

Introduction to Psycholinguistics

Lecture 1: Introduction

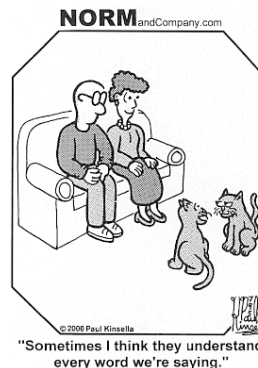


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Introduction

- Speech is one of the natural activities that we, as humans, engage in. Unlike many other learned activities, virtually all humans learn a language and any human baby can learn any human language; not dependent on what language parents spoke.
- Only humans learn language. It is one of the unique abilities that distinguishes us from all other animals.
- Understanding more about how the linguistic system functions and how it is related to other cognitive systems, be they other characteristics unique to humans or traits shared by virtually every animal, furthers our understand how we function.



What is Psycholinguistics?

- Psycholinguistics is the field that studies the unconscious processes that underlie our language abilities.
- Key topics within Psycholinguistics include:
 - Sentence processing: How do we understand sentences.
 - Morphological processing: How do we recognize morphologically complex words and how do we represent relations between related words.
 - Spoken word recognition: How do we parse an acoustic stream into discrete units and then how do we recognize those discrete units as words of our language.
 - Language Acquisition: How do we learn language; what are the stages of acquisition, what are the challenges the child faces.
 - Speech Production: How do we find the words to express our thoughts; how do we assemble words into sentences; why do we make the errors that we do and not others.
 - Bilingualism: How do I manage/organize the information that I know for my two languages. Do these systems interact or are they strictly separate?

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What's the big deal?

- It is actually something of a miracle that we manage to speak and understand as well as we do. Our processor is extremely considering all the complications it faces.
- What we do:
 - We understand speech streams which include no discrete boundaries to indicate where one word ends and another begins.
 - We understand people with different accents, different speech rates, even people speaking with their mouths full.
 - We understand stammering non-fluent politicians. Incomplete sentences are no problem for us. We deal with ambiguity all the time without breaking down.
 - We have a vocabulary of between 50,000-100,000 words. When speaking, we access somewhere between 2-4 words per second and we do this with incredible accuracy. (error rates around 2/1000 words)
 - We understand speech even faster than we can produce it. We are so fast, we can even finish each others sentences.

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Topics

- General and Philosophical Issues
 - The domain of psycholinguistics
 - + Competence-performance
 - Methods of investigation: experimental design and interpretation.
- Syntactic Processing
 - Psychologically plausible parsers
 - + Incrementality, Memory Load and Ambiguity
 - Theories of Ambiguity Resolution and Reanalysis
- Lexical Processing
 - Auditory word recognition
 - Morphological processing
 - Bilingual Lexicon
- Speech Production
 - Lexical Selection
 - Grammatical encoding

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Structure of the Course

- Roughly ...
 - Sentence Processing; general (Crocker)
 - Sentence Processing; The role of the visual context (Knöferle)
 - Lexical Processes (Weber & Melinger)
 - Speech Production (Melinger)
 - Weekly readings
- Course assessment:
 - Participation: If you miss more than 2 lectures you won't be admitted to the exam.
 - Exam at end of course = 100% of grade
 - + Responsible for **all** material presented in the course
 - ▲ Lecture material and assigned papers
 - + Anyone planning to take the exam **MUST** register for it on-line.
- Materials
 - Lecture overheads and assigned readings will be available from the course web page (<http://www.coli.uni-sb.de/~crocker/courses/psycholinguistics.html>), in the library, and/or distributed in class.

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Course Schedule

Week	Montag 11am-1pm
26.04.04	L1: Introduction
03.05.04	L2: Experimental Methods and Analysis
10.05.04	L3: Sentence comprehension
17.05.04	L4: Syntactic processing
24.05.04	L5: Constraint-based models
31.05.04	No lecture
07.06.04	L6: Spoken sentence comprehension
14.06.04	L7: Interaction of language and vision
21.06.04	L8: Lexical Processing
28.06.04	L9: Lexical Processes
05.07.04	L10: Language Production
12.07.04	L11: Course Review
19.07.04	Klausur

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Competence vs. Performance

- Traditionally, theoretical linguistics deals with human language *Competence*; what we know about language that allows us to speak and comprehend.
 - ☐ Implicit Knowledge - knowing what is 'right'
 - ☐ Explicit knowledge - explain in terms of formal rules
- Psycholinguistics deals additionally with linguistic *Performance*.
 - ☐ What one does; how knowledge is used.
 - ☐ Many of the issues that linguists want to avoid because they muddy up theoretical issues are of interest to the psycholinguist:
 - ☐ Many of the questions you may have asked about language out of curiosity.
 - + Why we sometimes make errors,
 - + Why we make some errors not others,
 - + Why we sometimes misunderstand some words or sentences,
 - + How we learn a language,
 - + How we accommodate speakers with thick accents,
 - + How we deal with ambiguous words,
 - + How we deal with ambiguous sentences
 - + What makes a sentence 'hard' to understand.

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A theory of performance

- A theory of performance focussing on language production should provide a model of how speakers move from an intention to express something to the utterance of the corresponding sentence(s), including all intervening steps.
- A theory of performance focussing on language understanding should also provide an explanation for how a listener takes an acoustic stream or written text as input and extracts a corresponding meaning representation.
- Note, neither of these goals is a necessary characteristic of models of competence.
 - If a generative grammar posits that passive sentences are *derived* from active sentences, this is not a processing claim but rather a statement about the relationship between what speakers know about the two sentences.

Derivational Theory of Complexity (DTC)

- The complexity of producing or comprehending a sentence should be related to the number of transformations that sentence must undergo according to a given generative grammar.
 - a. the secretary has typed the paper (kernel)
 - b. the paper has been typed by the secretary (passive)
 - c. the secretary has not typed the paper (negative)
- All attempts at linking derivational complexity to processing complexity failed.
- One must be extremely careful when connecting processing evidence to arguments about the linguistic knowledge.
- Doesn't mean that experiments can't inform us about knowledge, but we must be very careful about how we link performance data to competence data. In many respects, the whole DTC research agenda was flawed because there was no claim within the linguistic theory that a generative derivation corresponded to a processing model.

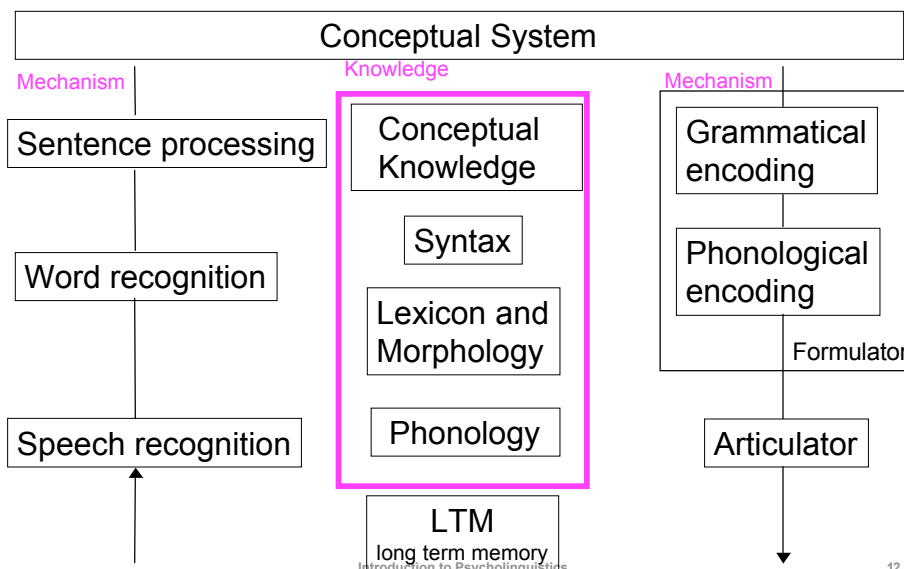
Important factors for processing explanations

- Linguistic processes do not operate in a vacuum. Other cognitive capacities, such as memory resources, attentional resources, etc, can also impact on behavioral results.
- A processing model deals not just with abstract (linguistic) representations of knowledge of words and sentences but also the real-world characteristics of the words and sentences.
 - How often a word is used influences how easily we can retrieve that word.
 - How often a particular sentence type occurs in actual discourse influences how easily we can process it.
 - ✚ Practice does make perfect.
- Therefore, when conducting psycholinguistic research, we must be sensitive not only to the linguistic characteristics of our materials (our object of study) but also other (irrelevant) characteristics that might exert an influences.
- Some factors that should be equated in the design of an experiment:
 - word frequency, word length, concreteness, age of acquisition, part of speech, quality of picture, transitional probability of bigram, typicality or probability of X in Y context, morphological complexity, frequency of base, speech rate, duration of stimulus, number of words in a sentence, position on screen, repetition, ambiguity.

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Speech Processing Model (Dijkstra & Kempen, 1993)



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Modularity in Language (Fodor, 1983)

- A *module* is a specialized, encapsulated cognitive systems that has evolved to handle specific information types of enormous relevance to the species.
 - Modules are
 - + Encapsulated (it is impossible to interfere with the inner workings of a module)
 - + Unconscious (it is difficult or impossible to think about or reflect upon the operations of a module)
 - + Fast
 - + Have shallow outputs (no information about the intervening steps that led to that output)
 - + Obligatory firing (operate reflexively, providing pre-determined outputs for pre-determined inputs regardless of context)
 - + Ontogenetically universal (develop in a characteristic sequence)
 - + Localized (have dedicated neural systems)
 - + Pathologically universal (break down in characteristic fashion following some insult to the system)
 - + Domain specific (deal exclusively with a single information type)
 - It is assumed that learned systems do not display these all of these characteristics.

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Other Modular systems

- Learned systems can be domain-specific but are not instinctually based.
- Innate systems may operate across domains, but are then too general, less interesting and difficult to investigate
- Other examples of Modular systems are:
 - Face recognition in humans and other primates
 - Echo location in bats
 - Fly detection in frogs
- Is language encapsulated from other cognitive systems such as memory or attention?
- The issue remains open whether language is an encapsulated module.
- What about the inner workings of the linguistic system? Is the system internally modular?

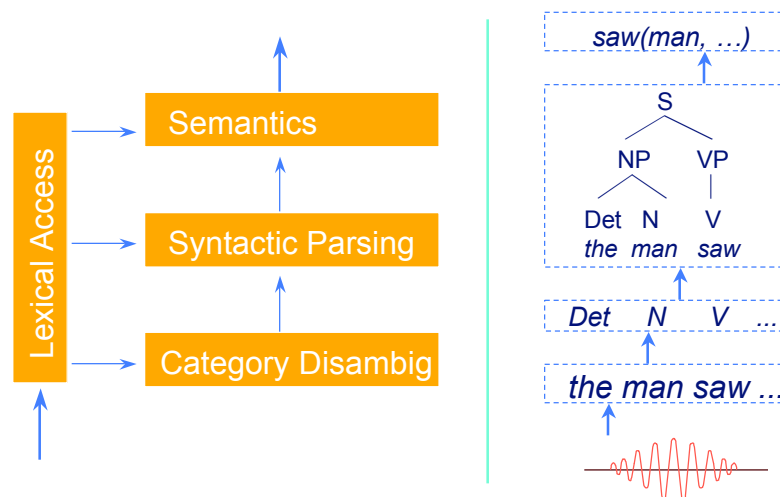
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Different types of explanations

- Sentences with object-extracted relative clauses are harder to parse than sentences with subject-extracted relative clauses.
 - Who did Kate see kissing the actress.
 - Who did Kate see the actress kissing.
- Non-modularists can refer to memory load differences to explain this contrast.
 - You must keep the Wh-filler in memory longer until you reach the point in the sentence (the gap) where you can understand its function
- Modular theorists must explain this contrast only by referring to language-internal contrasts.
 - Posit general language parsing preferences that would account for this difference.

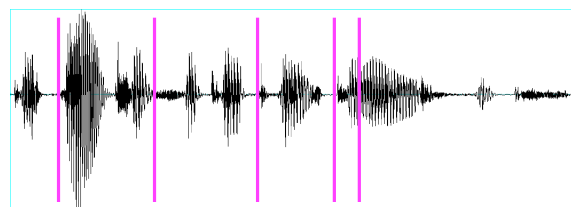
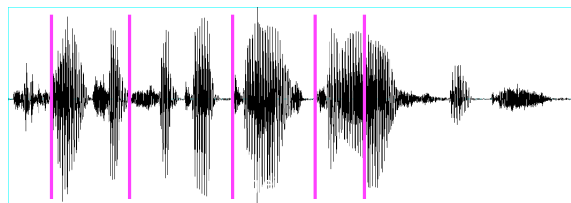
A Modular Model



Context effects in the initial parse

- The safe cracked...
 - ...in two pieces.
 - ... by the thieves was empty.
- A burglar tried to rob my neighbors house. They have two safes hidden around the house. The safe cracked...
- Is the ease of parsing a reduced relative clause influenced by the referential context?
 - A modular theory would not believe that possible.

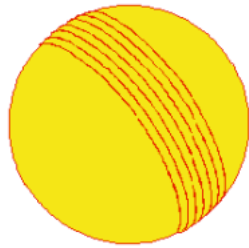
Segmentation/Variability: „Die Ente füttert gleich den Nachwuchs.“



Lexical Ambiguity Problem

■ Many words are ambiguous in various ways.

- BALL
- The boy played with the ball.
- Cinderella went to the ball.

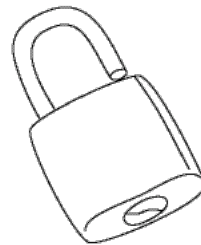
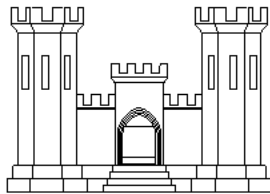


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Lexical Ambiguity

■ Schloss



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Lexical Ambiguity - gender helps?

■ Kiefer



Die Kiefer



Der Kiefer

Semantic and grammatical context

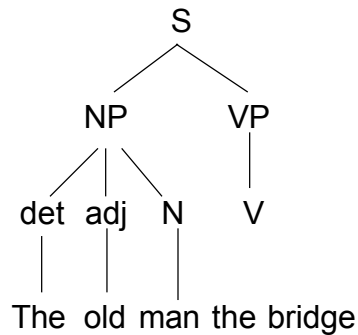
■ Leiter

■ Die stabile und verlässliche Leiter.



Complications in sentence processing

- How should we incorporate ambiguous words into a sentence?
 - Do we keep various options open and postpone decision making to later
 - Do we commit to one interpretation early on, based on parsing principles, and only later fix mistakes?



NP → det (adj) N

S → NP VP

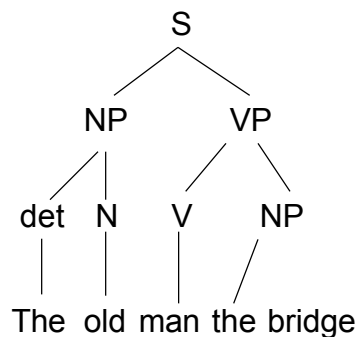
No rule allows two adjacent NPs at the beginning of the sentence. The sentence must be reanalyzed

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Complications in sentence processing

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NP → det (adj) N

S → NP VP

old → A

old → N

man → N

man → V

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