Categorial Grammar lesson
20 april, 2017
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Old syntax-semantics interface: Y-model

-disconnect between syntax and semantics
-multi-step process: build the tree then send to semantics
-several challenging ramifications:

1. Psycholinguistic results

You start processing sentences as soon as you hear them, even when there is an abstraction, resulting (in Y-model syntax) in a structure that can't be processed until you arrive at the trace.

(1) The guy that_1 John and Mary wanted to invite *t*_1 couldn't come.

2. Covert movement

A very strange situation: movement initially posited for dislocation issues; the idea of 'covert movement' seems paradoxical.

Today, Categorial Grammar, where syntax and semantics go hand in hand.

In class: introduce the system, non-constituent coordination, relative clauses
Homework: revisiting processing and one case of covert movement

Let's get started.

The basic principles of syntax:

-what is a noun?
-a dumb answer: a noun is whatever can appear where a noun can appear.

Consider:

John saw a table.
...banana.
...green banana with brown spots.

Conclusion: these are all the same category. Let's call it an N.

An NP is anything that goes where an NP goes.

John saw a table.
John saw the table.
John saw Mary.
John saw everyone that was invited to the party.

Okay, from this perspective, what is a verb?

(2) a. John likes Mary.
b. John showed Bill the money.
c. John said he liked the music.

Uh oh...

(3) a. * John showed Mary.
b. * John likes Bill the money.
c. * John said Bill the money.

By definition, things of the same category are things that pattern together. Let's bite the bullet: *showed, likes, and said* are not the same category!

Categorial Grammar

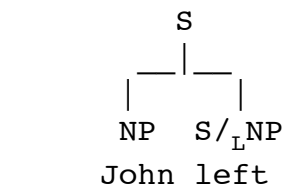
Categories
-S, NP, and N are base categories (there may be others)
-If A and B are categories, then so are $A/_R B$ and $A/_L B$. *(Inductive rule)*

Function application *(composition rule)*

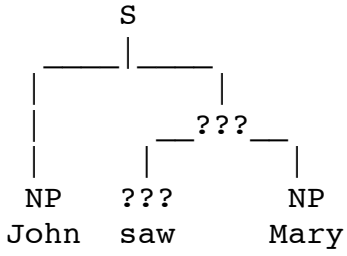
1.	Syntax	A	→ $A/_R B$	B
	Semantics	f(x)	f	x
2.	Syntax	A	→ B	$A/_L B$
	Semantics	f(x)	x	f

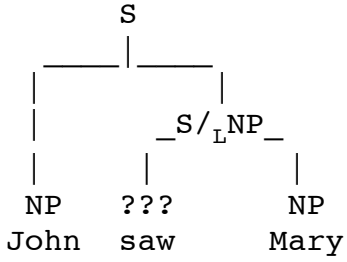
Intuitively, $S/_L NP$ says: if you give me an NP to my left, then I'll give you an S.

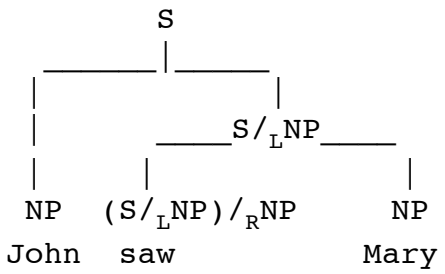
$S/_L NP$ is the category for what we have previously called VP.



We can figure out lexical categories by backwards engineering from the top down:







Similarly:

left	$S/_L NP$
saw	$(S/_L NP)/_R NP$
show	$((S/_L NP)/_R NP)/_R NP$
say	$(S/_L NP)/_R S$

Moral 1. the syntax and semantics go hand in hand

Observation 1: given the lexical categories, you don't need any more information to finish the derivation.

Observation 2: deep connection between the *syntax* and the *semantics*.

	Syntax *category*	Semantics *type*
John	NP	e
John left.	S	t
left	S/NP	<e,t>
likes	(S/NP)/NP	<e, et>
showed	((S/NP)/NP)/NP	<e, <e, et>>

Question: why did we want to say that verbs form a natural class?

Empirically, a *morphological* natural class: this is the word that shows inflection:

leave/left, leave/leaves
like/liked, like/likes
show/showed, show/shows

Under the new perspective, how do we define this natural class syntactically?

A new point of view:
Verbs are words of a category that, once all their arguments are saturated, produce an S.

Note: this is actually more explanatory than just stipulating that they are all category V. (Though the homework introduces at least one possible wrinkle.)

(Food for thought: vacuously, any lexical items of category S are of this type. Any such examples? How about French *voilà*? Does this have verb-like morphological properties?)

Function composition
(Moral 2: you don't always get what you want)

What is the syntax of conjunction?

(4) a. John and Mary left.
b. John danced and sang.
c. John squashed the black and yellow insect.

In Categorial Grammar, *and* is $(\alpha/_L\alpha)/_R\alpha$

Observation: unlike other constituent tests (substitution, movement), coordination is very promiscuous.

(5) a. John wanted to do, but didn't understand, the homework.
b. John tried to jump into, but ended up soaring over, the pool.
c. Allison loved, but worried that Herman ate, her pet turtle.

(5') a. Jean a voulu faire, mais n'a pas compris, les exercices.

How analyze?

Hypothesis 1: ('You always get what you want')
Underlyingly, the first conjunct of (5a) has a saturated argument:
"a voulu faire <les exercices>"

One possible instantiation of this hypothesis: ellipsis.

(5'') a. Jean a voulu faire ~~les exercises~~, mais n'a pas compris les exercices.

Puzzles:
1. Cataphoric, not anaphoric.
2. The object of the second conjunct cannot be elided.

Hypothesis 2: ('You don't always get what you want')
Some manner of composition allows the two conjuncts to be constituents.
"a voulu faire" is a constituent

Function composition: $(f \circ g)(x) = f(g(x))$

Mathematics example:
f(x) = x^2
g(x) = x+3
$(f \circ g)(x) = (x+3)^2$

Function composition *(composition rule)*

1.	Syntax	$A/_R C$	→	$A/_R B$	$B/_R C$
	Semantics	f ◦ g		f	g

2.	Syntax	$A/_L C$	→	$B/_L C$	$A/_L B$
	Semantics	f ◦ g		g	f

Aside: reformulation as an operator

'geach' = < ((A/C)/(B/C))/(A/B) , λfλgλx[f(g((x))] >

Example:

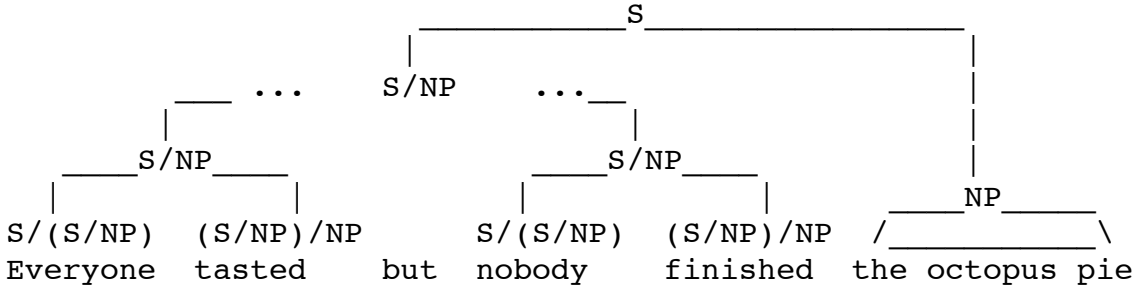
(6) Everyone tasted but nobody finished the octopus pie.
(6') Tout le monde a gouté, mais personne n'a fini, la tarte aux poulpes.

What type are QPs?

<et,t>

Since syntax directly reflects semantics, what category are they?

$S/_R(S/_L NP)$



Here, *but* is $(S/_R NP)/_L(S/_R NP)/_R(S/_R NP)$

More evidence for Hypothesis 2:

(7) a. All of the girls admired, but most of the boys detested, one of the saxophonists.

b. All of the girls admired one of the saxophonists, but most of the boys detested one of the saxophonists.

(7') a. Toutes les filles admiraient, mais la plupart des garçons détestait, un des saxophonistes.

b. Toutes les filles admiraient un des saxophonistes, mais la plupart des garçons détestait un des saxophonistes.

(7a) ≠ (7b)!

One more rule: *Lift*

(8) Alisa and all the children are in the backyard.

Lift *(composition rule)*

1.	Syntax:	$A/_L(A/_RB)$	→	B
	Semantics:	λP[P(x)]		x
2.	Syntax:	$A/_R(A/_LB)$	→	B
	Semantics:	λP[P(x)]		x

As an operator:

Lift: < (A/(A/B))/B , λxλP[P(x)] >

This should be familiar from earlier classes.

<u>Relative clauses</u>

Previously, we analyzed relative clauses as involving a bound trace.

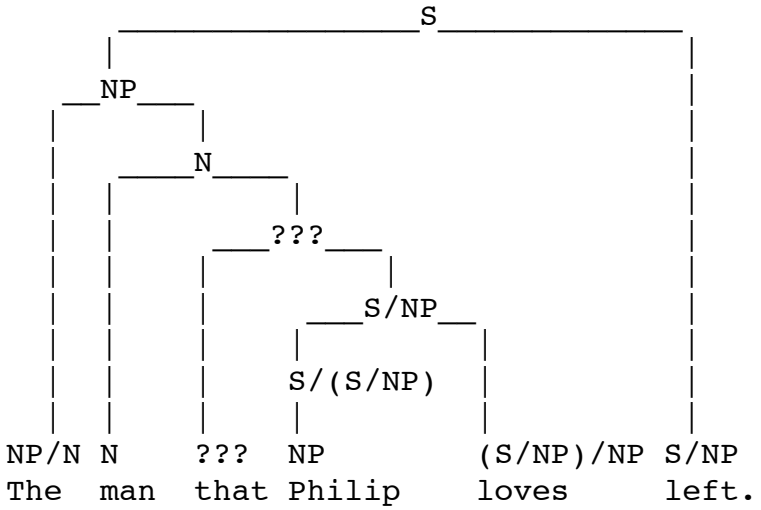
In (9), the underlined constituent is of category $S/_RNP$.

(9) The man that <u>Philip loves</u> left.

What is the category of *that*?

Let's do as much as we can, then work backwards.

1. Lift *Philip*, then function compose with *loves*.
2. We know that '*man that Philip loves*' is an N, since it's the same category as *man*



- '*that Philipe loves*' has to be $N/_LN$
- *that* is thus $(N/_LN)/_R(S/NP)$

Personifying a bit:

'*Philip loves*' is a hungry category, since it's missing its argument.
But remember, you don't always get what you want...
The relativizer *that* is hungry for a hungry category!

What is the type of *that*?
Since semantics mirrors syntax, *that* is type <et,<et,et>>.
(NB: Ns are type <e,t>.)

What should this meaning be? How about the following?

[[that]] = λPλNλx[P(x)∧N(x)]

Observation 1: on the earlier analysis of relative clauses, the relativizer *that* was semantically vacuous, and we made use of Predicate Modification to combine the N with the relative clause. On the current analysis, the word *that*, itself, is performing the role of Predicate Modification.

Observation 2: if we leave off the directional subscript on the slash in (S/NP) in the category of *that*, we can leave it underspecified. This extends the analysis immediately to subject relative clauses.

(9) The man that loves Philip left.