*KRCP Lecture 9*

*Language*

**Language and Linguistics**

* **Syntax**: rules that tell us how to organize words (grammar)
* **Phoneme**: smallest unit of speech
* **Grapheme**: smallest unit of written language
* **Semantics**: meaning of language
* **Morpheme**: smallest unit of meaning
* **Lexicon**: mental store of word information that includes: semantic info (word’s meaning), syntactic info (how to make words into sentences) and word forms (spelling and sound patterns); semantic network
* **Prosody**: rhythm and pitch of speech
* **Pragmatics**: knowledge of social rules

**Language acquisition**

* We acquire language in **several states**:
  + Cooing
  + Babbling (6 months)
  + One-word utterances (1 year)
  + Two-word utterances (2-3 years)
  + Basic adult structure
* **Overextension errors**: Use of wrong semantic word
* **Irregular verb errors**: Overgeneralization of grammatical rules
* There seems to be a **critical period**, but one may learn language at an older age, however, never with the same mastery

**Anatomy of Language**

* Language is left lateralized
* Left Peri-sylvian language network: Inferior frontal cortex, Broca’s area, Inferior parietal lobe, Superior temporal gyrus, Wernicke’s area, Arcuate fasciculus

**Aphasia**

* **Aphasia**: language deficits in production and comprehension even though articulatory mechanisms are intact
* **Broca’s aphasia** (anterior, expressive): Damage of Broca’s area, deficits in speech production, also comprehension deficits related to syntax
* **Wernicke’s aphasia** (posterior, receptive): Damage of Wernicke’s aphasia, deficits in speech comprehension, also production deficits related to semantics
* **Conduction aphasia**: Damage of arcuate fasciculus, mainly production deficits (producing and repeating speech)

**Language Comprehension**

* Semantics: the meaning of a word/sentence; Denotation (literal meaning) and Connotation (emotional overtone)
* Syntax: how can words be combines and sequenced into a sentence; Grammar (the set of rules to do this)
  + Phrase structure grammar: hierarchical, tree
  + Chomsky’s transformational grammar: one must understand syntactical relationship between words, transformation rule: how can an underlying proposition be arranged in a sentence
* Perceptual analysis: speech and reading only differ in the first steps
  + **Speech**: Spoken word 🡪 **Acoustic analysis** 🡪 **Phonological input code** 🡪 **auditory word form**
    - Problems: **Coarticulation/Segmentation problem**: identifying the boundaries between words, syllables or phonemes in spoken language; **Invariance problem**: same phoneme can have different acoustic patterns in different syllable contexts
  + **Reading**: Written word 🡪 **Visual analysis** 🡪 **Orthographic input code** 🡪 **visual word form**
    - **Pattern Recognition: Selfridge’s pandemonium model** (Pattern recognition by “deamons”, purely feed forward, bottom-up), **McLelland and Rumelhart connectionist model** (Pattern recognition by recursive ANN, purely feed forward & feedback, bottom-up & top-down)
  + **Lexical analysis** (**lexical access:** activating word-form representations 🡪 **lexical selection**: selecting the best matching lexical representation 🡪 **lexical integration**: integrate words into sentence or discourse) 🡪 **Conceptual analysis** 🡪 Concept

**Speech Production**

* Slips of the tongue help us to make models of language:
  + **Anticipation**: **b**ake my bike
  + **Preservation**: cold **c**urkey
  + Substitution: he is going **up** town
  + Reversal/Spoonerism: The Lord is a **sh**oving **l**eopard
* **Levelt’s model**: Conceptual preparing 🡪 Lexical encoding (Lexical selection 🡪 Morphological encoding 🡪 Phonological encoding) 🡪 Articulation / **Self monitoring:** back to start

**Can computers understand language?**

* Alan Truing**: Turing Test**
* **ELIZA**: structured dictionary, looks for words in sentence and then searches for synonyms, categories and asks question
* **ALICE**: chatbot inspired by alice
* **WATSON**: question answer computer, answers questions in natural language