

► **Inflectional Languages**

- Example from German: see p. 88 in Altmann

Real-World Knowledge Can Supply Constraints That Operate As Part Of The Structure Of Language

► **Regularities** in the language make statistical prediction possible.

- The average college-educated adult has a speaking vocabulary of _____ words.
- The 50 most commonly used words in English make up about _____ of all words we speak, and about _____ of all those we write.
- Thus some words are *more predictable* than other even without context.

SYNTACTIC STRUCTURE OF A SENTENCE

► In order to understand a sentence, the listener or reader must determine its syntactic structure.

► **Parsing** –

► **Tree Diagram**

- $S \rightarrow NP + VP$
- $NP \rightarrow Adjective + Adjective + Noun$
- $VP \rightarrow Verb + Adverb$

DEEP STRUCTURE VS. SURFACE STRUCTURE

► **Surface Structure** =

► **Deep Structure** =

- 2 sentences can have very different surface structure, but the same deep structure.

SENTENCE PROCESSING AND SYNTACTIC AMBIGUITY

Most of the Time Ambiguity Is Not Noticed – Why?

- ▶ We have _____ that reduce this ambiguity.
 - _____ are preferred.
 - ▶ “If someone read this sentence thought it ungrammatical because it missed an ‘and’ between ‘sentence’ and ‘thought’ they would be wrong.”
 - _____: Sentences should be studied in the _____ in which they normally appear.
 - ▶ “The burglar blew open the safe *with the new lock* and made off with the loot.”

▶ Prosody:

- Distinction between written and spoken language.
- Example of using stress to convey meaning:
 - ▶ You’re wrong – Sam didn’t buy MARY a pizza
[he bought it for someone else]
 - ▶ You’re wrong – Sam didn’t BUY Mary a pizza
[he made her one]
 - ▶ You’re wrong – SAM didn’t buy Mary a pizza
[someone else did]
- Does stress disambiguate the alternative meanings, or add alternative meanings?

Why are Ambiguous Sentences Used to Study Sentence Processing?

TWO MODELS OF SENTENCE PROCESSING

- ▶ **Autonomous/Modularity Model Of Language Processing:**

- ▶ **Interactive Model of Language Processing:**

- ▶ **Bottom-up Processing:**

- ▶ **Top-down Processing:**

- ▶ **Top-down/bottom-up interaction:**

- ▶ **On-line interactive models:**

GARDEN PATH SENTENCES

- ▶ *The old man the boats*

- ▶ **Garden Path Sentence (GPS)**

- ▶ There are 2 major theories that try to explain how people process such sentences.

- ▶ The debate is over whether _____ or _____ factors lead us up the GP.

GARDEN PATH MODEL OF SENTENCE PROCESSING

▶ **This is a 2-stage Autonomous Model:**

▶ First stage:

▪ Second stage:

▶ **2 Important Principles of the GP Model:**

▪ late closure principle

▪ minimal attachment principle:

▶ **Late Closure Principle** focuses on the way in which listeners might determine they are at the end of a major clause boundary.

▶ *Because Jay always jogs a mile ...,*

▶ *Because Jay always jogs a mile, this seems like a short distance to him.*

▶ *Because Jay always jogs, a mile seems like a short distance to him.*

GARDEN PATH MODEL

- ▶ The alternative to late closure would be to keep our options open and consider all kinds of different interpretations.
- ▶ The problem with the open-options alternative is that it places a _____
_____ than trying to retain one option at a time.

CONSTRAINT-BASED MODEL

- ▶ This model states that more than one syntactic analysis of a word sequence may be generated during comprehension.
- ▶ It also contends that both _____ information constrain sentence processing and **lead us down the GP**.
 - *The old man the boats.*
- ▶ Although we are only consciously aware of the _____ of *The old man*, the alternative of the _____ has also been activated, but at a level below conscious awareness.
- ▶ When we reach the end of the sentence and discover that we must have made a parsing error, we resolve this confusion by activating to a conscious level the alternative interpretation.

GARDEN PATH MODELS VS. CONSTRAINT BASED MODEL

- ▶ **Eye Movement Studies**: have been used to try to discover which of these theories is correct.
 - There are different patterns of eye fixations for GPSs relative to nonGPSs.
 - Studies indicate that GPSs disrupt reading.
 - Read the Harley text and determine which model this research supports.

GARDEN PATH MODELS VS. CONSTRAINT BASED MODEL: READING TIME STUDIES

- ▶ Some studies suggest that readers construct multiple interpretations in ambiguous regions of as they read the sentences.
- ▶ These studies also show that such factors as semantic context can override minimal attachment and late closure principle.

Trueswell, Tanenhaus, and Garnsey (1994)

- *The witness examined by the lawyer was useless*
 - *The evidence examined by the lawyer was useless.*
- ▶ According to _____ principle of the garden path model, readers process these two sentences no differently -- they have _____.
 - ▶ Trueswell et al. found that reading times were faster for the _____.
 - ▶ This is because the _____ constrains interpretation of the _____.
 - ▶ Clifton & Ferreira (1987) demonstrated that the problem of GPS is not eliminated by additional _____, and parsing seems to unfold on the basis of _____ without interacting with other knowledge.

SENTENCE PROCESSING & PROSODY

- ▶ **Speakers** can and usually do _____ by using such _____ as stress, intonation, and pauses.

IS SYNTAX PROCESSED SEPARATELY FROM MEANING?

- ▶ **CLICK STUDIES**: Insert a click into a recorded sentence and then ask listeners to indicate where it appears.

Garrett, Bever, & Fodor (1966)

- ▶ Ss heard the sentence with a prerecorded click sound occurring at either 1, 2, or 3.
- ▶ “In order to catch [1] his train, [2] George drove [3] furiously to the station.”
- ▶ **Results**:
 - ▶ Why did the subjective impression of where the click occurred migrate toward the major syntactic boundary of the sentence?
 - Perceptual isolation of linguistic clause is the first step in sentence processing, and formal syntactic structure alone was sufficient to tell the listener where the clause boundary had occurred.
- ▶ **Criticisms**
 - The claim that semantics and prosody are not important.
- ▶ **Reber & Anderson (1970)**: Ss were falsely told that sentences contained clicks – subliminal clicks.
- ▶ **Prosody** is often used to mark phrase boundaries and end of sentences.
- ▶ **Wingfield & Klein (1971)**: Formal clause boundary and the prosodic markings for a clause boundary were in direct conflict.

CONFLICTING RESULTS

- ▶ Proponents of the GP model argue that the effects that are claimed to support the constraint-based model arise because:

- ▶ Proponents of the Constraint-Based Model argue that research favoring the GP model use techniques that

MEANING: THE GOAL OF SENTENCE PROCESSING

- ▶ We discard the surface structure to retain only the meaning of a sentence.

- ▶ **Sachs (1967)**: had Ss listen to paragraph length stories that contained a critical test sentence.
 - **Results**: