

# Discourse

## BSc Artificial Intelligence, Spring 2011

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# Plan for Today

- Presupposition
- Topics for final projects

# What's a presupposition?

A presupposition is **background information** that is **taken for granted**. But not any kind of background information ...

## Background information, but not presuppositions in the technical senses

John wrote Harry a letter, presupposing he could read.

The theory of evolution presupposes a vast time scale.

Adolph addressed the butler as "sir", presupposing he was the host Sir Ansel himself

## Presuppositions

Martha regrets drinking John's home brew.  $\rightsquigarrow$  Martha drank John's home brew.

Confirm your eBay transaction (*spam email*).  $\rightsquigarrow$  you have done an eBay transaction

Carter returned to power.  $\rightsquigarrow$  Carter held power before.

Technically, a presupposition of an utterance  $U$  is background information that:

- must be assumed by the speaker and the addressee of  $U$  for  $U$  to be considered appropriate in a context;
- is associated with a specific lexical item or construction in  $U$ ;
- will remain a necessary assumption even if  $U$  is negated.

# Presupposition vs. Entailment

Presuppositions behave differently from entailments and in that sense they are not part of the *regular* meaning of a sentence.

- **Semantic entailment:**  $A$  entails  $B$  ( $A \models B$ ) iff every situation that makes  $A$  true makes  $B$  true.

Mary's dog was killed in an accident

$\models$  Mary's dog is dead

$\rightsquigarrow$  Mary has a dog

Mary's dog was **not** killed in an accident

$\not\models$  Mary's dog is dead

$\rightsquigarrow$  Mary has a dog

John managed to stop in time

$\models$  John stopped in time

$\rightsquigarrow$  John tried to stop in time.

John **didn't** managed to stop in time

$\not\models$  John stopped in time

$\rightsquigarrow$  John tried to stop in time

- One way to define **presupposition** is thus as follows:

$A$  presupposes  $B$  iff

- \* in all situations where  $A$  is true,  $B$  is true
- \* in all situations where  $A$  is false,  $B$  is true

# Presupposition Triggers (1)

Where do presuppositions come from? Researchers have identified a long list of presupposition triggers. Here are some of them:

- **Definite descriptions and proper names**

John saw **the** man with two heads.

↪ there exists someone called John / there exists a man with two heads.

**The** couple that won **the** dance contest was please.

↪ there was a dance contest / there is a couple that won it

- **Possessive case**

Marta's dog is tiny. ↪ Marta has a dog.

Jody loves **her** husband. ↪ Jody has a husband / is married.

- **Factive / implicatives/ change of state verbs**

Vincent **regrets/knows/realized** that Mia is married. ↪ Mia is married

John **forgot** to open the door. ↪ John ought to / intended to lock.

John **stopped / continued** drinking. ↪ John had been drinking.

# Presupposition Triggers (2)

- **Iteratives**

Sue took the class **too**.  $\rightsquigarrow$  Someone else took the class  
I would do it **again**  $\rightsquigarrow$  I did it before

- **Questions**

**Who** broke the window?  $\rightsquigarrow$  Someone broke the window.

**Where** / **Why** did you murder Prof. Jones?  $\rightsquigarrow$  you murdered Prof. Jones

- **Comparisons and contrasts**

Marianne called Adolph a male chauvinist, and then **HE** insulted **HER**.

$\rightsquigarrow$  For Marianne to call Adolph a male chauvinist would be to insult him.

Carol **is a better** linguist **than** Barbara.  $\rightsquigarrow$  Barbara is a linguist.

For more lexical items and constructions that are typically considered presupposition triggers see, e.g., the Presupposition entry in the Stanford Encyclopedia of Philosophy:

<http://plato.stanford.edu/entries/presupposition/>

# Presupposition Projection

If a complex sentence contains presupposition triggers, are the presuppositions inherited by the complex sentence (*projected*)?

The **projection problem**: presuppositions survive in some contexts where entailments do not, but they disappear in some other contexts.

These are the main **projection tests** to check whether something is a presupposition:

- **Negation**: if  $S$  presupposes  $P$ , then  $\neg S$  presupposes  $P$  as well.
- **Questions**: if  $S$  presupposes  $P$ , then  $P$  is a presupposition of the interrogative version of  $S$  as well.

Ed realizes that it is Wednesday.  
 $\rightsquigarrow$  It is Wednesday

**N**: Ed doesn't realize that it is Wednesday.  
**Q**: Does Ed realize that it is Wednesday?  
 $\rightsquigarrow$  It is Wednesday

# Presupposition Projection

- **Conditionals**

- \* If  $p$  is a presupposition of sentence  $S$ , then  $p$  is a presupposition of any sentence of the form *if  $S$ , then  $S'$* .

If Sam stopped smoking, then his marathon time should improve.

$\rightsquigarrow$  Sam used to smoke.

- \* If  $p$  is a presupposition of sentence  $S'$  and  $p$  is entailed by sentence  $S$ , then  $p$  is **not** a presupposition of any sentence of the form *if  $S$ , then  $S'$* .

If Sam once smoked, then he has stopped smoking.

$\not\rightarrow$  Sam used to smoke.

Since the presupposition itself is hypothetical (stated in the antecedent of the conditional) it can't be taken for granted.

The latter example shows that in some contexts presuppositions do not project. There are other context in which presuppositions are cancelled. . .



# Presupposition Cancellation

Presuppositions are defeasible. Unlike entailments, they can be overtly denied:

John didn't manage to pass his exam

$\rightsquigarrow$  John tried to pass his exam.

$\models$  John didn't pass his exam.

John didn't manage to pass his exam, in fact he didn't even try. ✓

John didn't manage to pass his exam, in fact he passed it. ✗

[it is not the case that he didn't pass it]

Sometimes background knowledge cancels a presupposition.  
Consider the following example:

Sue cried before she finished her thesis.

$\rightsquigarrow$  Sue finished her thesis

Sue died before she finished her thesis.

$\not\rightsquigarrow$  Sue finished her thesis

Here the entailments of the sentence (event precedence) and background assumptions (about what is possible after death) clash with the presupposition, which leads to cancellation.

# Accommodation

Presuppositions need to be compatible with the background assumptions of the interlocutors.

- If a presupposition is compatible with the hearer's knowledge but not yet part of it, a hearer will tend to add it – **accommodate** it.
- For instance, the following sentence is felicitous even if the presupposition is not part of the knowledge of the hearer:

Sorry, I'm late. My son was ill this morning.  $\rightsquigarrow$  the speaker has a son.

However, not all presupposition allow easy accommodation:

John had dinner in New York last night, too.

$\rightsquigarrow$  someone else had dinner in NY last night. [*surely part of anyone's knowledge* ]

What seems to be needed for the sentence to be felicitous is that *somebody relevant to the interlocutors* had dinner in New York last night, and that this has been mentioned in the previous discourse.

# Presuppositions in DRT

How can we deal with presupposition within the DRT framework?  
The best well-known approach is due to Rob van der Sandt.

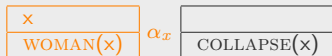
Van der Sandt (1992) Presupposition projection as anaphora resolution. *Journal of Semantics*, 9/4: 333–377.

Geurts and Beaver (2007) Discourse Representation Theory, in Ed N. Zalta (ed.), *The Stanford Encyclopedia of Philosophy*. <http://plato.stanford.edu/entries/discourse-representation-theory/>

Bos (2003) Implementing the binding and accommodation theory for anaphora resolution and presupposition projection, *Computational Linguistics*, 29(2): 179–210

- Like pronouns, presuppositions are **anaphoric expressions**: they require the presence of an antecedent in the discourse context.
- Presuppositions have more descriptive content than pronouns, and hence do not only introduce discourse referents, but full **DRSs** that include conditions.
- B&B (Bos 2003) mark presuppositional DRSs with an  $\alpha$  operator:

the woman collapses  $\rightsquigarrow$  **there is a woman**



# Presupposition Triggers in Prolog

The implementation uses the `alfa` operator (that we used to mark pronouns) to mark presupposition triggers in the lexicon and indicate what they presuppose. These are the macros for personal pronouns, the definite article, and possessive pronouns:

## Semantic Macros in `SemLexPresupDRT.pl`

```
semLex(pro,M):-
  M = [symbol:Sym,
       sem:lam(P,alfa(pro,drs([X],[pred(Sym,X)]),app(P,X)))].

semLex(det,M):-
  M = [type:def,
       num:sg,
       sem:lam(U,lam(V,alfa(def,merge(drs([X],[ ]),app(U,X)),app(V,X))))].

semLex(det,M):-
  M = [type:poss(Symbol),
       num:sg,
       sem:lam(U,lam(V,alfa(pro,drs([Y],[pred(Symbol,Y)]),
                                alfa(def,merge(drs([X],[rel(of,X,Y)]),app(U,X)),app(V,X)))))].
```

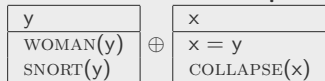
# Presupposition Resolution

Once we have computed the presuppositions of a sentence (taking into account the information in the lexicon and using semantic composition), we need to resolve them.

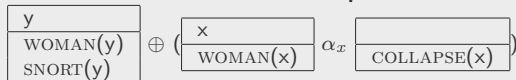
This can be done via **binding** (linking) or **accommodation**.

Binding is equivalent to pronouns resolution: for each  $\alpha$ -DRS, we need to find an antecedent that is structurally accessible and compatible, and bind the anaphoric referent to the antecedent.

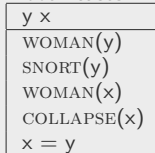
**A woman snorts. She collapses**



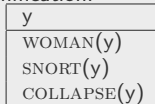
**A woman snorts. The woman collapses**



Result in both cases:



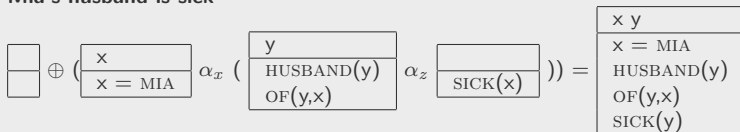
After unification:



# Accommodation

If a presupposition cannot be bound to an accessible antecedent, we may resort to accommodation: we simply add the presupposed information to the discourse context.

Mia's husband is sick



Accommodation follows certain constraints:

- Given the DRS structure, there may be several accommodation sites.
- Free variable check: accommodation should not lead to free discourse referents.
- Consistency: presuppositions need to be consistent with the other information conveyed by the sentence and with the previous discourse.
- Informativity: presuppositions should not be redundant, else there is no need to accommodate.

⇒ We'll discuss accommodation further in the next class.

# Implementation: Binding & Accommodation

The main level program is `presupDRT.pl`, which integrates both pronoun resolution and presupposition resolution.

- it first uses the grammar to build a representation that includes merge and alpha operators with `t/3`
- it then does merge reduction and pronoun/presupposition resolution with `resolveDrs/2` by binding alpha referents to accessible referents or, for presuppositions, performing accommodation when binding fails.

```
?- presupDRT:t([sem:Drs], [mia, loves, her, husband], []).
```

```
Drs = alfa(nam,drs([A],[pred(mia,A)]),alfa(pro,drs([X],[pred(female,X)]),  
alfa(def,merge(drs([B],[rel(of,B,X)]),drs([], [pred(husband,B)])),  
merge(drs([C],[pred(love,C),rel(agent,C,A),rel(patient,C,B),  
pred(nonreflexive,C)]),drs([], [pred(event,C)]))))).
```

```
?- presupDRT.
```

```
> Mia loves her husband.
```

```
1 drs([A,B,C],[pred(female,A),pred(mia,A),rel(of,B,A),  
pred(husband,B),pred(love,C),rel(agent,C,A),rel(patient,C,B),  
pred(nonreflexive,C),pred(event,C)])
```

## What's Next

- Next week (April 26) there will be no lecture.
- Get in touch with me by Friday 29 at the latest to discuss your preferences for a final project topic (send me an email or possibly make an appointment).
- On Tuesday 3 May, we will probably have a practical session – more details to be announced.
- Tuesday 10 May: wrap-up session, including report on your ongoing work in the projects.
- Friday 20 May: final projects due (written report + code, etc.).
- Monday 23 May: presentation of final projects.