**Foundations of Language Science
and Technology**

WS 2014/2015

Syntax

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Slides are based on:
**An Introduction to Language,
Ninth Edition**
Victoria Fromkin, V., Robert Rodman, R. and Hyams, N. (2011)
An Introduction to Language.
And more ☺

Simple sentences

John swims well. (Subject, Verb, Adverb)

John saw Mary. (Subject, Verb, Direct Object)

Bush became President. (Subject, Verb, Subject-Complement)

John gave Mary a mink coat. (Subject, Verb, Indirect Object, Direct Object)

The country elected Bush President. (Subject, Verb, Direct Object, Object Complement)

Syntax?

**CAUTION!
THIS LANGUAGE
IS UNDER
CONSTRUCTION**

"The part of grammar that represents a speaker's knowledge of sentences and their structures is called **syntax."**

Speakers of any human language can produce and understand an infinite number of sentences

The cat chased the mouse.

The cat chased the mouse that ate the cheese.

The cat chased the mouse that ate the cheese that came from the cow.

The cat chased the mouse that ate the cheese that came from the cow that grazed in the field.

What the Syntax Rules Do

"Then you should say what you mean," the March Hare went on.

"I do," Alice hastily replied, "at least—I mean what I say—that's the same thing, you know."

"Not the same thing a bit!" said the Hatter. "You might just as well say that 'I see what I eat' is the same thing as 'I eat what I see'!"

"You might just as well say," added the March Hare, "that 'I like what I get' is the same thing as 'I get what I like'!"

"You might just as well say," added the Dormouse . . . "that 'I breathe when I sleep' is the same thing as 'I sleep when I breathe'!"

"It is the same thing with you," said the Hatter.

LEWIS CARROLL, *Alice's Adventures in Wonderland*, 1865

Rules of syntax

❏ Combine words into phrases and phrases into sentences

❏ English: Subject Verb Object language (SVO)

The old man drove the new car.

*Old man the new the car drove.

…, because the old man drove the new car.

*…, because old man the new the car drove.

Rules of syntax

❏ Combine words into phrases and phrases into sentences

❏ German: Subject Object Verb language (SOV)

Der alte Mann fuhr das neue Auto. (The old man drove the new car.)

*Alte der Mann das Auto neue fuhr .

…, weil der alte Mann das Auto fuhr.

*…, weil alte der Mann fuhr neue das Auto.

Syntax and relations

❏ Syntax describes the relationship between the meaning of words (groups) and the order of those words.

❏ Same words in a sentence **but** different meaning.

I mean what I say.

I say what I mean.

Grammatical relations

❑ Relation between subject and object
❑ Who is doing what to whom?

The cat chased the mouse.
The mouse chased the cat.

Peter kissed Mary

Syntyctic rules -> constraints-> subcategorizaion

*The boy found.
*The boy found quickly.
*The boy found in the house.
The boy found the ball.

find-> subcategorization
-> *"subcategorization frame"*

Syntyctic rules -> constraints

*Mary slept the baby.
Mary slept soundly.

sleep-> subcategorization
-> *"subcategorization frame"*

Syntyctic rules -> constraints

Zack believes Robert to be a gentleman.
*Zack believes to be a gentleman.
*Zack tries Robert to be a gentleman.
Zack tries to be a gentleman.
Zack wants to be a gentleman.
Zack wants Robert to be a gentleman.

Believe, try, want -> subcategorization

Syntyctic rules -> constraints

❑ Native speakers judgement -> similar/ the same
❑ E.g.,

*Mary slept the baby.
Mary slept soundly.

❑ Determined by rules shared by all speakers of a language

Similar but different

(a) Jack and Jill ran up the hill.
(b) *Jack and Jill ran the hill up.
(c) Up the hill ran Jack and Jill.

(d) Jack and Jill ran up the bill.
(e) Jack and Jill ran the bill up.
(f) *Up the bill ran Jack and Jill.

"How can we describe the different judgments?"

Run up the hill versus *run up the bill*

❑ Sentences are not simply strings of words with no further organization.

❑ Differences in distribution of

run up the hill versus *run up the bill*

❑ *Difference in phrase structure*

Run up the hill versus *run up the bill*

❑ *up the bill* -> unit (He ran [up the bill])
❑ *up the hill* -> *no natural unit*

   ❑ *WHY?*

(c) Up the hill ran Jack and Jill.
(f) *Up the bill ran Jack and Jill.

Syntactic knowledge

❑ *Rules*
  ❑ *how words form groups in a sentence*
  ❑ *how words are hierarchically arranged*

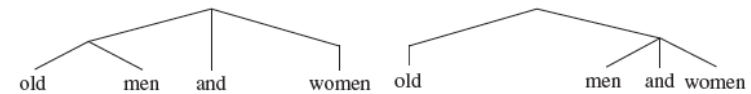The captain ordered all old men and women off the sinking ship.

❑ Structure and meaning/ different readings?

Syntactic knowledge

❑ *Rules*
  ❑ *how words form groups in a sentence*
  ❑ *how words are hierarchically arranged*
  ❑ *ambiguities*

The captain ordered all old men and women off the sinking ship.

Different structures -> structural ambiguity

❑ Why are the following sentences funny?

For sale: an antique desk suitable for lady with thick legs and large drawers.

We will oil your sewing machine and adjust tension in your home for $10.00.

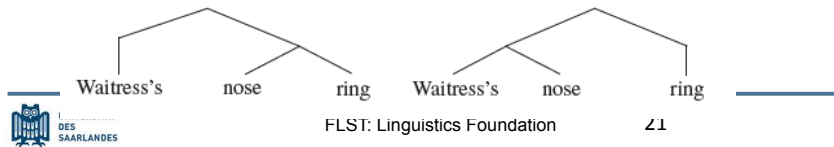## Different structures -> structural ambiguity

Rhymes With Orange (105945) © Hilary B. Price. King Features Syndicate

Different structures -> structural ambiguity

Rhymes With Orange (105945) © Hilary B. Price. King Features Syndicate

Waitress's   nose   ring   Waitress's   nose   ring

Syntactic rules

❑ Reveal grammatical relation (words of a sentence)

❑ Word order

❑ Hierarchical organization

❑ Grouping of words -> meaning (structural ambiguities)

❑ Creativity of linguistic knowledge

❑ Chomsky 1959 Review of B. F. Skinner *Verbal Behavior*

❑ Central: **'creativity'**

❑ Humans are able to produce and understand sentences which they have never uttered or used before

❑ Humans are able to react to situations even if the situation is absolutely new

Speakers of any human language can produce and understand an infinite number of sentences

His thoughts tumbled in his head, making and breaking alliances like underpants in a dryer without Cling Free.

Thank you very much for stepping on my toe because I was afraid I had elephantiasis and now that I can feel it hurt I know it isn't so.

Her hair glistened in the rain like nose hair after a sneeze.
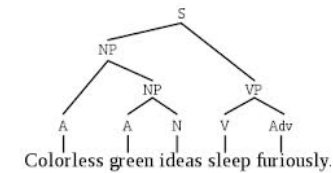
Syntactic knowledge

Furiously sleep ideas green colorless.

Milk the crumpled verb a.

Grammatical?


Syntactic knowledge

Colorless green ideas sleep furiously.

*Furiously sleep ideas green colorless.

Summary

- ❑ Grammaticality ≠ the truth of sentences
- ❑ Grammaticality ≠ whether real objects are being discussed
- ❑ Grammaticality ≠ whether something is possible in the real world

- ❑ "Untrue sentences can be grammatical, sentences discussing unicorns can be grammatical, and sentences referring to pregnant fathers can be grammatical." (p. 123)
- ❑ Syntactic rules -> produce, understand sentences
- ❑ Syntactic rules -> unconscious rules
- ❑ Grammar -> mental grammar
- ❑ ≠ prescriptive school grammar
- ❑ Language acquisition and Grammar -> Universal Grammar (UG) !?
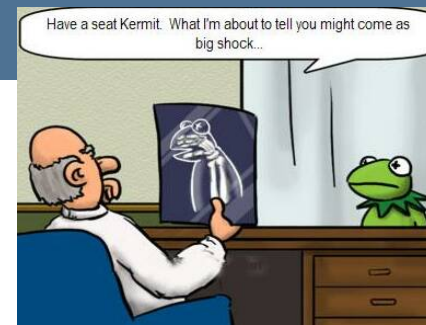
My nose is crying.
Don't giggle me.
I am barefoot all over.
What the boy hit?
Mommy get it my ladder.

Children and correction

Child: *Nobody don't* like me.

Parent: No, say "nobody likes me."

Child: *Nobody don't* like me.

...

(Eight repetitions of this dialogue)

…

Parent: No, now listen carefully;

say "nobody likes me."

Child: Oh! *Nobody don't likes* me.

(David McNeill, 1970)

Children and correction

Child: Want *another one* spoon, Daddy.

Parent: You mean, you want the other spoon.

Child: Yes, I want *other one* spoon, please Daddy.

Parent: Can you say "the other spoon"?

Child: Other … one … spoon.

Parent: Say "other."

Child: Other.

Parent: "Spoon."

Child: Spoon.

Parent: "Other spoon."

Child: "Other spoon."

Child: "Other … spoon. Now give me *other one* spoon?

Sentence structure

❑ A template for a sentence

  ❑ Det-N-V-Det-N

❑This template says:
  • A determiner is followed by a noun, which is followed by a verb …
  • Describes the following sentences

  The man found the book.

  The student read a paper.

  That cook won the competition.

  The child found a puppy.

Sentence structure

The child found a puppy.

  • Hierarchical structure but not a 'flat' structure
  • Words are grouped
    – [the child] (subject)
    – [found a puppy] (predicate of the sentence)
    Or
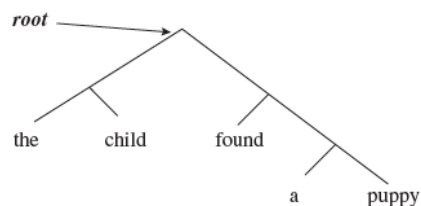   – [the child]
    – [[found] [a puppy]]
    Or
    – [[the] [child]] [[found] [[a] [puppy]]]

  • Can be described in a tree structure/ tree diagram

Sentence structure

The child found a puppy.

❑ What does this do?
- Phrases
- Sentence structure and relations
- *[found a] [puppy]

Constituents and Constituency Tests

❑ Groupings of words -> constituents

The child found a puppy.

❑ Tests
❑ Stand alone test
- What did you find?
  – A puppy
  – Not: found a

Constituents and Constituency Tests

❑ Groupings of words -> constituents

The child found a puppy.

❑ Replacement by a pronoun
- Where did find a puppy?
  – I found *him* in the park.

❑ Replacement *do*
❑ *Do* can take the place of the predicate
- John found a puppy and Bill *did* too.

Constituents and Constituency Tests

❑ Groupings of words -> constituents

The child found a puppy.

❑ "Move as a unit" test
❑ Constituent => a group of words can be moved
- It was *a puppy* that *the child* found.
- *A puppy* was found by *the child*

Constituents and Constituency Tests

❑ Groupings of words -> constituents

The puppy played in the garden.

❑ Tests -> *in the garden* is a constituent
  ❑ Where did the puppy play? *In the garden* (stand alone)
  ❑ The puppy played *there.* (replacement by a pronoun-like word)
  ❑ *In the garden* is where the puppy played. (move as a unit)
  ❑ It was *in the garden* that the puppy played.

Constituents and Constituency Tests

❑ Groupings of words
❑ ➔ constituents
❑ ➔ tests => constituent structure

The puppy played in the garden.
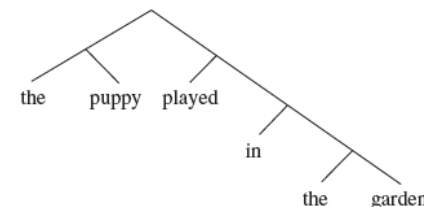
Constituents and Constituency Tests

I bought an antique desk suitable for a lady with thick legs and large drawers.

❑"Every sentence in a language is associated with one or more constituent structures. If a sentence has more than one constituent structure, it is ambiguous, and each tree will correspond to one of the possible meanings." (p.126)

Constituents and Constituency Tests

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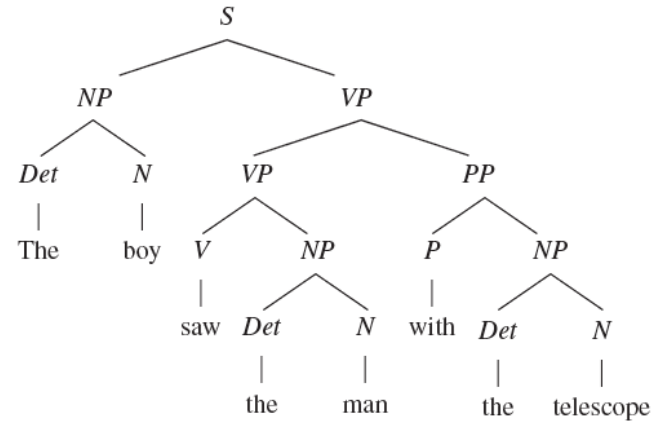
I bought an antique desk suitable for a lady with thick legs and large drawers.

❑Structural ambiguity => two phrase structures
  ❑Who did you buy an antique desk for?
    • [a lady with thick legs and large drawers]

  ❑ The phrase *with thick legs and large drawers* modifies *the phrase a desk for a lady*
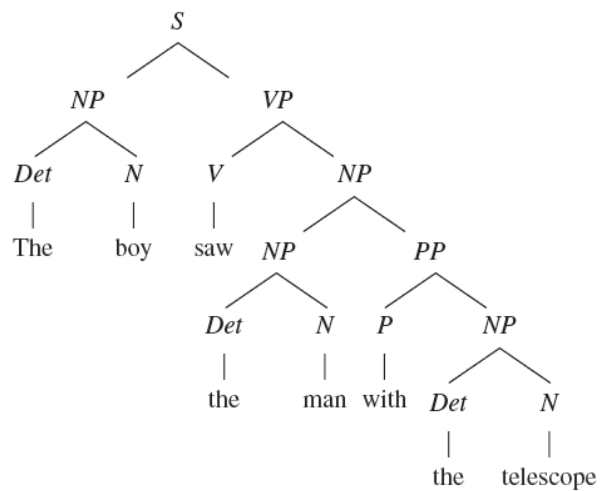   • [[a desk for a lady] [with thick legs and large drawers]].

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Ambiguities (structural) ???

- *The boy saw the man with the telescope.*

- *The woman kissed the man with the suit.*

- *The woman kissed the man with the brick.*

- *The woman hit the man with the suit.*

- *The woman hit the man with the brick.*

- *The blind boy saw the man with the telescope.*

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1.

Tree 1: S → NP (Det "The", N "boy") + VP [VP (V "saw", NP (Det "the", N "man")) + PP (P "with", NP (Det "the", N "telescope"))]

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2.

Tree 2: S → NP (Det "The", N "boy") + VP (V "saw", NP [NP (Det "the", N "man") + PP (P "with", NP (Det "the", N "telescope"))])

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1.

2.

Drenhaus: Psycholinguistik, WS13/14
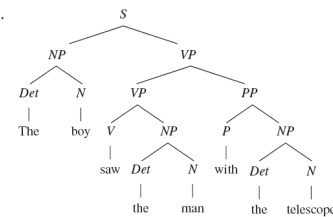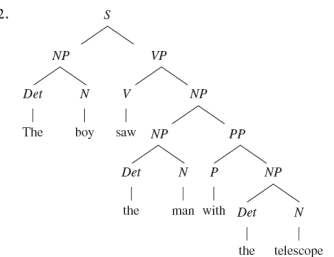
What does the brain tell us about ...

Position of the electrodes
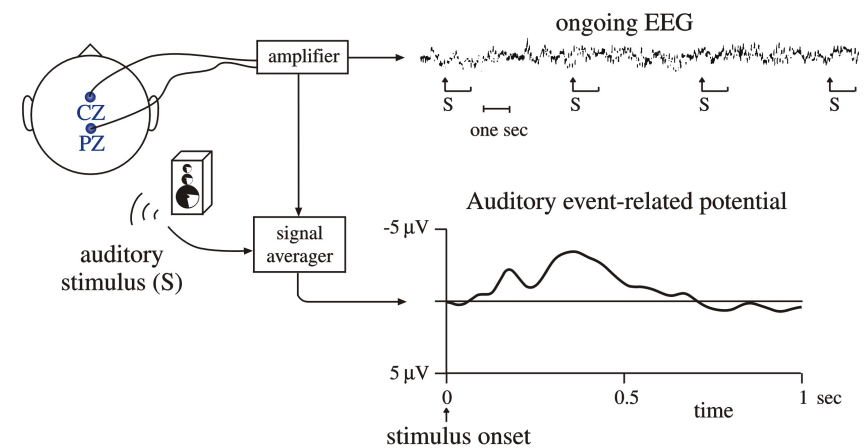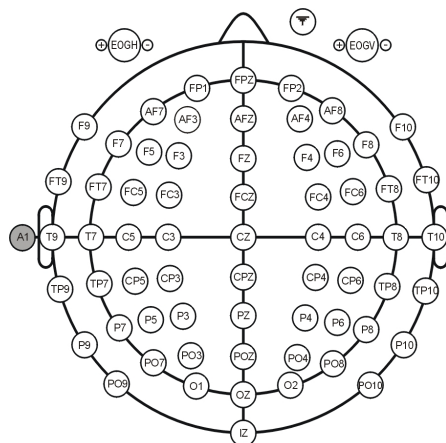
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ongoing EEG

amplifier

S   S   S   S

one sec

CZ
PZ

auditory
stimulus (S)

signal
averager

Auditory event-related potential

-5 µV

5 µV

0   0.5   time   1 sec

stimulus onset

adapted from Coles &Rugg (1995)

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Syntactic Parsing as Revealed by Brain Responses: First-Pass and Second-Pass Parsing Processes

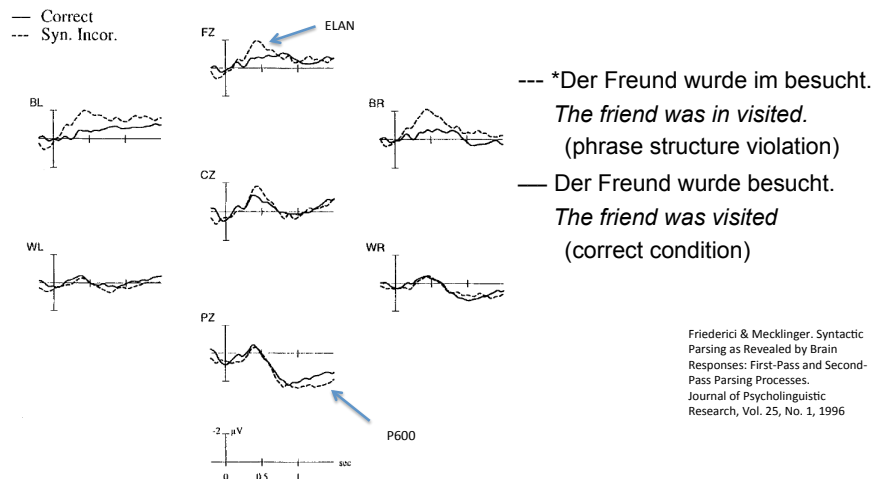**Angela D. Friederici[1,2] and Axel Mecklinger[1]**

This paper reviews a series of electrophysiological experiments on syntactic processing against the background of a psycholinguistic two-stage model of parsing. The data reveal two event-related brain potential components in correlation with syntactic processes: an early left anterior negativity and a late centro-parietal positivity. It is argued that these two components can be correlated with two separate stages of syntactic processing: the early left anterior negativity reflecting first-pass parsing processes and the late positivity reflecting second-pass parsing processes possibly including processes of reanalyses.

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What does the brain tell us about ...

- ❑ (1) *Der Freund wurde im <u>besucht</u>.
  - ❑ *The friend was in visited.*
  - ❑ Phrase structure violation
- ❑ (2) Der Freund wurde <u>besucht</u>.
  - ❑ *The friend was visited*
  - ❑ Correct condition
- ❑ (3) *Die Wolke wurde <u>begraben</u>.
  - ❑ *The cloud was buried*
  - ❑ Semantic violation
- ❑ (4) *Das Parkett wurde <u>bohnere</u>.
  - ❑ *The parquet was polish*
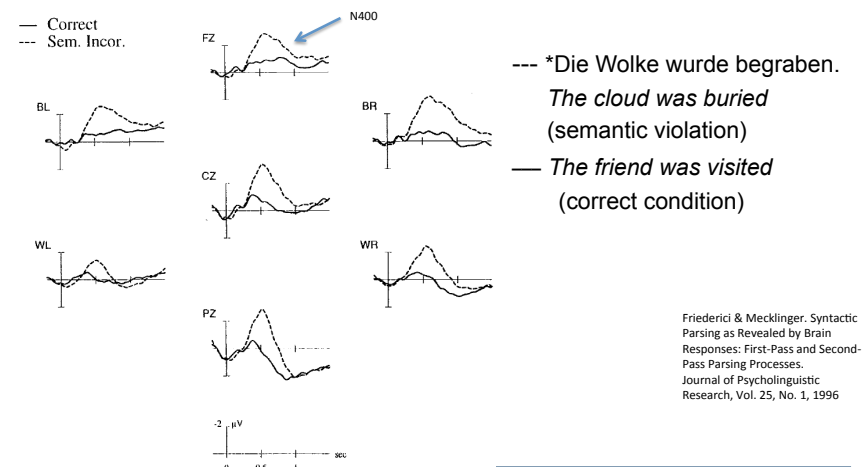 - ❑ Morpho-syntactic violation

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ELAN/P600

--- *Der Freund wurde im besucht.
The friend was in visited.
(phrase structure violation)
— Der Freund wurde besucht.
The friend was visited
(correct condition)

Slide 52

N400

--- *Die Wolke wurde begraben.
The cloud was buried
(semantic violation)
— *The friend was visited*
(correct condition)

Slide 53

— Correct
--- Morph. Incor.

FZ — N400

BL BR

CZ

WL WR

PZ — P600

-2... μV

0 0.5 1 sec

--- *Das Parkett wurde <u>bohnere</u>.
The parquet was polish
(Morpho-syntactic violatio)

— Der Freund wurde besucht.
The friend was visited
(correct condition)

Friederici & Mecklinger. Syntactic Parsing as Revealed by Brain Responses: First-Pass and Second-Pass Parsing Processes. Journal of Psycholinguistic Research, Vol. 25, No. 1, 1996
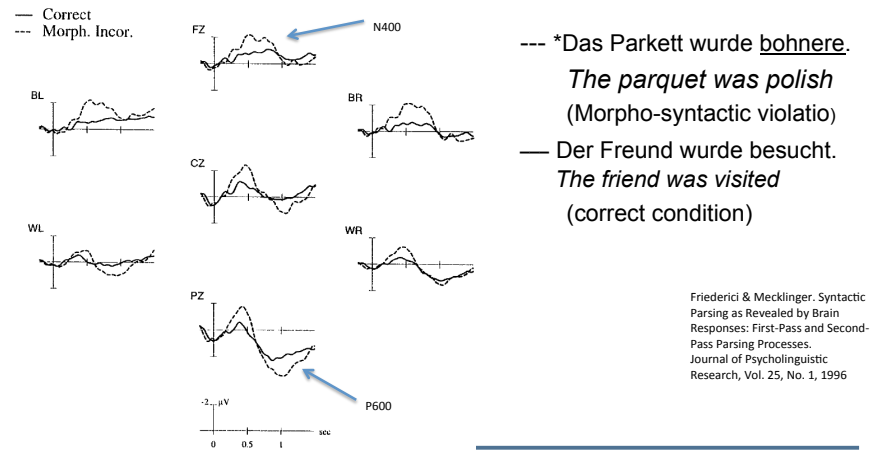
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Friederici (1995; 1999; 2002)

Phase I (100-300 ms)	**Phase II** (300-500 ms)	**Phase III** (500-1000 ms)
modular	*interactive*	*interactive*
Integration of word category information-> phrase structure	Semantic and morpho-syntax information	Reanalyzes and repair
ELAN	LAN/N400	P600

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Slide 55

Have a little fun with Yapese syntax and morphology

1. gadow bea marweel — we (dual inclusive) are working
2. gu maa marweel — I work (habitually)
3. kea guyeeg — he saw me
4. ga bea marweel — you (singular) are working
5. bea guyeeg — he is seeing me
6. gu bea guyeem — I am seeing you.
7. gamow raa guyeem — we (dual exclusive) will see you
8. kea gaywgeeg — he helped me.
9. kea guy Tamag — he saw Tamag
10. kea feek boechquw — he took some

Oceanic languages
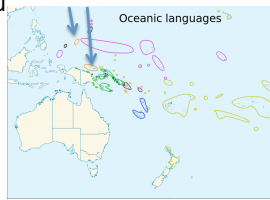
(a) List and gloss all Yapese morphemes, free and bound, that are used in sentences 1-10 above.
(b) Give all (and only) the phrase structure rules needed for the Yapese data given above.
(c) Draw the phrase structure trees for the Yapese sentences (2-3) and (9).
(d) How would you say 'we (dual inclusive) will help you' in Yapese?

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! ☺ Have fun ☺ !

Break down the following words from Ayacucho Quechua (Parker 1969) into their constituent morphemes and state their meaning. (Van Valin, Robert D. *An introduction to syntax*. Cambridge University Press, 2001.)

(1) Rimani. 'I speak.'
(2) Warmita rikun. 'He/she sees the woman.'
(3) Runtuta mikurqani. 'I ate an egg.'
(4) Runa rimarqa. 'The man spoke.'
(5) Warmi rikun. 'The woman sees him/her.'
(6) Runakuna rimarqaku. 'The men spoke.'
(7) Runata rikuni. 'I see the man.'
(8) Warmikuna rimanku. 'The women speak.'
(9) Runtuta mikuni. 'I eat an egg.'
(10) Runa hatun. 'The man is big.'

(11) Warmikunata rikurqani. 'I saw the women.'
(12) Runa daliwan. 'The man hits me.'
(13) Rimarqani. 'I spoke.'
(14) Runtu hatun. 'The egg is big.'
(15) Warmi rikurqawa. 'The woman saw me.'
(16) Rikurqa. 'He/she saw him/her.'
(17) Riman. 'He/she speaks.'
(18) Warmikuna rikurqawaku. 'The women saw me.'
(19) Warmi runtuta dalirqa. 'The woman hit an egg.'
(20) Mikurqaku. 'They ate.'

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(18) Warmikuna rikurqawaku. 'The women saw me.'
(19) Warmi runtuta dalirqa. 'The woman hit an egg.'
(20) Mikurqaku. 'They ate.'

What would the following forms mean:
(21) Mikun.
(22) Warmi runata rikurqa.
(23) Runata dalirqani.
(24) Runa rikurqawa.

How would you say the following in Ayacucho Quechua?
(25) The men saw an egg.
(26) The woman ate an egg.
(27) The women hit [PAST] the man.
(28) The men see the woman.

❑ Break down the words in the following sentences from Hungarian (de Groot 1989) into their
❑ constituent morphemes and state their meaning. If a morpheme has more than one allomorph, give all of them.

(1) János a könyvet Marinak adta. 'John gave the book to Mary.'
(2) A könyv az asztal alatt van. 'The book is under the table.'
(3) Mari Jánosnak adta az órát. 'Mary gave the clock to John.'
(4) A gyerek látta Marit. 'The child saw Mary.'
(5) Az óra az asztal fölött van. 'The clock is above the table.'
(6) Mari látja Jánost. 'Mary sees John.'
(7) A gyerek tette az órát az asztalhoz. 'The child put the clock near the table.'
(8) Mari Jánosnak adja a könyvet. 'Mary gives the book to John.'
(9) A level az asztal alatt van. 'The letter is under the table.'
(10) János a könyvet az asztalra tette. 'John put the book on the table.'
(11) Mari látta a gyereket. 'Mary saw the child.'
(12) A könyv van az asztal mögött. 'The book is behind the table.'
(13) Mari írja a levelet. 'Mary writes the letter.'
(14) Mari a gyereknek adta az órát. 'Mary gave the clock to the child.'
(15) János írta a levelet. 'John wrote the letter.'