

# Semantic Theory

## week 13 – Current issues in semantic theory

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Noortje Venhuizen

Universität des Saarlandes

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# Semantic Theory

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Topics covered in this course:

Predicate logic - Type Theory - Lambda Calculus -  
Generalised Quantifiers - Event Semantics - Dynamic  
Semantics - Discourse Representation Theory -  
Presuppositions - Distributed Situation-State Space



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# Open questions

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## I. What is meaning?

Truth-conditions vs. context-change potential  
vs. answering the Question Under Discussion



## II. Which phenomena should be captured by a semantic formalism?

Syntax vs. Semantics vs. Pragmatics



## III. How to validate predictions from formal semantic theories?

Experimental approaches, Computational Semantics



# Communication as question-answering

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The Goal of communication: to determine what the world is like.

But: an exhaustive characterisation of the current state of the world – “The Big Question” (Roberts, 1996) – is too big a task

- What makes certain issues more important to us than others has to do with our goals
- Therefore, we establish certain subgoals, which take the form of issues to be resolved or Questions Under Discussion (QUDs)
- Content that addresses the QUD is called *at-issue* content; all other content is *not at-issue*

# Inquisitive semantics

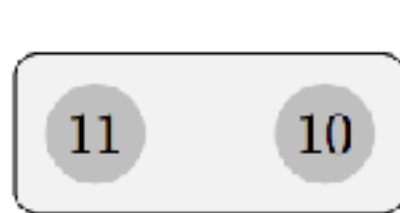


“Meaning is Information EXchange Potential”

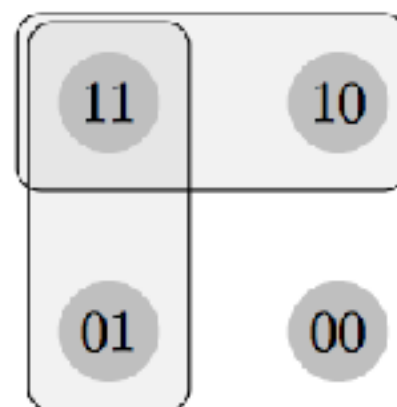
$$(1) \llbracket \text{John plays} \rrbracket^{M,w,g} := \{\lambda v. \text{play}(\text{John})(v)\} :: \langle s, t \rangle$$

$$(2) \llbracket \text{John or Bill plays} \rrbracket^{M,w,g} := \{\lambda v. \text{play}(\text{John})(v), \lambda v. \text{play}(\text{Bill})(v)\}$$

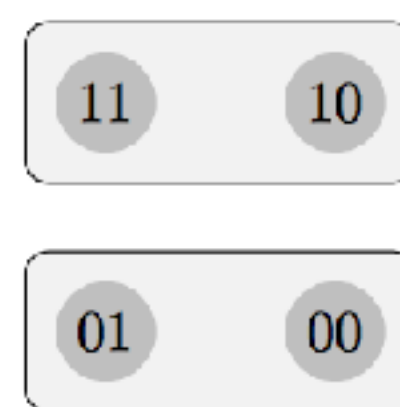
$$(3) \llbracket \text{Does John play?} \rrbracket^{M,w,g} := \{\lambda v. \text{play}(\text{John})(v), \lambda v. \neg \text{play}(\text{John})(v)\}$$



(a)  $\llbracket p \rrbracket$



(b)  $\llbracket p \vee q \rrbracket$



(c)  $\llbracket ?p \rrbracket$

(Groenendijk, 2009; Groenendijk & Roelofsen, 2009)

# Defining the playing field of semantic theory

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What can/should be captured in a semantic formalism?

The syntax-semantics interface:

- quantification, anaphora, tense and aspect, thematic roles, ...

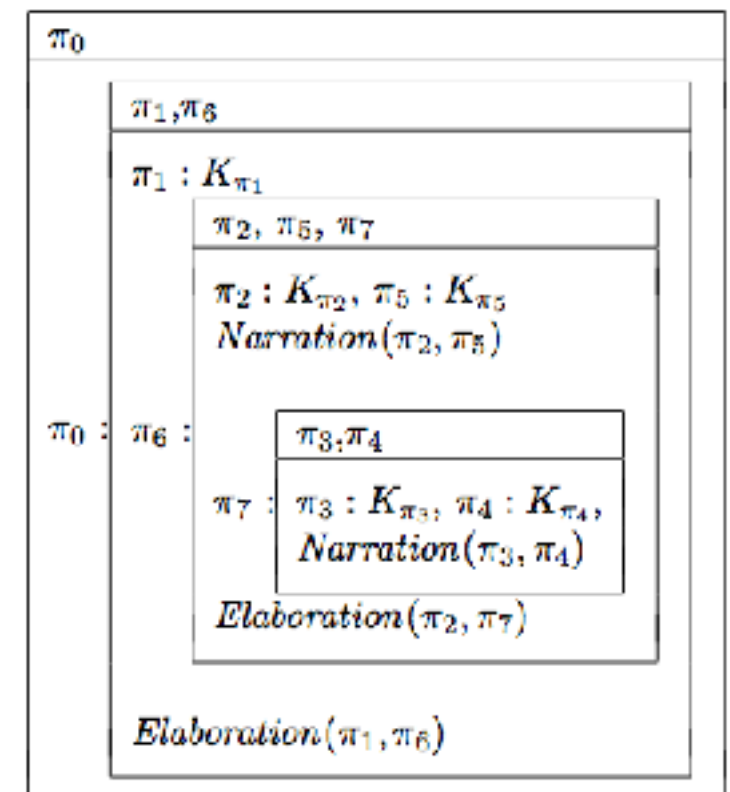
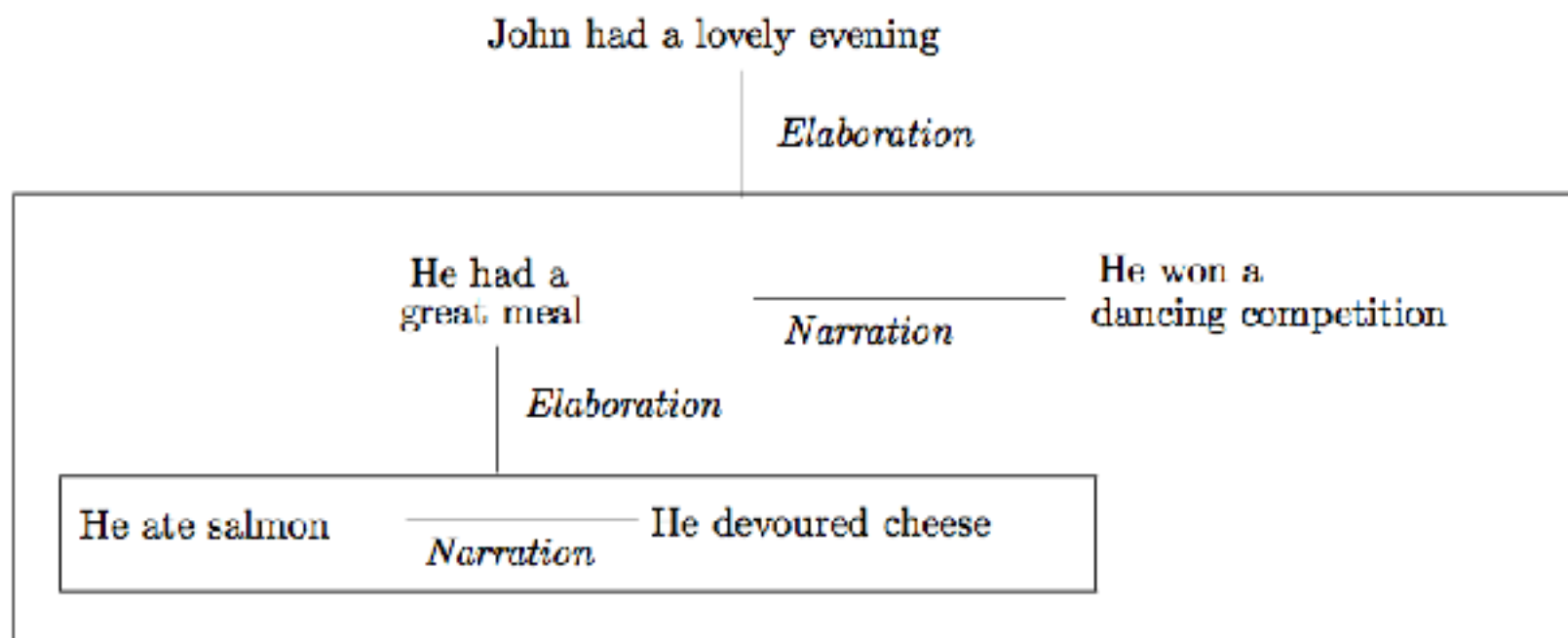
The semantics-pragmatics interface:

- rhetorical structure, implicature, presuppositions, information structure, ...

# Beyond truth-conditional meaning: Rhetorical Structure



(1) *John had a great evening last night. He had a great meal. He ate salmon. He devoured lots of cheese. He won a dancing competition. ??It was a beautiful pink.*



Segmented DRT: DRT with discourse relations

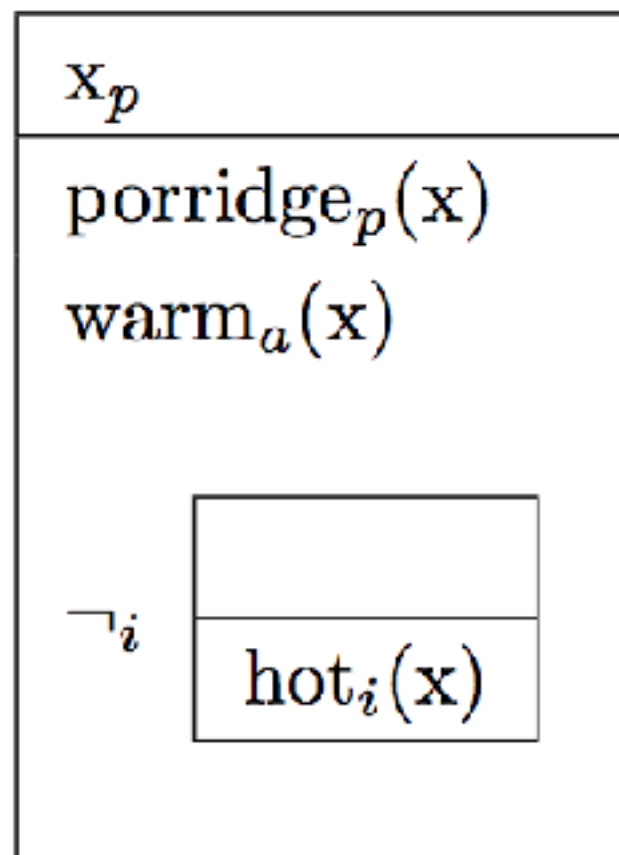
(Asher, 1992; Asher & Lascarides, 2003)

# Beyond truth-conditional meaning: Implicature



- (1) a. The porridge is warm. As a matter of fact, it is hot.  
b. ?The porridge is warm. As a matter of fact, it is cold.

Layered DRT: DRT with multiple layers of meaning



Geurts & Maier 2003; 2013



# Beyond truth-conditional meaning: Information structure



- (1) John has a sister. He visits her every week. → **assertion**
- (2) John visits his sister every week. → **presupposition**
- (3) John, who has a sister, visits her every week → **conventional implicature**

## Projective Discourse Representation Theory (PDRT): DRT with information structure



PDRT provides a unified, unidimensional treatment of asserted and projected content (including: presuppositions, anaphora, and *conventional implicatures*)

# Formal semantics in the real world

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How to apply and evaluate formal linguistic theories?

⇒ Testing predictions from formal semantic theories using psycholinguistic methods (questionnaires, eye-tracking, EEG)

- Geurts et al. (2010); Chemla et al. (2011); Florian Schwarz (ed., 2015), ...

⇐ Using implementations of semantic formalisms to perform large-scale computational semantic analyses

- PDRT-Sandbox (Brouwer & Venhuizen, 2013)
- Boxer (Bos, 2008)
- The Groningen Meaning Bank (Basile et al., 2013; Bos et al., 2015)

# Groningen Meaning Bank



Corpus of semantically annotated texts – with (P)DRSs!

**k0:** x2 x4 x6 x8 x10 x11 x13 e14 t16 x17 e18 e19 p20

```

named(x2, u.s., loc)
ambassador(x2)
named(x4, vatican, loc)
to(x2, x4)
support(x6)
named(x8, catholic_church, org)
of(x10, x8)
push(x10)
for(x6, x10)
more(x11)
religious(x11)
freedom(x11)
named(x13, china, loc)
in(x11, x13)
for(x6, x11)
voice(u14)
Agent(e14, x2)
Topic(e14, x8)
now(t16)
x17 = t16
x18 > x17
e14 < e18
say(e18)
Cause(e19, x2)
Topic(e19, p20)
p20:
  x23 e25 t16 t26 x28
  named(x23, beijing, loc)
  cooperate(e25)
  Agent(e25, x23)
  openly(e25)
  more(e25)
  now(t16)
  e25 < t26
  t16 < t26
  named(x28, holy_see, org)
  with(e25, x28)
        
```

**k29:** x00 x2 e32 p33 t16 t34

```

ambassador(x2)
with(x30, x2)
named(x30, frank_money, per)
say(e32)
Cause(e32, x30)
Topic(e32, p33)
p33:
  x11 x35 x38 e40 t16 x41 t42 p43
  male(x11)
  named(x35, church, org)
  of(x38, x35)
  mission(x38)
  support(e40)
  Experience(e40, x11)
  Stimulus(e40, x38)
  now(t16)
  x41 = t16
  t42 > x41
  e40 < t42
  p43:
    x45 x46 x13 x47
    greater(x45)
    liberty(x46)
    catholic(x46)
    named(x13, china, loc)
    in(x46, x13)
    for(x45, x46)
    secure(e47)
    Cause(e47, x11)
    Theme(e47, x45)
  now(t16)
  e32 < t34
  t34 < t16
        
```

**k48:** x50 x52 x53 x55 x13 p57 e58 t16 t59

```

announcement(x50)
president(x53)
with(x52, x53)
named(x52, bush, per)
of(x55, x52)
trip(x55)
named(x13, china, loc)
where(x13, p57)
p57:
  x52 x23 p61 e62 t16 t63
  m19(x62)
  named(x23, beijing, loc)
  p61:
    x55 x56 x67 x68 x69 u70
    greater(x55)
    x66 < x55
    x67 < x55
    x68 < x55
    freedom(x66)
    x68 < x57
    x69 < x57
    political(x56)
    freedom(x68)
    religious(x69)
    freedom(x56)
    allow(e70)
    Agent(e70, x23)
    Theme(e70, x55)
  like(e62)
  Agent(e62)
  Recipient(e62)
  now(t16)
  e62 < t59
  t59 < t16
  to(x55, x13)
  follow(e5)
  Agent(e5)
  Theme(e5)
  now(t16)
  e58 < t59
  t59 = t16
        
```

**k71:** x73 e75 p76 t16 x77 e78

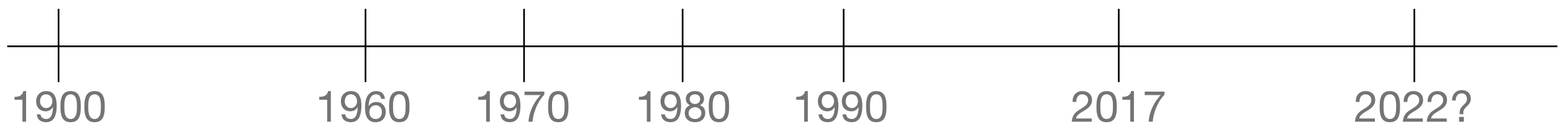
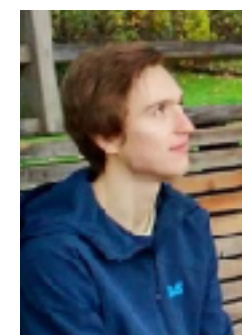
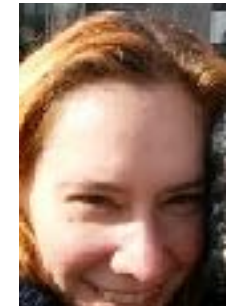
```

named(x73, pope_benedict, per)
say(e75)
Cause(e75, x73)
Topic(e75, p76)
p76:
  x73 e80 x81 x13 x82 e83 x84 t16 t35 t16 t36
  male(x73)
  interested(e80)
  theme(e80, x73)
  diplomatic(x81)
  to(x81)
  named(x13, china, loc)
  x13 = x82
  seven(e83)
  Theme(e83, x82)
  time(x84, t16)
  in(e83, x84)
  now(t16)
  e83 < t85
  t85 < t16
  with(x81, x13)
  re-establishing(e80, x81)
  now(t16)
  e78 < t85
  t85 = t16
  now(t16)
  x77 = t16
  e78 > x77
  e75 < e78
        
```

continuation(k0, k29)  
 continuation(k29, k48)  
 continuation(k48, k71)  
 continuation(k71, k87)

# Semantic Theory: from past to present (and future?)

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# But first... the exam!

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- The date for the final exam is: **Thursday July 27, 10am (sharp!)**
- You can (have to!) register for the exam: until tomorrow (12.07)
- You can find a practice exam at:  
[http://noortjejoost.github.io/teaching/ST17/practice\\_exam.pdf](http://noortjejoost.github.io/teaching/ST17/practice_exam.pdf)
- An example of the supplementary materials is given at:  
[http://noortjejoost.github.io/teaching/ST17/exam\\_materials.pdf](http://noortjejoost.github.io/teaching/ST17/exam_materials.pdf)
- Next Thursday: **Q&A**. Take a look at the practice exam, previous exercises, and the slides — **Prepare questions!**

# Links

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- Groningen Meaning Bank:  
<http://gmb.let.rug.nl>
- Groningen Meaning Bank Web Demo:  
<http://gmb.let.rug.nl/webdemo/demo.php>