

## Chapter 10

### Language

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### Organization of Language

- Language analyzed at different levels
- Ideas – sentences or propositions
- Phrases – groups of words
  - Going to the mall
  - A very foolish mistake
- Words
- Morphemes
  - smallest units of language that carry meaning.
  - Include content morphemes or free morphemes (words) & function morphemes or bound morphemes (e.g. *ed, est, ing, er*)

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### Organization of Language - 2

- **Phonemes** – if two words are identical except for one sound, and that sound difference changes the meaning, the two different sounds are different phonemes.
  - *Bit* vs. *bet*: difference between *short i* and *short e*.
  - *Share* vs. *chair*: *sh* sound and *ch* sound are different phonemes in English
- Different languages have different sets of phonemes. French doesn't have *th* sounds; French *r* sound is different.
- Phonemes are represented by letters in our language

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## Organization of Language - 3

- Limited number of phonemes (approx 44 in English) can be combined in different orders to make many different words
- Large number of words can be recombined in different orders to make many sentences.
- Not all combinations are allowable.
  - E.g. *zmlir*
- Phonotactic rules specify allowable sequences of phonemes
- Rules of syntax specify allowable sequences of words in sentences.

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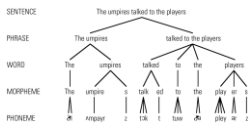
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## Psycholinguistics




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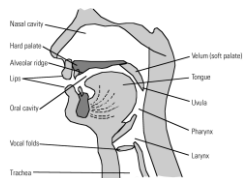
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## Production of Speech




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## Production of Speech - 2

- Noise produced if airflow out through nose and mouth is restricted.
- Vocal folds (cords) – can be vibrated to produce a tone → voicing
  - /d/ voiced but /t/ not voiced; /s/ voiced but /z/ not voiced
- Restricting air flow through mouth produces hissing sound.
  - Spectrum of frequencies depends on location of restriction.
    - Compare /f/, /th/, /s/, sh sound

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## Production of Speech - 3

- Nasality – can direct outward air flow through nose or not.
  - Compare /b/, /p/, & /m/; /d/, /t/, & /n/; /k/, /g/, ng
  - Nasals are voiced
- Place of articulation
  - /b/, /d/, & /g/ all voiced but differ in place of articulation
  - /p/, /t/, & /k/ all unvoiced & differ in place of articulation
- Manner – how the flow of air is restricted:
  - through nose (nasals) /n/, /m/, ng
  - partial restriction → hissing sound (fricatives and affricates) /s/, /f/ etc.
  - complete stoppage of air flow (stops) /d/, /p/, /t/, /g/ etc.

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## Speech Perception

- Speech perception by machine is limited
  - Different speakers have vocal production systems of different sizes and shapes
    - different voice characteristics
- Coarticulation – sound of all phonemes depend on which phonemes precede or follow it
- E.g. *fish*: When saying /f/, preparing for *short i* sound. Compare /f/ in *fish* & *food*.
    - *Short i* sound in *fish* is different from *short i* sound in *timber* (because of position of articulators)

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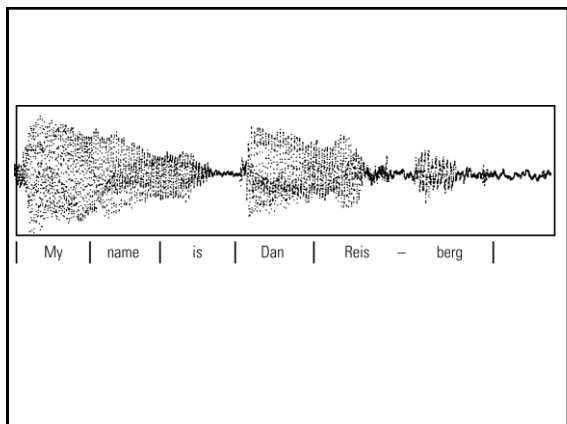
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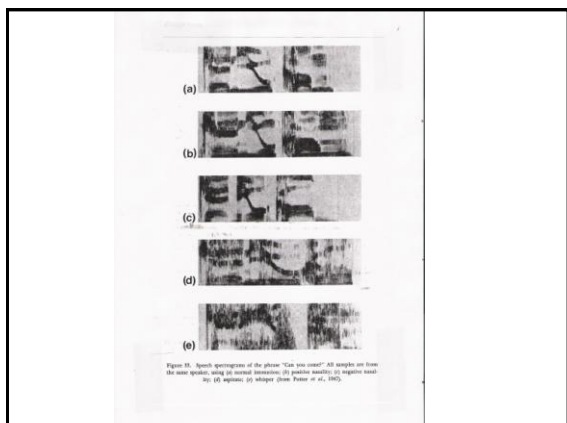
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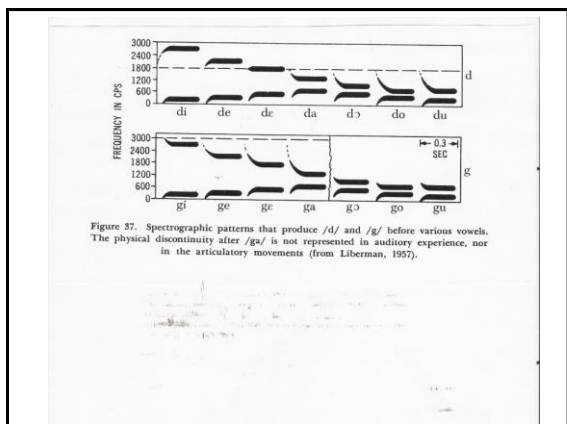
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## Speech Perception - 3

- Segmentation
  - How do you know when one phoneme ends and the next begins?
    - Phonemes overlap in time because of co-articulation.
  - No silent period between phonemes; no silent period between words.
  - No simple acoustic cues to phonemes or words.

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## Speech Perception - 4

- Aids to speech perception
  - Top down effects: knowledge of context, subject of conversation etc.
    - Analogous to error correction effect in word identification (reading)
    - Restoration effect (see ch. 3) – *legi\_lature*
    - Perception of words in isolation worse than words in sentence context.
  - Redundancy within language
    - Syntax: sentences have structure. In some positions must have a verb or noun etc.
    - Phonotactic rules: phonemes go together in certain ways; e.g. English words don't start with *zd*, or *tl*

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## Categorical Perception of Phonemes

- We hear differences between different phonemes, but don't hear differences between different exemplars of the same phoneme.
  - Russian: palatalized vs. non palatalized consonants
  - English: /g/ before low vowel (short *a*, *o*, or *u*) is not palatalized, but before short *i* or long *e* is *palatalized*.

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### Categorical Perception - 2

- Hearing voicing differences
  - Difference between voiced and unvoiced consonant is that voice comes on approx. 60 msec later for unvoiced.
  - Synthetic speech: vary voice onset time (VOT) in 5 msec intervals from /ba/ to /pa/
- Results
  - VOTs from -25 to 15 msec always heard as 'ba'; VOTs above 25 never heard as 'ba'
  - VOTs below 20 msec never heard as 'pa'; VOTs above 30 msec always heard as 'pa'
  - 15 msec range where Ss sometimes heard /b/ & sometimes /p/

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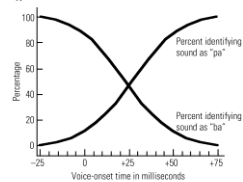
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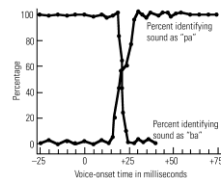
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Hypothetical identification data



Actual identification data




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### Categorical Perception - 4

- Discrimination Task: Ss could not hear difference between -25 msec and 15 msec VOT (a difference of 40 msec) but could hear the difference between 15 and 25 (a difference of only 10 msec)
- Could hear difference between stimuli heard as 'pa' and those heard as 'ba, but could not perceive any difference between items within a category.

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## Combining Phonemes

- Certain letter patterns highly frequent in certain positions in English words & other patterns rare.
- E.g. *tr* occurs at beginning of word but not at end; *rt* occurs at end. *tl* not allowed at beginning, but *lt* can occur at end of word.
- Taboo combinations in English:
  - *Zd* or *zn* at beginning of word (but *st* and *sn* are allowed); *tl* not allowed at beginning, but *pl* and *cl* are allowed.
- Must be rules rather than rote memorization - Ss can judge *wordlikeness* of nonsense words

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## Knowing Words

- Phonological representation – sound of word & how to say it
- Semantics - meaning of word - referent
- Morphology – study of the structure of words
- Orthography – spelling of word
- Grammatical category of word determines how word is used in sentences
  - Parts of speech: Noun, verb, adjective, adverb, conjunction, preposition
  - Verbs which take direct objects (*put*, *take*) and those which do not (*smile*, *sleep*)

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## Generativity of Language

- We frequently use old words in new ways
  - Hoover the floor (Hoover was the brand name of a popular vacuum cleaner.)
  - If you don't know about a person or company, you *google* it on the internet.
  - *Kleenex* vs. facial tissue
- Shorten words, combine two words into one.
  - Nuke (from nuclear)
    - A nuclear bomb
    - To drop a nuclear bomb on someone or something
    - To cook something in a microwave oven
  - Carjack – hijacking of a car
  - Camcorder – combined camera and video recorder
  - Getgo – beginning

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## Generativity of Language - 2

- Rules for making words
  - Make nouns out of verbs and vice versa
    - Impact (originally noun or adjective)
    - Not listed in Microsoft thesaurus as a verb
  - Neologisms created by applying 'rules'
    - E.g. add 'y', 'ian' or 'ish' to make an adjective
      - Snob → snobbish, trash → trashy, Canada → Canadian
  - Make adjectives out of nouns or Names
    - Hebbian cell assemblies
    - Skinnerian teaching methods
    - Darwinian evolution theory

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## Generativity of Language - 3

- Rules for making words
  - Add inflections
    - Geek (noun) → geeky (adjective), geekier
    - Hack (verb) → hacker (noun), to be hacked
- People use language creatively, make new words, using old words in new ways or with new meanings.
- Rules for adding morphemes

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## Syntax: Phrase Structure

- Rules which specify elements of sentence,
  - Doer (who or what sentence is about) + action & recipient of action (information about the doer)
  - where, when, how, under what conditions etc.
- Phrase structure – shown by tree diagram
- Rewrite rules
  - $S \rightarrow NP \ VP$
  - $NP \rightarrow (det) A^* N$
- Rules govern sequence of & specify 'roles' of words in sentences

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## Phrase Structure - 2




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## Phrase Structure - 3

- Noun phrase has optional determiner (e.g. *the, a, his, one*), one or more adjectives (optional), & noun
- Recursion: a symbol (e.g. NP) can occur on both sides of the equation.
  - VP → V NP (...ate the chocolates)
  - VP → V S (...believe that Mary took the book)
- Recursion → creativity in language

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## Prescriptive vs. Descriptive Rules

- Prescriptive rules – tell you what is correct
- Descriptive rules – describe how language works
- One's language use communicates information (social class, education level)
- Many linguists (& Reisberg) don't like prescriptive rules. Want to see creative language use.
  - Must have some agreement on the rules of syntax and definitions

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## Phrase Structure - 4

### Function of Phrase Structure Rules

- Grammaticality judgements
  - Rules specify order of words & phrases in sentences
- Shows major units (or breaks) in the sentence.
  - When reading, people pause at ends of phrases.
- Guide interpretation of sentence
  - Helps us identify
    - doer (subject),
    - What doer is like (adjectives, adjectival phrases)
    - info about doer (predicate),
    - recipient of action (direct object)
    - how, when or where action was done (adverbs or adverbial phrase)

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## Phrase Structure - 5

### Functions, cont' d

- Define sequence of noun phrase, verb phrase etc. independently of phrase's position in sentence.
  - Ill-formed phrase rejected in any position

### Phrase-structure ambiguity

- Two different phrase structures can apply giving different meanings.
- Deep vs. surface structure

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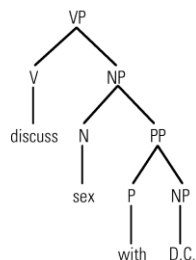
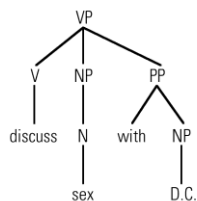
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He wants to discuss sex with Dick Cavett.



I saw the gorilla in my pajamas.  
 The shooting of the hunters was terrible.  
 They are roasting chickens.  
 Visiting relatives can be awful.  
 Two computers were reported stolen by the TV announcer.

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### Movement Rules: Reorganizing sentences

- Change focus or attitude of sentence: active to passive, question, double negative.
- S (or surface structure) – sentence as spoken or written.
  - The book was borrowed by Mary.
  - The project is going to be done by whom? (expresses surprise or annoyance)
  - She isn't unattractive.
- D (or deep) structure
  - Mary borrowed the book.
  - Who is going to do the project?
  - She is ugly.
- S structure – in speech or print; D structure → semantic analysis

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### Movement Rules - 2

- Changing the organization of the sentence keeps the same core meaning, but allows emphasis on different elements.
  - E.g. Active to passive change shifts emphasis to direct object (That book was borrowed by Mary.)
- Statement-to-Question transformation
  - denotes that listener is expected to supply the missing element.
- Double negative implies doubt or hedge.
  - She is not unattractive.

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## Linguistic Universals

- Some rules = linguistic universals.
  - Apply to all human languages
  - May be probabilistic (subject-verb order in 80% of languages; subject before object order in 98%)
- Correlations:
  - SOV order → Question words added at end of sentence
  - SVO order → Question words added at beginning

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## Linguistic Universals - 2

- Argument: children learn language very quickly → something must be “innate”.
- Are language universals innate?
- Learning a particular language would involve “setting parameters” (e.g. SVO or SOV)

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## Sentence Parsing & Comprehension

- How does S parse sentence? What information used?
- Evidence for Online Processing
- Processing times for reading words
  - Present sentences one word at a time
  - Let S trigger presentation of next word
- Pattern of viewing times shows long times for the last word of a phrase.
- Suggests that Ss pause briefly at the end of a phrase to integrate words

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## Syntax and Parsing - 2

- Minimal Attachment – assume the simplest phrase structure consistent with available information
  - Fat people → interpreted as noun phrase (adjective + noun)
  - The fat *which* people eat accumulates in their bodies.
- *The horse raced past the barn fell* → not grammatical !
  - *The horse, racing past the barn, fell.*
  - *The horse raced past the barn and fell.*
  - *The horse who raced past the barn fell.*
  - *The horse raced past; the barn fell.* (Note: use semicolon, not comma between sentences.)
- Importance of Intonation, Stress, & Pauses (Prosody), Punctuation
  - The secretary, who was applauded for his efforts, was soon promoted.
  - Because he ran, the second mile went very quickly

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## Semantics and Parsing

- Reversible sentences
  - The boy chased the girl vs. The girl chased the boy.
  - The elephant squashed the peanut vs. The peanut squashed the elephant.
- Semantics often help us sort out passive sentences. Passives do not take longer or create more errors if sentences not reversible.
  - Academic writing communicates new & often abstract information. Can't rely on semantics → understanding syntax is essential.

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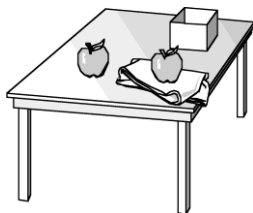
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## Extra-linguistic Context

- Put the apple on the towel into the box.
  - No false interpretation if picture or concrete situation is available.




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## Prosody

- Rise and fall of voice, pauses, stress, clarify meaning.
  - The secretary (pause) applauded for his efforts (pause) was soon promoted.
  - The secretary applauded (pause) for his efforts were finally rewarded.

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## Pragmatics

- Includes
  - Speaker' s & listener' s attitudes & beliefs
  - Understanding of the context in which sentence is spoken
  - Knowledge of how language is used to persuade or mislead,

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## Dangling Modifiers

- People understand badly structured sentences (e.g. those with dangling modifiers) because of either linguistic context or extra-linguistic context.
  - When [the researchers were] examining cognitive functioning, the MMSE was administered ....
  - Anyone who read the original article knows who did the examining of cognitive functioning

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## Language Use: What is Unsaid

- Antecedents for Pronouns
  - ...patients with psychosis exhibit a more rapid decline in cognitive functioning. They further explained that ....
  - ‘Recency rule’ → pronoun (*they*) refers to most recent noun that matches in gender and number
- Exception to Recency Rule
  - *She spoke to her supervisor about the thesis and she complained to the Dean.* Who complained to the Dean?
    - If the Dean complained, the sentence would read, ... who complained to the Dean.
  - Susan smiled to Maria, but then she insulted her.
    - Who insulted whom? According to grammar, Susan insulted Maria.
    - Pragmatic knowledge
- Extensive use of semantic knowledge of world, conversational context

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## Biology of Language

- Aphasia
  - Precise symptoms depend on which area of brain is affected.
  - Broca’s aphasia - Nonfluent aphasia
    - ok comprehension but production problems. Sentences lack inflections & don’t make sense.
  - Wernicke’s aphasia – Fluent aphasia:
    - Patients produce speech which is ‘grammatical’, but it has no content. Comprehension problems.
  - Echolalia: S can repeat what he hears, but lack comprehension & production
  - Anomia: S can’t name objects, sometimes just objects in specific categories (e.g. colours or animals)

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## Language Learning

- Children born deaf & not taught ASL will create their own language (signs)
  - ‘home sign’ parallels spoken language
- Language learning not just imitation or explicit instruction – children infer rules
  - E.g. Add *ed* to indicate past tense. Play → played
  - Over-regulation errors: *runned, goed, two foots or two feets, persons*
- Likely to involve innate mechanisms to detect, patterns & deduce rules.

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## Language Learning - 2

- Chomsky LAD hard wired → Language universals
- Children sensitive to regularities & patterns in language, e.g. syllables that go together to make a word or phrase. (e.g. Do you *want milk?* )
- Children use semantics to learn about syntax.

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## Language Learning - 2

### Selective Language Impairment

- Some children are slow to learn language, don't catch on to some aspects of grammar, have phonological difficulties etc.
  - Comprehension & production difficulties (word retrieval problems, speech problems, literacy difficulties, problems with syntax & morphology, etc.)
    - E.g. confuse *I* and *you*, *she* and *her*
- SLI children can have high nonverbal intelligence
- Dyslexia & SLI similar in many ways; Dyslexia involves fewer language problems.
- Large genetic component

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## Language and Thought

- Whorf: language forces us into certain modes of thinking
  - Do people who speak languages with many colour words (English) perceive colours differently than people who speak languages with few colour words? No.
    - May remember colours differently
  - More likely that language draws attention to certain concepts & gives practice in thinking in certain ways.
    - Doesn't crystalize modes of thought – people learn new concepts
  - Language biases ways of thinking about the world, but people learn new modes of thinking.
- Language provides labels. Labels = dense chunks, can be rehearsed.

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### Language Learning - 3

Williams' Syndrome

- Severely mentally incapacitated, low IQ
- But have fluent language (poor in content), are very sociable & musical.
- Recent case of child with syndrome "opposite" to Williams' syndrome. Had severely impaired language, but was other wise normal. Had extra repeats of genetic sequence which was absent or reduced in Williams' Syndrome.

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