket \text{John stopped smoking} \rrbracket^{s_0,g} = 0$
 b. $\llbracket \text{John stopped smoking} \rrbracket^{s_1,g}$ is undefined.
 c. $\llbracket \text{John stopped smoking} \rrbracket^{s_2,g} = 1$

- **Some technical details:** In order to ensure larger phrases to inherit presuppositions of smaller phrases, we revise our compositional rules as follows:

(27) *Functional Application* (Presuppositional)

Suppose A is not a binding index.

a. $\llbracket \begin{array}{c} \wedge \\ \text{A B} \end{array} \rrbracket^{s,g}$ is defined iff $\begin{cases} \llbracket \text{A} \rrbracket^{s,g} \text{ is defined} \\ \llbracket \text{B} \rrbracket^{s,g} \text{ is defined, and} \\ \llbracket \text{A} \rrbracket^{s,g}(\llbracket \text{B} \rrbracket^{s,g}) \text{ or } \llbracket \text{B} \rrbracket^{s,g}(\llbracket \text{A} \rrbracket^{s,g}) \text{ is defined.} \end{cases}$

b. If defined, $\llbracket \begin{array}{c} \wedge \\ \text{A B} \end{array} \rrbracket^{s,g} = \llbracket \text{A} \rrbracket^{s,g}(\llbracket \text{B} \rrbracket^{s,g}) \text{ or } \llbracket \text{B} \rrbracket^{s,g}(\llbracket \text{A} \rrbracket^{s,g})$, whichever is defined.

(28) *Binding Rule* (Presuppositional)

$\llbracket \begin{array}{c} \wedge \\ i \text{ A} \end{array} \rrbracket^{s,g} = \lambda x_e. : \llbracket \text{A} \rrbracket^{s,g[i \rightarrow x]}$ is defined and $\llbracket \text{A} \rrbracket^{s,g[i \rightarrow x]}(x)$ is defined. $\llbracket \llbracket \text{A} \rrbracket^{s,g[i \rightarrow x]}(x) \rrbracket$

INTERIM SUMMARY

- **Felicity judgments**

Given a situation s and a sentence ϕ , we can tell if ϕ is felicitous in s or not.

(29) #I have three sisters, and both of them have kids.

- Two characteristics of **Presuppositions**

- **Pragmatic status:** presuppositions impose felicity conditions.
- **Projection:** presuppositions interact with logical operators in a particular way, e.g. negation doesn't negate them.

- **Partial function theory:** For a situation s and an assignment function g , $\llbracket \phi \rrbracket^{s,g}$ is either 1 (TRUE), 0 (FALSE) or undefined (INFELICITOUS).

- **Presupposition triggers**, e.g. 'stopped smoking', 'the' and 'both', denote partial functions.

- In order for $\llbracket \phi \rrbracket^{s,g}$ to be defined, all the subconstituents of ϕ must be defined.

- Some more presupposition triggers:

- 'Both NPs' presuppose that there are exactly two individuals who are NPs.

(30) 'both philosophers' presupposes that there are exactly two philosophers.

- a. I don't think both philosophers will agree with me.
- b. Do both philosophers agree with me?
- c. If both philosophers agree with me, I will be surprised.

– 'a forgot to VP' presupposes that a was supposed to VP.

(31) 'John forgot to call Mary' presupposes that John was supposed to call Mary.

- a. I don't think John forgot to call Mary.
- b. Did John forget to call Mary?
- c. If John forgets to call Mary, he will be in trouble.

- Assuming that NPs denote one-place predicates (just like VPs do), i.e. function of type $\langle e, t \rangle$:

(32) $[\text{the}_{\text{sing}}]^{s,g}$ (type $\langle \langle e, t \rangle, e \rangle$)
 $= \lambda P_{\langle e, t \rangle} : |\{x : P(x) = 1\}| = 1$. the unique y such that $P(y) = 1$

(33) $[\text{both}]^{s,g}$ (type $\langle \langle e, t \rangle, \langle \langle e, t \rangle, t \rangle \rangle$)
 $= \lambda P_{\langle e, t \rangle} . \lambda Q_{\langle e, t \rangle} : |\{x : P(x) = 1\}| = 2$. for all y such that $P(y) = 1$, $Q(y) = 1$

2 Gender Features as Presupposition Triggers

- Recall our semantics of pronouns:

(34) $[\text{he}_i]^{s,g} = g(i)$ (for any $i \in \mathbb{N}$)

- Let's first focus on gender features.
- Obviously, 'He' and 'she' should have different meanings:

(35) SITUATION: Pointing to John,
 a. #She lives in Paris.
 b. ^{ok}He lives in Paris.

(36) SITUATION: Pointing to Lisa,
 a. ^{ok}She lives in Paris.
 b. #He lives in Paris.

- Gender features restrict the range of possible referents according to their gender. We analyze their meanings as presuppositions (originally due to Cooper 1983; see also Pollard & Sag 1994, Heim & Kratzer 1998).

To simplify, let's ignore the neuter pronoun 'it' and the animacy part of the gender features.

(37) a. $[\text{he}_i]^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is male in } s \\ \text{is undefined} & \text{otherwise} \end{cases}$
 b. $[\text{she}_i]^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is female in } s \\ \text{is undefined} & \text{otherwise} \end{cases}$

- Evidence: gender inferences triggered by pronouns show characteristic features of presuppositions.
 - They give rise to the felicity conditions, e.g. (35)-(36).
 - They project in an expected manner (see Cooper 1983 and Yanovich (2010) for some complications).

- (38) a. I don't think that she lives in Paris.
 b. Does she live in Paris?
 c. If she lives in Paris, I will visit her.

All these sentences presuppose that the referent of 'she' is female.

- Phi-features on bound pronouns.

- (39) a. Every boy⁹ likes **his**₉ mother.
 b. Every girl¹ likes **her**₁ mother.

- (40) a. #Every boy³ likes **her**₃ mother.
 b. #Every girl⁷ likes **his**₇ mother.

The gender presupposition triggered on the bound pronoun 'her' becomes the presupposition of the predicate 'called her mother' that the subject is female.

- Lexical entries (We won't analyze the internal structure of 'her mother'. Also, we ignore the presupposition of the possessive construction).

- (41) a. $\llbracket \mathbf{her}_1 \mathbf{mother} \rrbracket^{s,g} = \begin{cases} = g(i)'s \text{ mother} & \text{if } g(i) \text{ is female in } s \\ \text{is undefined} & \text{otherwise} \end{cases}$
 b. $\llbracket \mathbf{likes} \rrbracket^{s,g} = \lambda y_e. \lambda x_e. 1 \text{ iff } x \text{ likes } y \text{ in } s$

- When can we combine these two? For any s and g ,

$$\left[\left[\begin{array}{c} \mathbf{VP} \\ \mathbf{likes} \mathbf{her}_1 \mathbf{mother} \end{array} \right] \right]^{s,g} \text{ is defined iff } \begin{array}{l} \llbracket \mathbf{her}_1 \mathbf{mother} \rrbracket^{s,g} \text{ is defined,} \\ \llbracket \mathbf{likes} \rrbracket^{s,g} \text{ is defined,} \\ \text{and } \llbracket \mathbf{likes} \rrbracket^{s,g}(\llbracket \mathbf{her}_1 \mathbf{mother} \rrbracket^{s,g}) \text{ is defined} \end{array} \\ \text{iff } g(1) \text{ is female in } s$$

When defined,

$$\begin{aligned} \left[\left[\begin{array}{c} \mathbf{VP} \\ \mathbf{likes} \mathbf{her}_1 \mathbf{mother} \end{array} \right] \right]^{s,g} &= \llbracket \mathbf{likes} \rrbracket^{s,g}(\llbracket \mathbf{her}_1 \mathbf{mother} \rrbracket^{s,g}) \\ &= [\lambda y_e. \lambda x_e. 1 \text{ iff } x \text{ likes } y \text{ in } s](g(1)'s \text{ mother}) \\ &= \lambda x_e. 1 \text{ iff } x \text{ likes } g(1)'s \text{ mother in } s \end{aligned}$$

- Let's put the binder index above this:

$$\begin{aligned} &\left[\left[\begin{array}{c} \mathbf{VP} \\ \mathbf{likes} \mathbf{her}_1 \mathbf{mother} \end{array} \right] \right]^{s,g} \\ &= \lambda z_e : \llbracket \mathbf{VP} \rrbracket^{s,g[1 \rightarrow z]} \text{ is defined and } \llbracket \mathbf{VP} \rrbracket^{s,g[1 \rightarrow z]}(z) \text{ is defined. } \llbracket \mathbf{VP} \rrbracket^{s,g[1 \rightarrow z]}(z) \\ &= \lambda z_e : g[1 \rightarrow z](1) \text{ is female in } s. \llbracket \mathbf{VP} \rrbracket^{s,g[1 \rightarrow z]}(z) \\ &= \lambda z_e : z \text{ is female in } s. \llbracket \mathbf{VP} \rrbracket^{s,g[1 \rightarrow z]}(z) \\ &= \lambda z_e : z \text{ is female in } s. [\llbracket \lambda x_e. 1 \text{ iff } x \text{ likes } g[1 \rightarrow z](1)'s \text{ mother in } s \rrbracket](z) \\ &= \lambda z_e : z \text{ is female in } s. 1 \text{ iff } z \text{ likes } g[1 \rightarrow z](1)'s \text{ mother in } s \\ &= \lambda z_e : z \text{ is female in } s. 1 \text{ iff } z \text{ likes } z's \text{ mother in } s \end{aligned}$$

– So the gender presupposition became the presupposition of the predicate.

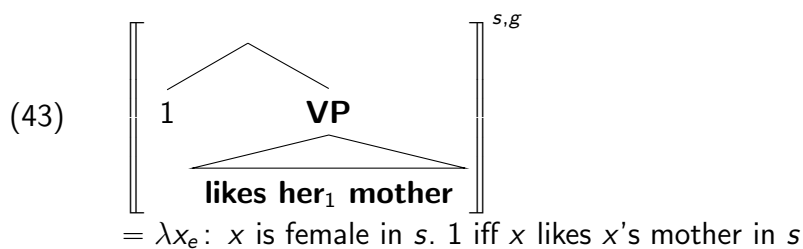
- It's easy to incorporate the animacy in a similar way:

$$(42) \quad \begin{array}{l} \text{a. } \llbracket \mathbf{he}_i \rrbracket^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is animate and male in } s \\ \text{is undefined} & \text{otherwise} \end{cases} \\ \text{b. } \llbracket \mathbf{she}_i \rrbracket^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is animate and female in } s \\ \text{is undefined} & \text{otherwise} \end{cases} \\ \text{c. } \llbracket \mathbf{it}_i \rrbracket^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is inanimate in } s \\ \text{is undefined} & \text{otherwise} \end{cases} \end{array}$$

(This might not be satisfactory for cases where the referents are animals, babies, ships, etc. We'll discuss these complications in Section 4)

SECTION SUMMARY

- Gender features are presupposition triggers, e.g. (42).
- The gender presuppositions of bound pronouns are inherited by larger phrases.



3 Unmarked Features and Anti-Presuppositions

3.1 Unmarked Features

- The presuppositional semantics for gender features:

$$(44) \quad \begin{array}{l} \text{a. } \llbracket \mathbf{he}_i \rrbracket^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is male in } s \\ \text{is undefined} & \text{otherwise} \end{cases} \\ \text{b. } \llbracket \mathbf{she}_i \rrbracket^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is female in } s \\ \text{is undefined} & \text{otherwise} \end{cases} \end{array}$$

- Here's an interesting difference between 'he' and 'she':

(45) SITUATION: There are both male and female students.

- Every student⁸ likes his₈ mother.
- #Every student⁴ likes her₄ mother.

- More generally, when the domain of quantification contains both male and female individuals, *he* can be used but *she* cannot.
- Caveat: In many contemporary dialects of English, (45a) is also infelicitous (cf. 'his or her' or 'singular *they*').

- In more ‘sexist’ languages like French, the contrast is clearer. (In French nouns are also gender marked, which impose independent felicity conditions, but luckily, there are gender neutral noun like *élève* ‘pupil’.)

(46) *French*

- Chaque élève pense qu’ **il** est intelligent.
each pupil thinks that he.MASC is smart.MASC
‘Each pupil thinks that he is smart.’
- Chaque élève pense qu’ **elle** est intelligente.
each pupil thinks that she.FEM is smart.FEM
‘Each pupil thinks that she is smart.’

- From our symmetric analysis of [masculine] and [feminine], the contrast is unexpected.

- What exactly are the predictions?

- Generally, when we combine a universal quantifier like *every student* and a presuppositional predicate, we get a **universal presupposition** that every student satisfies the presupposition of the predicate.

- (47)
- Every student stopped smoking.
(Presupposition: Every student was smoking)
 - Every student forgot to call Mary.
(Presupposition: Every student was supposed to call Mary)
 - Every student likes both of his sisters.
(Presupposition: Every student has exactly two sisters)

- Why presuppositions project universally through ‘every student’ is actually not so easy to account for. Suffice it to say that that’s how presuppositions behave.

- Then, (45a) should presuppose that every student is male and (45b) should presuppose that every student is female.

- This accounts for the infelicity of (45b), but why is (45a) felicitous??

- It looks like [masculine] is not interpreted in (47a). Let’s pursue this hypothesis.

3.2 Maximize Presupposition and Anti-Presupposition

- **Proposal:** [masculine] is semantically empty (this idea is originally due to Percus 2006; see also Heim 2008, Sauerland 2008).

- (48)
- $[[\mathbf{he}_i]]^{s,g} = g(i)$
 - $[[\mathbf{she}_i]]^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is female in } s \\ \text{is undefined} & \text{otherwise} \end{cases}$

- This accounts for the following data:

(49) SITUATION: There are both male and female students.

- Every student⁸ likes his₈ mother.
- #Every student⁴ likes her₄ mother.

(50) a. Every boy⁶ likes his₆ mother.

- #Every boy² likes her₂ mother.

- But now we overgenerate for the following:

- (51) a. #Every girl¹ likes his₁ mother.
 b. Every girl² likes her₂ mother.

If 'his mother' has no presuppositions, (51a) should be fine along with (51b).

- Percus (2006) and Heim (2008) resort to the following principle to account for the infelicity of (51a) (the idea is originally due to Heim 1991):³

- (52) *Maximize Presupposition* (informal)
 Suppose declarative sentences ϕ and ψ are 'alternatives' to each other. If ϕ and ψ 'mean the same thing' except that ψ has more presuppositions, and if both $\llbracket\phi\rrbracket^{s,g}$ and $\llbracket\psi\rrbracket^{s,g}$ are defined, then ϕ is infelicitous with respect to s and g .

The idea is that you prefer to use a **presuppositionally stronger** sentence ψ whenever possible.

- (53) *Maximize Presupposition* (formal)
 Suppose ψ is an alternative sentence of ϕ . If all of the following are true, ϕ is infelicitous with respect to situation s and assignment function g :
- $\{s' : \llbracket\psi\rrbracket^{s',g} \text{ is defined}\} \subset \{s' : \llbracket\phi\rrbracket^{s',g} \text{ is defined}\}$
 (i.e. ψ has more presuppositions)
 - For all situations s' such that $\llbracket\psi\rrbracket^{s',g}$ (and $\llbracket\phi\rrbracket^{s',g}$) is defined, $\llbracket\phi\rrbracket^{s',g} = \llbracket\psi\rrbracket^{s',g}$
 (i.e. modulo presuppositions, ϕ and ψ mean the same)
 - $\llbracket\psi\rrbracket^{s,g}$ is defined

(It's crucial that ϕ and ψ are alternatives of each other. We'll simply assume that two sentences are alternatives if one can be derived from the other by substitution of a terminal node. But see Percus 2006 for more complicated cases.)

- Let's apply this to our example:

- (54) a. #Every girl¹ likes his₁ mother.
 b. Every girl² likes her₂ mother.

– (54a) has no gender presupposition, (54b) presupposes that all the girls are female, which is true in any situation.

– These two sentences mean the same thing modulo the presupposition. That is, whenever defined, they are true iff all the girls like their own mothers.

– Consequently, (54a) is always infelicitous.

- By the same token, we can explain (55).

- (55) SITUATION: There are only female students.
 a. #Every student⁸ likes his₈ mother.
 b. Every student⁴ likes her₄ mother.

In this particular situation, (55b) is true, so it must be used.

³Advanced topics on Maximize Presupposition: See the discussion in Percus (2006) and Singh (2011) for the projection problem for Maximize Presupposition; For the pragmatics of this principle, see Chemla (2008) and Schlenker (2011).

- The present analysis works for free pronouns too.

(56) SITUATION: Pointing to Marie,

- a. #He is French.
- b. She is French.

- (56a) has no presupposition. (56b) presupposes that Marie is female, which is true.
- (56a) and (56b) mean the same thing modulo the presupposition: they are true iff Marie is French.
- Therefore (56a) is infelicitous.

- Consequently, a masculine pronoun can only be used when the gender presupposition of the corresponding sentence with a feminine pronoun is not met. Such an inference is sometimes called an **anti-presupposition**.⁴

- Crucially, the anti-presupposition of a masculine pronoun is different from the requirement that the referent be not female.

- Let's consider the following imaginary pronoun:

$$(57) \quad \llbracket \mathbf{he}^* \rrbracket^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is not female in } s \\ \text{is undefined} & \text{otherwise} \end{cases}$$

- The following sentence without a bound pronoun should be infelicitous:

(58) SITUATION: There are male and female students.
 (#)Every student³ likes his₃^{*} mother.

The actual masculine pronoun is fine in this sentence (in the relevant context).

- We also observe that in a situation where the gender of the referent is not known, a free pronoun 'he' can be used.

(59) I'm reviewing an anonymous abstract. I don't know who wrote it, but **he** must be a famous linguist.

- Our account with anti-presuppositions explains this use too.
- Because the presupposition of the feminine pronoun 'she' is not met, i.e. we do not know if the referent of the pronouns is female in this situation, so it cannot be used.
- Consequently, the masculine pronoun can be used.

- What about animacy? Which of 'he' and 'it' is unmarked? In order to test this, we need a noun that applies to both animate and inanimate objects. Here's an attempt:⁵

(60) SITUATION: Some shareholders are individual investors, some are companies and institutions.

- a. $\langle \rangle$ Every shareholder³ lost **his**₃ equity.
- b. $\langle \rangle$ Every shareholder³ lost **its**₃ equity.

If both of them are infelicitous, that means that both [+animate] and [–animate] are semantically active, i.e.

⁴Sauerland (2008) uses the term *implicated presupposition*.

⁵Thanks for Philippe Schlenker (p.c.) for the idea.

- (61) a. $\llbracket \text{he}_i \rrbracket^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is animate in } s \\ \text{is undefined} & \text{otherwise} \end{cases}$
- b. $\llbracket \text{she}_i \rrbracket^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is animate and female in } s \\ \text{is undefined} & \text{otherwise} \end{cases}$
- c. $\llbracket \text{it}_i \rrbracket^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is inanimate in } s \\ \text{is undefined} & \text{otherwise} \end{cases}$

- More examples of anti-presuppositions:

– Singular *the* vs. *a*

- (62) a. I read the book that John wrote.
(Presupposition: There is a unique book that John wrote)
- b. I read a book that John wrote.
(Anti-presupposition: It is false or unknown that there is a unique book that John wrote)

– *know* vs. *think*

- (63) a. John knows that I have a sister.
(Presupposition: I have a sister)
- b. John thinks that I have a sister.
(Anti-presupposition: It is false or unknown that I have a sister)

If it is known that I have a sister, (63a) should be used. You tend to infer from (63b) that I do not have a sister.

– *both* vs. *all*

- (64) a. Both of my laptops costed more than \$1000.
(Presupposition: I have exactly two laptops)
- b. All of my laptops costed more than \$1000.
(Anti-presupposition: It is false or unknown that I have exactly two laptops)

(64b) suggests that I have three or more laptops.

3.3 Singular ‘They’

- In many dialects of English, ‘they’ can be used with singular referents:

- (65) SITUATION: There are male and female students.
- a. %Every student⁵ likes **his**₅ mother.
- b. #Every student⁵ likes **her**₅ mother.
- c. Every student⁵ likes **their**₅ mother.

- It’s not always licensed:

- (66) a. #Every boy⁵ likes **their**₅ mother.
- b. #Every girl⁵ likes **their**₅ mother.

- Singular ‘they’ can also be found when the gender of the referent is not known.

- (67) I’m reviewing an anonymous abstract. I don’t know who wrote it, but **they** must be a famous linguist.

- We can understand the restrictions as follows: singular ‘they’ can be used, when the versions of the sentence with ‘she’ or ‘he’ (or ‘it’) are infelicitous. This can be explained as an anti-presupposition.

– For these dialects, [masculine] is interpreted.

– We also need to talk about number features. Let’s naively assume that [singular] requires that the referent is just one individual (we’ll talk about number features in more detail on Day 4).

$$(68) \quad \begin{array}{l} \text{a. } \llbracket \mathbf{he}_i \rrbracket^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is one individual and male in } s \\ \text{is undefined} & \text{otherwise} \end{cases} \\ \text{b. } \llbracket \mathbf{she}_i \rrbracket^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is one individual and female in } s \\ \text{is undefined} & \text{otherwise} \end{cases} \end{array}$$

– We assume that ‘they’ has no presuppositions.

$$(69) \quad \llbracket \mathbf{they}_i \rrbracket^{s,g} = g(i)$$

– Due to Maximize Presupposition, ‘they’ can only be used when ‘he’ or ‘she’ cannot be used.

- Bound use:

(70) SITUATION: There are male and female students.

- #Every student⁷ likes **his**₇ mother.
- #Every student⁷ likes **her**₇ mother.
- Every student⁷ likes **their**₇ mother.

(71) a. #Every boy⁷ likes **their**₇ mother.
b. Every boy⁷ likes **his**₇ mother.

(72) a. #Every girl⁷ likes **their**₇ mother.
b. Every girl⁷ likes **her**₇ mother.

The same for number:

(73) a. #[One or two boys]¹⁰ like **his**₁₀ mother.
b. [One or two boys]¹⁰ like **their**₁₀ mother.

- Referential use: When the gender is not known:

(74) a. #I don’t know who wrote the abstract, but **he** must be a famous linguist.
b. #I don’t know who wrote the abstract, but **they** must be a famous linguist.
c. I don’t know who wrote the abstract, but **they** must be a famous linguist.

Of course, when the referent is more than one individual, you have to use ‘they’:

(75) I have two sisters.
a. **They** are married.
b. #**She** is married.
c. #**He** is married.

‘They’ can also be used when the number of the referent is unknown.

(76) Apparently Mary got one or two papers published last year, but

- a. #I haven't read **it**.
- b. I haven't read **them**.

- 'He or she' has a similar distribution as singular *they*, except for number. We can give a similar analysis:

$$(77) \quad \llbracket [\text{he or she}]_i \rrbracket^{s,g} \begin{cases} = g(i) & \text{if } g(i) \text{ is animate in } s \\ \text{is undefined} & \text{otherwise} \end{cases}$$

(Further question: How should we analyze the meaning of 'or'?)

4 Grammatical Gender

- How does grammatical gender fit in the picture?

(78) *French*

Pierre a une chaise Louis XV. **Elle** est belle.
 Pierre has a.FEM chair Louis XV. she.FEM is beautiful.FEM

'Pierre has a Louis the 15th chair. It is beautiful.'

(adapted from Wechsler & Zlatić 2003:198)

Obviously, we don't want to say that the referent of 'elle' here (a chair) is female.

- French has two genders, [feminine] and [masculine]. The masculine pronoun 'il' would be infelicitous in the same context.

(79) *French*

Pierre a une chaise Louis XV. #**Il** est beau.
 Pierre has a.FEM chair Louis XV. he.MASC is beautiful.MASC

- In some languages you can find a context where both grammatical and natural gender make sense.

- (80) a. The ship lurched, and then **it** righted **itself**.
 b. The ship lurched, and then **she** righted **herself**.

(adapted from Wechsler & Zlatić 2003:6)

Again, for (80b), we don't want to say that the ship is female.

Another example from Serbian/Croatian:

(81) *Serbian/Croatian*

Ovo malo devojče je ušlo.
 this.NEU.SG little.NEU.SG girl.NEU.SG AUX.3SG entered.NEU.SG

a. **Ono** je htelo da telefonira.
 it.NEU.SG AUX.SG wanted.NEU.SG that telephone.3SG

b. **Ona** je htela da telefonira.
 she.FEM.SG AUX.SG wanted.FEM.SG taht telephone.3SG

'This little girl came in. She wanted to use the telephone.'

(Wechsler & Zlatić 2003:13)

- Grammatical gender matters for bound pronouns too.

(82) *German*

Jedes Kind³ definierte **seine**₃ Ziele.
 every.NEU child defined its.NEU goals

'Every child defined his or her goals.'

(Angelika Kratzer, p.c.)

(83) *Greek*

a. Kathe koritsi² diakosmise to dhomatio **tis**₂.
 every girl.NEU decorated the room her.FEM
 'Every girl decorated her room.'

b. Kathe koritsi² diakosmise to dhomatio **tu**₂.
 every girl.NEU decorated the room it.NEU
 'Every girl decorated her room.'

(adapted from Spathas 2010:222)

- Let's pursue a semantic account of grammatical gender (cf. Dowty & Jacobson 1989). Our hypothesis is that grammatical gender features are also presupposition triggers, but their presuppositions refer to a contextually salient NP.

(84) $[[\text{elle}_i]]^{s,g}$

$$\left\{ \begin{array}{l} = g(i) \quad \text{if } g(i) \text{ is female or,} \\ \quad \quad \quad \text{there is a salient NP headed by a feminine noun} \\ \quad \quad \quad \text{such that } [[\text{NP}]]^{s,g}(g(i)) = 1 \\ \text{is undefined} \quad \text{otherwise} \end{array} \right.$$

- When the referent is female animate, you can use 'elle' no matter what.
- In the case of 'grammatical gender', we need a salient feminine noun. In the above example, 'chaise' is a salient noun with [feminine] that is true of the referent.
- (We take for granted that nouns (can) have gender features; We'll return to this on the final day)

- We need to say the NP must be salient: two nouns with the same meaning but with different genders.

- A good case: Dutch has two nouns for 'bicycle': *fiets* (masculine), *rijwiel* (neuter).

(85) *Dutch*

De fiets staat in de tuin. **Hij** is kapot. Jan zet het
 the bicycle.MASC stands in the garden. It.MASC is defective. Jan puts the
 rijwiel op z'n kop, voorzichtig, want **het** heeft handremmen.
 bicycle.NEU on its head, carefully, because it.NEU has brakes.

'The bicycle (masculine) is standing in the garden. It (masculine) is defective. Jan puts the bicycle (neuter) upside down, carefully, because it (neuter) has brakes.'

(Dowty & Jacobson 1989:99 attributed to Landmann 1986)

– A bad case: German has two nouns for ‘car’, *Auto* (neuter) and *Wagen* (masculine).

(86) *German*

- a. #Ich kaufte ein neues Auto. **Er** war teuer.
 I bought a.NEU new.NEU car.NEU. It.MASC was expensive.
 ‘I bought a new car(neuter). It (masculine) was expensive.’
- b. (pointing to a car)
 #**Es** war teuer, aber **er** fährt schnell.
 ‘It (neuter) was expensive, but it (masculine) runs fast.’

(Dowty & Jacobson 1989:99)

- A minor variant of this analysis is that the natural gender also refers to an NP.

(87) $[[\text{she}_i]]^{s,g}$

$$\left\{ \begin{array}{l} = g(i) \quad \text{if } [[\text{female}]]^{s,g}(g(i)) = 1 \text{ or,} \\ \quad \quad \quad \text{there is a salient NP headed by a feminine noun} \\ \quad \quad \quad \text{such that } [[\text{NP}]]^{s,g}(g(i)) = 1 \\ \text{is undefined} \quad \text{otherwise} \end{array} \right.$$

According to this view, all gender features are *meta-linguistic* in the sense that they refer to linguistic expressions. And ‘natural gender’ is special because the ‘gender’ nouns (‘female’, ‘male’ and ‘neuter’) are always salient.

- In English, there is generally a choice for animals:

- (88) a. That dog is so ferocious, **it** even tried to bite **itself**.
 b. That dog is so ferocious, **he** even tried to bite **himself**.

(Pollard & Sag 1994:73)

– Analysis: The class of English neuter nouns includes animal denoting nouns like ‘dog’, so (88a) is licensed, along with (88b).

– Similar analysis for feminine nouns will account for (89).

- (89) a. John bought a boat. He named **her** ‘Elizabeth’.
 b. At one time, according to Sir George H. Darwin, the Moon was very close to the Earth. Then the tides gradually pushed **her** far away: the tides that the Moon **herself** causes in the Earth’s waters, where the Earth slowly loses energy.
 (‘The Distance of the Moon’ by Italo Calvino)

– (So English noun classes are determined on semantic grounds with no morphological clues.)

- Our presuppositional analysis accounts for cases without explicitly mentioned nouns (cf. surface anaphora):

(90) *French*

CONTEXT: At an open-air swimming pool in southwest France. A customer, on entering the reception area, to myself, who was just leaving:

Elle est froide?
 she.FEM.SG is cold.FEM

‘Is it (i.e. water) cold?’ (Cornish 1999:131 cited in Wechsler & Zlatić 2003:202)

- (91) *Serbian/Croatian*
 CONTEXT: Speaker comes home to find her bookcase mysteriously empty.
 a. Gde su (one) nestale?
 Where did (they.FEM.PL) disappear.FEM.PL
 'Where did they (i.e. the books) go?' (*kfjiga* 'book (feminine)')
 b. #Gde su (oni) nestali?
 Where did (they.MASC.PL) disappear.MASC.PL
 (Wechsler & Zlatić 2003:202f)

These cases are problematic for our account given the fact that presuppositions can sometimes be used in an informative way.

- (92) SITUATION: A sees an old friend with an infant in her arms.
 A: Is this your baby?
 B: Yes. **Her** name is Sarah.

- (93) A: Why is John chewing on his pen?
 B: He recently **stopped smoking**.

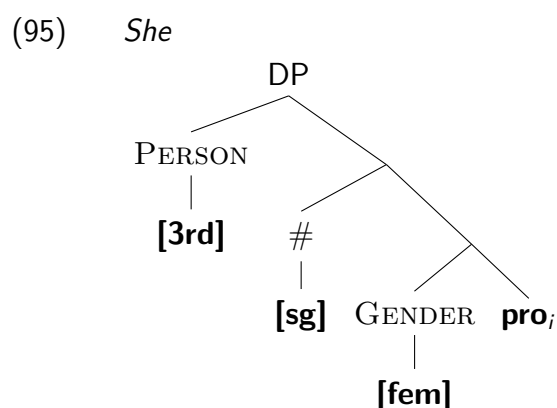
- (94) Sorry, I'll be late today. **Both** of my daughters are sick.

This is called **presupposition accommodation** (see Beaver & Zeevat 2007 for an overview).

What's going on with the above cases can be analyzed as presupposition accommodation of the existence of a salient noun phrase with an appropriate gender.

5 Excursus: Nano-Syntactic Analysis of Pronouns

- We assumed above that pronouns are syntactically simplex, and phi-features are encoded in their lexical entries.
- Alternatively, we can assume that pronouns are syntactically complex, and phi-features are introduced by independent heads (an idea due to Heim & Kratzer 1998; see also Heim 2008).
- Here's an illustration (the order of phi-features could be different).



- *pro* is the 'pronominal core' (or just the referential index *i*).
- the morphological component translates (95) as 'she' (if (95) has nominative Case, which might also be in an independent Case head).

- Assuming that all the features are presupposition triggers:

- (96) a. $[[\text{pro}_i]]^{s,g} = g(i)$
 b. $[[\text{fem}]]^{s,g} = \lambda x: x \text{ is female in } s. x$
 c. $[[\text{sg}]]^{s,g} = \lambda x: x \text{ is an atomic individual in } s. x$
 d. $[[\text{3rd}]]^{s,g} = \lambda x: x \text{ does not contain the speaker or hearer in } s. x$

- In order for $[[\text{DP}]]^{s,g}$ to be defined, $g(i)$ must be an atomic female individual in s that is distinct from the speaker or the hearer of s .

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