

Two Aspects of Human Language

- Arbitrary: There is no direct link between a word that represents a concepts and that concept (e.g. hungary makes you hungary)
- Generative: Even language speaker can state, write, or sing something that no one has ever said before

Structure of Language

- Phoneme: smallest unit of sound that makes a meaningful difference
 - e.g. m \rightarrow c; mat \rightarrow cat
- Morpheme: Smallest units of meaning in a language
- Syntax: need to be assembled in some manner that make sense
- Pragmatics: give and take between participants is also necessary for communication to be complete

Phonemes

- different language make use of different phonemes.
- mouth takes on different manner, and air is forced from your mouth in a different way \rightarrow regular and important differences that characterize these different phonemes
- Phonology: refers to the study of the ways in which sounds can be combined in any given language

Morpheme

- word endings, prefixes, tense markers are all morphemes

Syntax

- The arrangement of words within sentences, or their structure
- How morphemes are combined in a way that makes sense

- we have more implicit understanding of our language than we are able to explicitly state
- A linguist speaks of how utterances must be constructed in order to follow the rules of English, not if the utterance is particular proper or polite

Semantics

- explains: Anomaly(异常不规则) e.g. Coffee ice cream can take dictation
- explains: Contradictions e.g. My dog is not an animal
- explains: Ambiguity: e.g. I need to go to the bank
- explains: Synonym: e.g. You are too young to do something = you are not old enough
- explains: Entailment(限定继承): e.g. Pat is my uncle
- understanding the meaning of an utterance: understanding each of the words, understand the syntax (the word that utterance constructed) and the true value of each part of utterance

Pragmatics

- Practical rules that we use in maintaining conversations – using proper etiquette
- The social rules of a language
- understanding of pragmatics ensures that we use different way when speaking to a friend or to elders

Language Comprehension and Production

- Speech comprehension: one of the most awe inspiring skill that human comprehenders have
- Two fundamental problems with speech perceptions:
 - Speech is continuous
 - * A spectrogram is a physical representation of the frequency of sound plotted over time

- Individual phoneme can sound different depending on the other phonemes that are around it
 - * e.g. pumpkin vs phone in 'p'
- Process speech:
 - Categorical manner: hard wired to efficiently, without awareness or intention, force sounds into discrete categories
 - * enable us to make distinctions between sounds in a rapid and automatic way
 - * perceive sounds in categories that fit with the phonemes of our language
 - * e.g. some Chinese dialects l and r

Speech production

- speech errors:
 - substitute one phoneme for another
 - a phoneme might be shifted from the proper location to a second location
 - the exchange of complete words or morphemes
- the errors are not random, but in their own way they obey the law of the language

Neurological Views and Evidence

- comprehend language develops much earlier than producing it
- Aphasias: collective deficits in language comprehension and production that result from brain damage
- **Broca's Aphasia** – expressive aphasia
 - Damage to frontal area of the brain
 - is characterized by halting, agrammatic speech
 - can:
 - * express semantics (nouns and verbs)
 - * intact semantics

- * intact comprehension (only for easy sentences)
- loss:
 - * function words, or the connectors that hold our syntactically correct utterance together
 - * impaired syntax
 - * impaired production
 - * difficulty comprehending reversed sentences
- limit:
 - * e.g. can comprehend "The dog bit the boy", not that "The body was bit by the dog" which requires a little more heavily on syntax
- **Wernicke's Aphasia** – receptive Aphasia
 - Fluent speech without content (meaningless)
 - Damage to temporal lobe of left hemisphere
 - Cannot comprehend and execute simple commands like "touch your knee"
 - semantics are greatly impaired although syntax is relatively intact
 - produce language is spared, but cannot comprehend it
- Other Aphasia:
 - Anomia: difficulties in naming objects
 - Alexia: visual language impairments
 - Agraphia: inability to write
 - Alexia without Agraphia: one can write but cannot read what they write
- notes:
 - The study of language impairment has made it clear demonstrated the separability of
 - * semantics and syntax (meaning and structure)
 - * comprehension and production

- * they server in different part of brain
- clearly the case that language, in humans, is strongly lateralized
- language in right handed individuals resides most strongly in the left hemisphere of the brain

Reading

- A natural language has two necessary characteristics:
 - regular: governed by a system of rules (grammar)
 - productive: infinite combinations of things can be expressed in it.
- human language:
 - Arbitrariness: the lack of necessary resemblance between a word or sentences and what it refers to
 - discreteness: the system can be subdivided into recognizable parts (sentences into words, words into sounds)
- animals:
 - bee dance: lack of arbitrariness
 - bird songs: songs only about certain topics – productivity
 - Chimpanzees can be taught to use symbols or signs to make requests or label objects
 - Sue Savage-Rumbaugh: pygmy chimpanzees can learn to spontaneously use symbols to communicate, learn to use symbols simply by watching others use them, and learn to understand spoken English words
- all human languages are communication system, but not all communication systems have the prerequisites to be classified as natural language

Structure of Language

- different language have different sounds (phonemes)

- phonology: the study of the ways in which phonemes can be combined in any given language
- morphology: put the sounds together in some coherent way, identifying the meaningful units of language
- Linguist and psychologists distinguish between people's explicit and implicit knowledge of linguistic rules
 - knowledge of the rules is not explicit (cannot articulate what all the rules are, nor consciously aware all of them) but implicit (whatever the rules are, we somehow follow them)
 - often articulate the so-called prescriptive rules (do not say 'aint')
 - hard to articulate the descriptive rules of English, which characterize which sentences are legal and which are not
- Linguist and psychologists distinguish linguistic competence from linguistic performance
 - competence: the underlying linguistic knowledge that lets people produce and comprehend their language
 - lapse of attention or memory, nervousness or tiredness, environment changes, shifts in interest and random error can all interfere with usage of language → produce ungrammatical sentences or to comprehend a sentence incorrectly
 - linguistic performance would reflect linguistic competence only under completely ideal conditions, which never achieved. (p290)

Phonology

- phonetics: the study of speech sounds and how they are produced
- phonology: the study of the systematic ways in which speech sounds are combined and altered in language
- Linguist and phoneticians distinguish between consonants and vowels

- vowels: work without obstructing the airflow, simply depending on the shape and position of the tongue and lips
- consonants: phonemes made by closing or at least almost closing part of the mouth; differ in place of articulation (where the obstruction of the airflow occurs)
 - * differ in "manner of articulation" the mechanics of how the airflow is obstructed
- phonological rules:
 - govern the ways in which phonemes can be combined
 - explain how to pronounce new words and how to pronounce prefixes and suffixes to words
- why two different languages sound different?
 - contain different phonemes
 - have different rules for combining those sounds (phonology)

Syntax

- syntax rules: govern the ways in which different words or larger phrases can be combined to form "legal" sentences in language
 - two rules: should be able to describe every "legal" sentence, and they should never be able to describe an illegal sentence
- tree diagram helps explain why certain kinds of changes can be made in a sentence and other cannot
 - preposing – taking a certain part of a sentence and moving it to the front, usually for emphasis
- linguists by formulating constraints on syntactic rules : only constituents labelled as being whole phrase can undergo movement from one position in a sentence to another.
 - describe the ways in which parts of sentences are formed and work together
- Chomsky: phrase structure rules:

- functions to generate the structure depicted in tree diagram
 - rewrite rules: describe the ways in which certain symbols can be rewritten as other symbols
 - lexical-insertion rule: allows the insertion of words into the structures generated by the phrase structure rules
 - transformational rule: turn one structures into another structure
- the sounds of language, phrases and sentences: are organized and rule-governed in the way they are combined
 - rules of syntax: are not consciously aware of; only have some access to these rules, because language behaviour indicates a great deal of compliance with them and your judgement of grammaticality

Semantic

- exchanging creates an obligation for Y to give something back to X
- must cue the listener or reader about who the actor of the sentence is, what the action is and to whom or what the action is done
- truth conditions:
 - circumstances that make something true
- understand the meaning of the sentence:
 - an understanding of the meaning of each word in the sentence
 - an understanding of the syntax of the sentence
 - an understanding of the truth conditions of the sentence

Pragmatics

- social rules of language
 - e.g. not interrupting another speaker
 - e.g. beginning conversations with certain conventional greeting

- Different kinds of utterances demand different responses from us
 - Assertives: the speaker asserts one's belief
 - * it's hot in here: these require little overt response from the listener, who is assumed to add the information asserted by the speaker into one's own model of the world
 - Directives: instructions from the speaker to the listener
 - * close the door
 - Expressives: psychological states of the speaker
 - * I apologize for eating the last piece of pie
 - * I thank you for the favour
 - Declaration: speech acts in which the utterance is itself the action
 - * you are fired
- Searle's speech act theory: part of job as listener is to figure out which of the five types a particular utterance is and to respond appropriately
- Advertisers rely on the fact that the way they word ads implies causal relationships that may or may not be true
- Harris(1977): people are not very good at distinguish between what an ad directly states and what it only implies

Speech Perception

- George Miller(1990)
 - Speech is continuous: different sounds from the same word blend into each other
 - displays a spectrogram of a spoken sentence
 - although you hear the pause, the pause is illusory
 - a single phoneme sounds different depending on context
 - * perception of speech sounds is categorical: in processing speech sounds, we without awareness or intention, force the sounds into discrete categories
 - Lisker and Abramson demonstrated the categorical perception of speech sounds

- * syllables with a VOT of 10.03 second or less was heard as "ba"
- * syllables with a VOT of more than 10.03 second was heard as "pa"
- * a syllable with a VOT of 20.10 seconds was indistinguishable from a syllable with a VOT of 20.05 seconds
- * 0.00 and 10.05 seconds were identify by 100% of the participants as being different sounds
- pay attention to certain acoustic properties of speech(make meaningful difference in our language) but ignore others
- categorical perception also demonstrated for some nonspeech sounds, such as tones, buzzes, and musical notes played on different instrument
- although very young infants can discriminate many, of the sound distinctions used in all the world's languages, that ability begins to narrow to just the phonemes in the infant's primary language when the infant is about 6 months of age
- it is not just sound that influence us
 - * Massaro and Cohen: we make use of visual information in the perception of speech
 - * participants heard nine computer-synthesized syllables that ranged in acoustic properties from a clear ba to a clear da sound.
 - * participants did not notice a discrepancy when the auditory information presented was ba but videotaped speaker was saying da
 - * what the speaker appeared to be saying influenced what was heard
 - * context effect:
 - visual cues affect how sounds are perceived
 - * Warren demonstrated that in some cases people "hear" phonemes that are not there
 - phoneme restoration effect: because listeners apparently restore the missing phonemes predicted by other linguistic information during the course of perception
 - * Marslen-Wilson and Welsh: context help people perceive speech

- participants were often likely to restore the distortion to the proper pronunciation, especially if the word was highly predictable from the preceding context
- suggested that readers and listeners typically use the context of the previous words in a sentence to predict the next word and mishear or misread that word if it is presented in a distorted fashion.
- * incoming stimuli are limited to a number of discrete categories
- * they do not have to figure out which language you speaking; voice recognition systems only recognize names of different digits, they expect only certain response

Speech Errors in Production

- instances in which what the speaker intended to say is quite clear, but the speaker makes some substitution or reorders the elements.
- Speech error studies is observational rather than experimental; it is difficult to control experimentally the ways in which people produce speech
- Garrett found two broad classes:
 - errors showed meaning relations (use walk instead of run) → similarities of meaning not form
 - errors showed form relations (use mushroom for mustache) → similarities of form not meaning
 - two different kinds of processing are separate and operate at different points

Retrieving Meaning – single word

- Meyer and Schvaneveldt:
 - observers are faster and more accurate in making a lexical decision when a target word is preceded by another word, called a prime that is associated in meaning
 - semantic priming effect → considered to reveal information about the structure and processing of memory

- Neely (1977) two types of process that could be responsible for semantic priming
 - a fast-acting automatic spread of activation: target word presented after prime word in 250ms; semantic priming was still observed for pairs like body-foot
 - a slower expectancy-driven process: target word presented after prime word in 700ms; participants slower to respond to items that were really related than they were completely unrelated.
 - participants begin to expect certain types of targets to follow specific primes and activated those targets in memory
 - it requires participants awareness of the relation between the primes and targets, their willingness to use this strategy and the time to do it
- Smith (1979) semantic priming does not automatically occur when related pairs are presented.

Sentence Comprehension

- garden path sentences: they lead the listener or reader down onw path, to on interpretation, until somewhere in the middle or the end of processing, realize the interpretation is incorrect and need to be reprocessed.
 - normal processing can sometimes fail
 - the most of the time we process sentences very rapidly and efficiently
- syntactically ambiguous: they are consistent with at least two different parses.
- Lexical ambiguity: it occurs with words that have two meanings such as bank
- Swinney:
 - demonstrated the existence of priming across the modalities(spoken word can prime a visually presented word)
 - even in highly biased context such as the preceding one, both meanings of an ambiguous word were able to prime performance in the lexical decision task if the visual presentation happened immediately after the auditory presentation fo the ambiguous word

- Gernsbacher: good readers suppress the inappropriate meaning of a word and use the appropriate meaning, more efficiently and readily than do poor readers
- when processing ambiguous sentences – all the meanings of an ambiguous word are temporarily available through an automatic, bottom-up process or set of processes
- context effect operate, they do not operate immediately to restrict the listener or reader to the most appropriate reading of the words
- people resolve sentence ambiguity fairly quickly.
- sentence comprehension normally occurs with left-to-right processing

Comprehending Text Passages

- Just and Carpenter (1987)
 - conducted a number of studies on how people read.
 - fixation are brief pauses that everyone makes as their eyes scan text; reading consists of a series of fixations and jumps between fixations
 - average fixation lasts about 250 milliseconds, the average jump lasts 10 to 20 milliseconds
 - Just and Carpenter's model of reading
 - * assumes: as soon as reader encounter a new word, they try to interpret it and assign it a role → immediacy assumption
 - * eye-mind hypothesis : holds that the interpretation of each word occurs during the time it is fixated
 - * the time spent on each fixation provides information about ease of interpretation;
 - * among the factors that increase fixation duration, and thus ease of interpretation, are word length, word infrequency, and syntactically or semantically anomalous words
 - not every word is fixated, the content words almost always are
 - more time is spent on the meaningful or semantically rich parts of the text, would be expected given the reader's goal of understanding meaning.

- semantic factors influence the reading task.
- Kintsch and Keenan:
 - showed that two sentences of equal length might be differentially difficult to process
 - difficulty lies in the propositional complexity of the sentences, the number of basic ideas conveyed ; more proposition, harder to process
 - the more propositions a sentence contained, the longer it takes for the participants to read
 - much more likely to recall more central propositions – critical to the meaning of the sentence
- proposition are mentally represented in some sort of hierarchy with more central propositions at the top of the hierarchy
- relations among sentences
 - Haviland and Clark: given-new strategy: approach to processing sentences whereby listeners and readers divide sentences into two parts: the given and the new
 - the given part of a sentence contains information that is familiar from the context or background knowledge
 - the new part contains unfamiliar information
 - listeners first search memory for information corresponding to the given information and then update memory by incorporating the new information
 - antecedent: given-new strategy can work only if the information in the given part of the sentence corresponds to some information in the listener's memory
 - bridging inferences: making connections between sentences and memory by using slightly different ways
- make inferences between sentences that are far apart in a text
 - the number of inferences readers make and the strength of the inferences created affect how well readers remember and understand what they read

- John Bransford and Marcia Johnson – the role of context in processing language
 - with the context provided before the passage, participants recalled an average of 8/14, without any context, 3.6/14
- VAN den Broek and Gustafson(1999)
 - the mental representation is a construction by the reader that differs from and goes beyond the information in the text itself
 - * people recruit their own background knowledge to draw inferences to comprehend text
 - a good representation is coherent
 - * structures are used to make the information in a text fit together
 - reader's attentional resources are limited
 - * the number of inferences drawn would be overwhelming
 - inferences are created only when they are needed to create coherence

Gricean Maxims of Conversation

- Gricean maxims of cooperative conversations
- people must do more than produce utterances that are phonologically, syntactically, and semantically appropriate
- Miller and Glucksberg: speakers must obey constraints or general rules
- Grice argued that for a conversation to take place, all the speakers must cooperate with one another
- Four specific conversational maxims (Grice 1975)
 - Maxim of quantity: make your contribution as informative as required; do not make extra contribution more informative than is required
 - Maxim of quality: make your contribution one that is true. Do not say what you believe to be false. Do not say that for which you have no evidence
 - Maxim of relation: be relevant

- Maxim of manner: be clear. Avoid obscurity of expression, avoid ambiguity, be brief, be orderly
 - * govern the way you choose to construct your conversation contributions
- when the maxims are violated, the speaker apparently wishes to end the conversation, wishes to avoid the conversation, or expects the listener to understand that the violation is occurring and why

Language and cognition

- John Watson (1930) asserted that thought was language and nothing more, rejected the idea that thought could occur without some sort of conditioned language response occurring
- believe that all apparent instances of thinking were really the results of subvocal speech; thinking is talking to yourself
- Smith, Brown, Toman and Goodman:
 - Smith served as the subject and allowed himself to be injected with a curare derivative
 - subvocal speech and thought are not equivalent

The modularity hypothesis

- perception and language are modular
 - the process is domain-specific : operates specifically with certain kinds of input and not others.
 - informationally encapsulated process: operates independently of the beliefs and the other information available to the processor; relatively independently of other processes.
- Fodor argued that sentence parsing involves processes that are specific to the division of phrases and words into constituents.
- the modularity hypothesis: argues that certain perceptual and language processes are modules.

- memory, attention, thinking and problem solving are thought to be non-modular
- domain specific – specialized to work with only certain kinds of cognitive processes
- Swinney (1979)
 - lexical ambiguity resolution offers finding that consistent with the modularity hypothesis
 - all possible meanings are triggered for a fraction of a second
 - this triggering appears to be automatic and reflexive and completely independent of whatever other cognitive process might be operating at the time

The Whorfian Hypothesis

- strong relations exist between language and other cognitive processes
- language both directs and constrains thought and perception
- demonstrated Eskimo language has several words for snow, whereas English has one
- Eleanor Rosch: focal colour vs non focal colours
 - Dani speaker performed much better if the initial chip showed a focal rather than a non focal colour
 - learn new, arbitrary names for colours: Dani performed better when the colours shown were focal
- Alfred Bloom (1981)
 - the presence of certain linguistic markers makes some kinds of comprehension and thinking easier or more natural
 - counterfactual inference: 7% Chinese speaker while 98% English speaker
- Au:
 - unidiomatic – awkwardly phrased
 - showed very little difficulty responding idiomatically for Chinese-speaking participants

- little evidence suggests that language constrains either perception or higher-level forms of thinking

Neuropsychological Views

- Broca's aphasia (expressive aphasia): leave language reception and processing undisturbed
 - have difficulty in understanding spoken language
- Wernicke's aphasia (receptive aphasia): spare fluent production of words and sentences (meaningless)
- lateralization: the function of two cerebral hemispheres of the brain play different roles and have different functions
- left cerebral hemisphere: produce and comprehend language
- right cerebral hemisphere: process complex spatial relationships
- slow progressive aphasia: noting either normal or mild atrophy of the left language regions and hypometabolism
- Peterson, Fox, Posner, Mintun and Raichle:
 - using PET scans, different areas of the brain were activated for different tasks
 - listen to words: elevated cortical activity in the temporal lobes of both hemisphere (Wernicke's area)
 - the areas activated did not overlap
 - visual word and pronounce it: activation in both hemisphere motor cortex
 - generate another word: other area quite previously become active including Broca's area
- not all patients with Broca's aphasia have damage in Broca's area; not all Broca's aphasia patients show the same degree of impairment; many of them show an inability to process subtle nuances of language
- Caplan:

- language processes do not necessarily have a specific location in the brain
- distributed across a region of the brain in a neural network (like connectionist model)
- the exact location differs from individual to individual, but lies on a pathway connecting the frontal, parietal and temporal lobes (Catani, Jones, Ffytche)