Syntactic Processing

- Listener must figure out the syntactic and semantic relaxations among the word and phrases in a sentence → parsing
- Syntactic structure is built as soon as possible.

Temporary ambiguity (p.372)

Many sentences present temporary ambiguities.

1. Lexical ambiguity
   - The warehouse fires...
   - ......were set by an arsonist. → warehouse fires
   - ......employees over sixty. → fires employees

2. Syntactic ambiguity - garden path sentences
   - After the child visited the doctor prescribed a course of injections.

Exercise

For each of the following sentences is ambiguous. For each, indicate whether the ambiguity is lexical or structural.

1. The clown caught the thief with umbrella
2. The player knew that the ball would be attended by the price.
3. Tom said that Mary went on a date yesterday.

Garden path sentences

"The horse raced past the barn fell"

Garden path effect results from two principle of parsing

1. Minimal Attachment – build the simplest structure
2. Late Closure – attach new words to the clause currently being processed

Memory constraints

Another example of processing difficulty

This is the dog that worried the cat that killed the rat that ate the malt that lay in the house the Jack built.

Jack built the house that the malt that the rat that the cat that the dog worried killed ate lay in.
The ability to comprehend what is said to us is a complex psychological process involving:

1. The internal grammar
2. Parsing principles (Minimal Attachment, Late Closure)
3. Frequency factors,
4. Memory
5. Both linguistics and non-linguistic

Part 2

SPEECH PRODUCTION

How do we produce the speech?

Planning Units

How do you think we produce speech?

Is this what we are doing?

Step 1: Semantics
Step 2: Lexical mapping
Step 3: Syntax
Step 4: Phonology/phonetics

Slip of the tongue (speech error)

You have missed all my lectures.

You have hissed all my mystery lectures.

You have wasted the whole term.

You have tasted the whole worm.

The dear Old Queen.

The queer old dean.

(By William A. Spooner)

What do the errors tell us?

1. The hiring of minority faculty
2. Ad hoc
3. Big and fat
4. There are many ministers in our church
5. Seymour sliced the salami with a knife

Syntactic structure exist independent of the words that occupy them.

Lexical vs. grammatical word

The boys are singing

Speech production operate in real time with features, segments, morphemes, words, phrases

When we speak, words are chosen and sequenced quite a while ahead of when they are articulated.

Application & Misapplication of Grammar Rules

- an system → an istem
- an early bird → a burly bird
  But .......* an burly bird/ * a istem
  
  a system / an early bird
  an istem / a burly bird

This tells us the “stage” where a/an apply.
Computer Processing of Human Language

Computational linguistics
- Interaction of human language and computer

Let’s look at what computer can do for us.

Frequency Analysis

Corpus study
- Do you know what would be the 10 most frequently used words in written American English?
  
  the, of, and, to, a, in, that, is, was, he

- What about in spoken English?
  
  I, and, the, to, that, you, if, of, a, know

BNC: http://www.natcorp.ox.ac.uk/

Concordance and Collocations

Imagine, you have analyzed how many times word "words" appear in a paragraph.

- It was 5 times…
- But….which line of the paragraph does it appear?

Concordance analysis
  - [ ] words [ ] (p.379)

Collocation analysis
  - It tells us what kind of words appear with what kind of words
  - Authorship (who wrote which passage?)

Information Retrieval and Summarizations

ex. Google

- Using computer to locate and display data gleaned from possibly very large database.

Too much information……

- Summarization program

Computer that can Talk and Listen

C3PO

Hello, sir!

HAL 9000

Computational Phonetic and Phonology

- Speech recognition
  - [d] [p] ……/b/ /p/ (phones and phonemes)

- Using phonological rule and statistic to "guess"
- Often cannot understand different speakers (training is required)
- Cocktail party effect

- Speech synthesis
  - [d] [p] ……/b/ /p/
Speech synthesis

Simple solution...
Recording all of the words a machine may need and then make a sentence from them.
- will not sound at all natural.....

Formant synthesis
- Speech sounds can be reduced to a small number of acoustic component, so mix them together and produce speech.
- It does not sound like a human voice, but it is clear and fully understandable
http://www.speech.kth.se/wavesurfer/formant/

Concatenative synthesis
- Recording units such as phones, syllables, morphemes, words, phrase and sentence of real human voice
http://www.ims.uni-stuttgart.de/~moehler/synthspeech/