

Thinking about Thought

- Introduction
- Philosophy of Mind
- Cognitive Models
- Machine Intelligence
- Life and Organization
- Ecology
- The Brain
- Dreams and Emotions
- Language
- Modern Physics
- Consciousness

*"shi shi shi shi shi shi shi shi shi shi shi shi shi shi shi
= the master is fond of licking lion spittle"*
(Chinese tonguetwister)

Session Eight: Language for Piero Scaruffi's class "Thinking about Thought" at UC Berkeley (2014)

Roughly These Chapters of My Book "Nature of Consciousness":

15. Language: Minds Speak

16. The History of Language: Why We Speak

17. Metaphor: How We Speak

18. Pragmatics: What We Speak

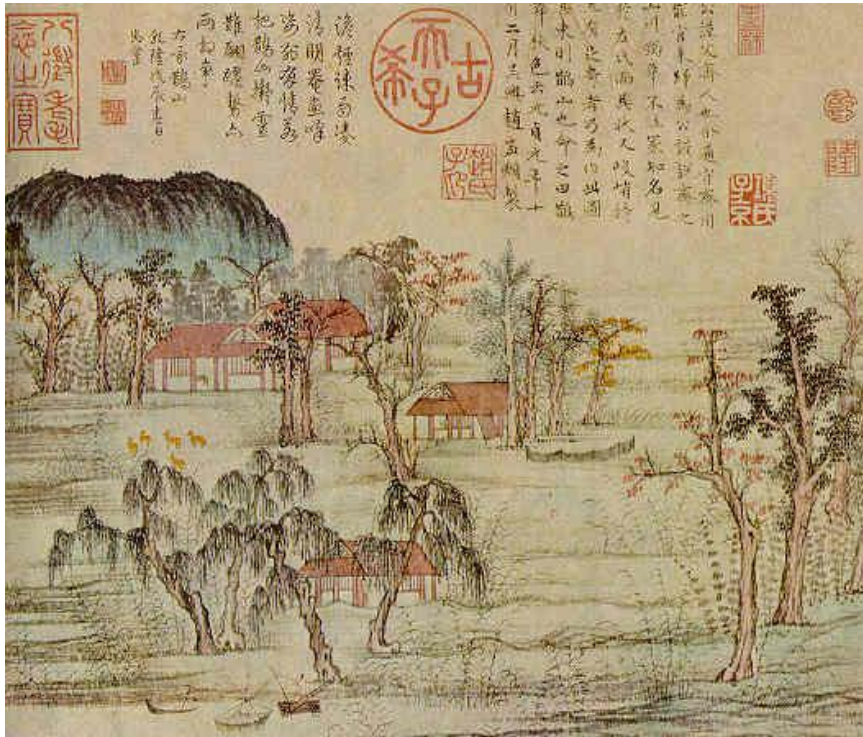
19. Meaning: Journey to the Center of the Mind

Introduction to Language

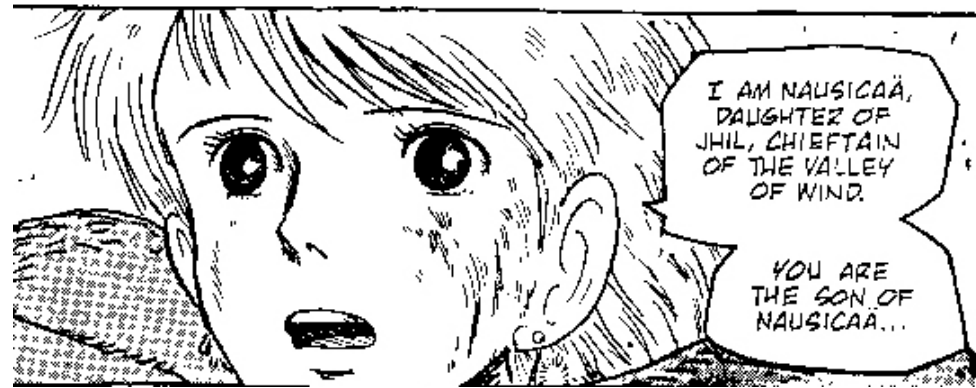
- Video: <https://youtu.be/g8FMmU6xRWs>
 - Howard Hawks: “His Girl Friday” (1940)
 - Soliloquy from “Hamlet” (1948) by Laurence Olivier
 - Granma and granddaughter in Sicily
 - A patient with Broca's aphasia (Wisconsin Physio Dept)
 - Dutch vocalist Jaap Blonk's virtuoso performance of Kurt Schwitter's “Ursonate” (1932)
 - The end of Bela Tarr's “Werckmeister Harmonies” (2000)

Introduction to Language

- Chinese scrolls, comic books, posters



Chao Meng-fu (1254)



Nausicaa (1982)



Hayao Miyazaki

Introduction to Language

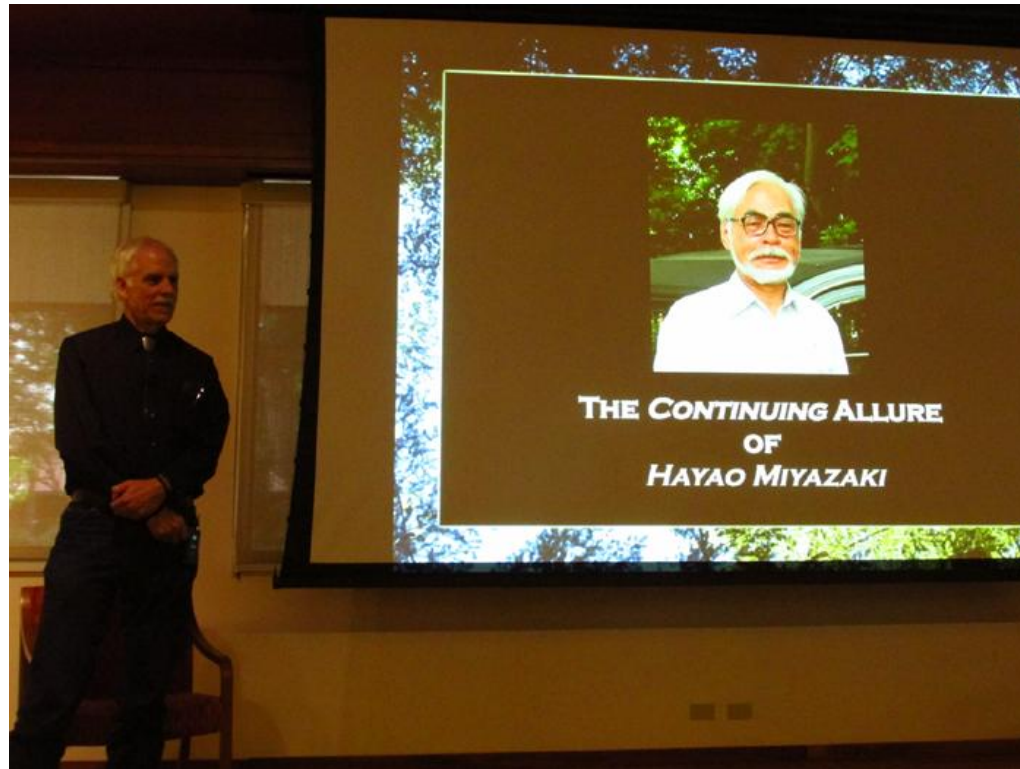
- Why is translation so difficult?

A sample translation done by Google
of one of my music bios:

*“The hesitation of the record , rightly
frightened by the ideas of the complex
, had been won when Zappa and
Cohen had shown that of that music ,
innovative and unusual as you want,
direct Yow mainly to an audience of
intellectuals stragglers , was also
exciting for weirdness and comicità` ,
for ease and panache . “*

Introduction to Language

- And why do we need translators in the first place? Is there any other animal that needs translators?



Fred Schodt, translator of books on Miyazaki

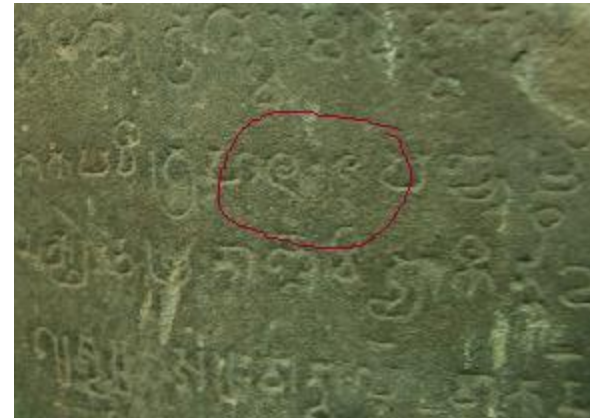
Introduction to Language



Introduction to Language

- 0: Like all symbols it refers to something, but in this case it refers to nothing.

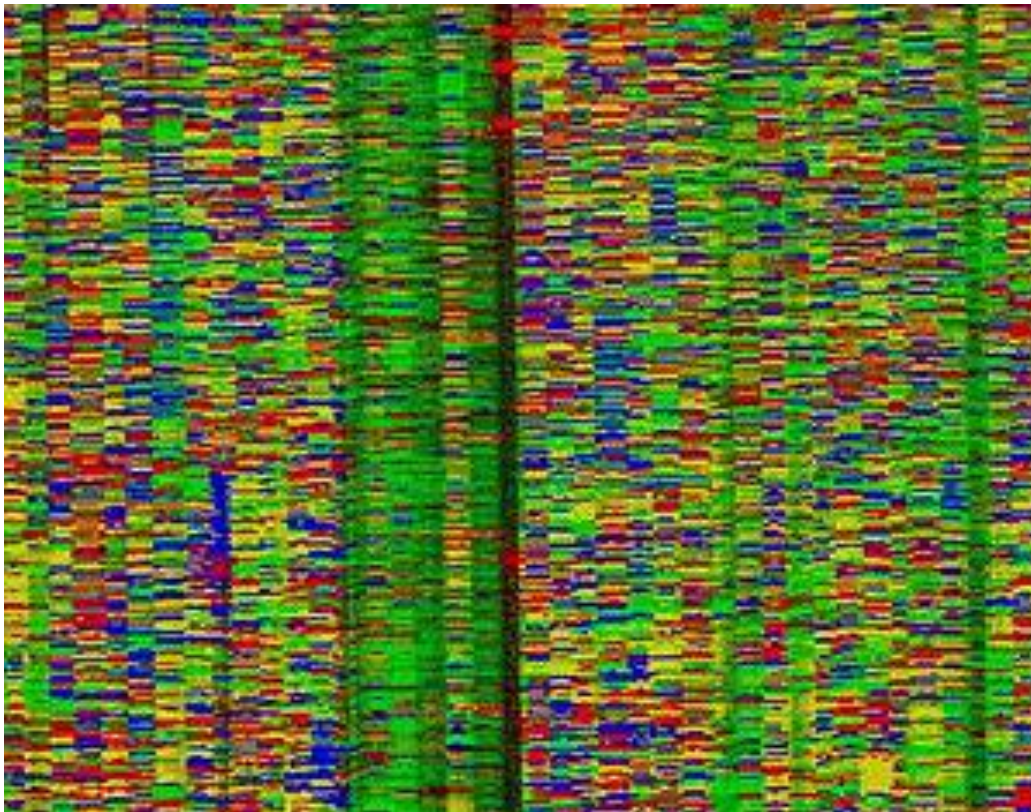
Inscription K-127, from Sambor on Mekong, the oldest extant representation of zero: the number 605 etched on a Khmer stele (7th c)



The second oldest extant representation of zero: the number 270 etched in a Gwalior temple (9th c)

Introduction to Language

- The oldest language on Earth



*...GATTTGGGGTTCAAAG
CAGTATCGATCAAATAGT
AAATCCATTTGTTCAACT
CACAGTTT...*

An excerpt from the human genome

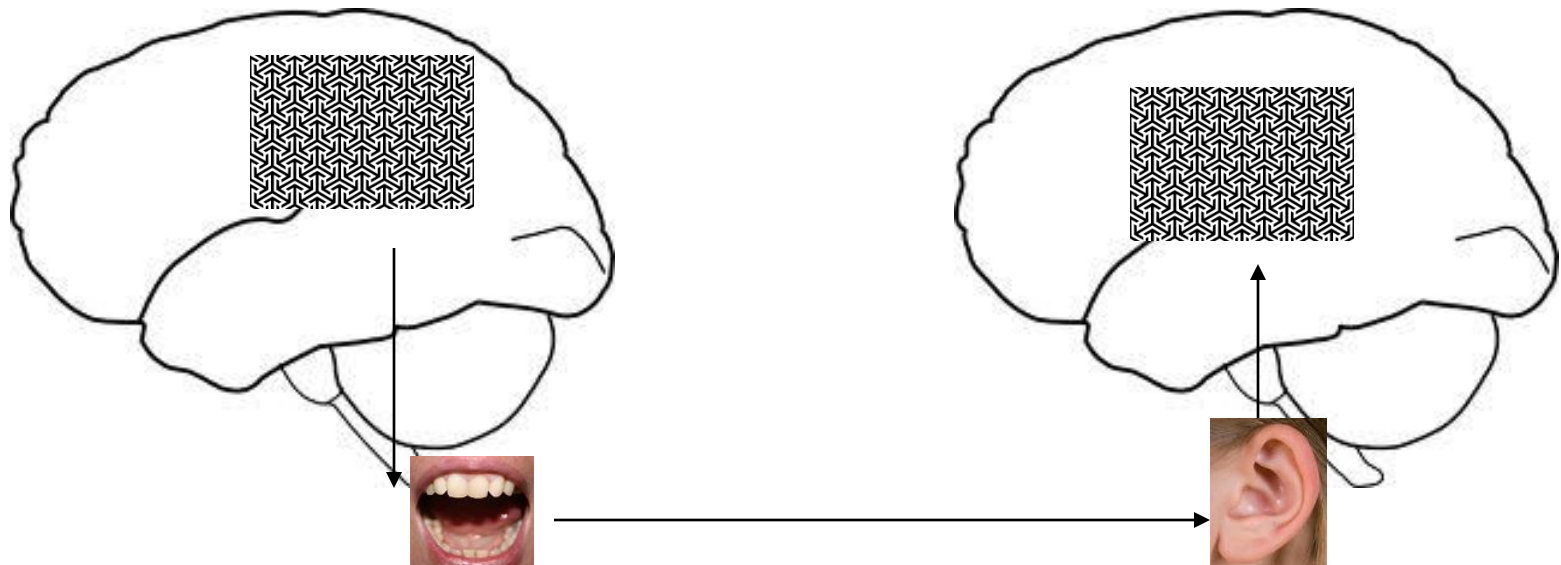
What Is Language?

- Language is a way to transfer a pattern from our brain to another person's brain



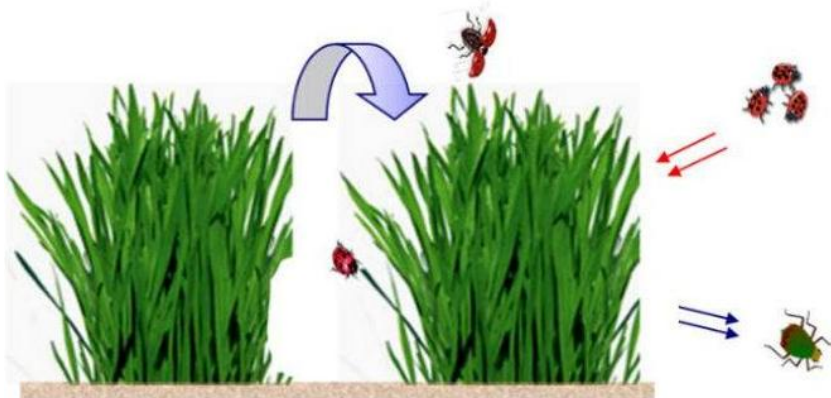
What Is Language?

- Language is a way to transfer a pattern from our brain to another person's brain
- It involves two brains, not just one
- The speaking expresses our mind, but the listening shapes our mind

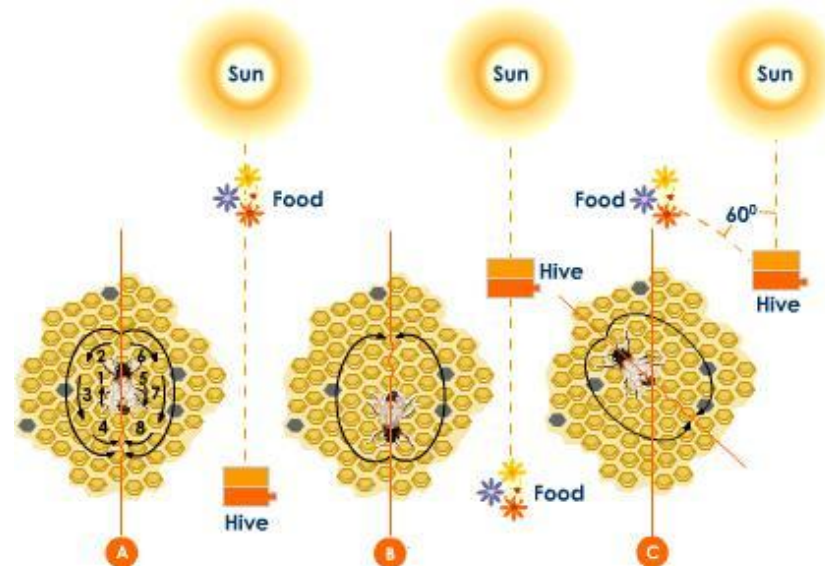


What Is Language?

- All animals communicate and even plants have some rudimentary form of interaction
- Communication is pervasive in nature, language being just one aspect of it
- Nature “speaks” to us all the time



Inger Ahman



What Is Language?

- The Earth existed before life as we know it, and the Earth is also made of living components such as ecosystems, which are made of societies, which are made of individual beings
- It is no surprise that all those ecosystems, societies and individuals are capable of communicating: they are merely “parts” of one giant organism, the Earth
- Communicating is their natural state



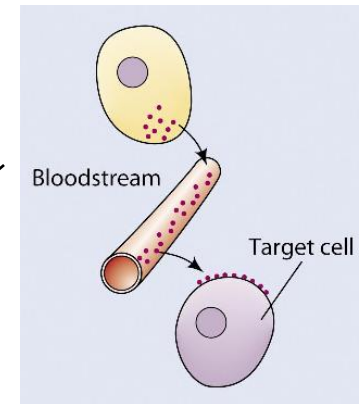
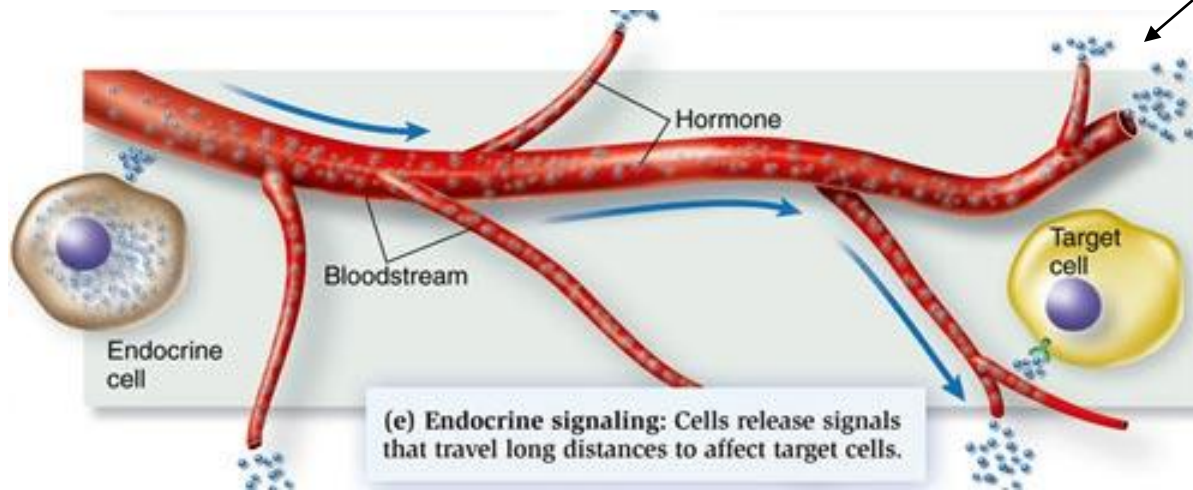
What Is Language?

- When a dog urinates repeatedly on its daily walk, the chemical markers it leaves behind tell other dogs about its gender, health and reproductive status



What Is Language?

- Molecular communication (using chemical signals to carry information) is widespread in nature
- Cells communicate with each other
 - Paracrine signaling via a protein (short distance)
 - Synaptic signaling via neurotransmitters (short distance)
 - Endocrine signaling via hormones in the bloodstream (long distance)

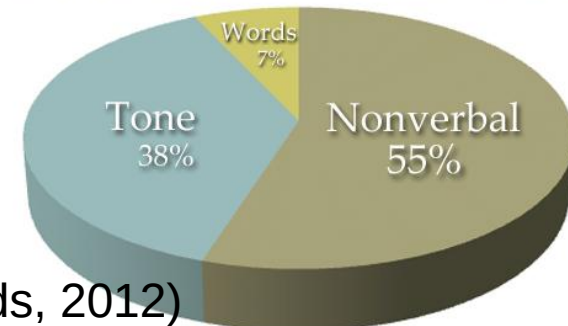


What is Language?

- Karl Lashley (1951)
 - A “syntax” similar to the one for language also exists in actions (physical movement)
- Ray Birdwhistell (1952)
 - “Kinesics”, paralinguistic body communication, such as facial expression
 - All movements of the body have some kind of meaning
 - Non-verbal behavior obeys its own grammar, with a "kineme" being the kinesic equivalent of the phoneme.



Communication Breakdown



(Julia Woods, 2012)

Why Do We Speak?



- Edward Sapir (1921)
 - Language and thought influence each other
 - Language also shapes thought
 - The structure of the language has an influence on the way its speakers understand the environment
 - Grammatical and categorial patterns of language embody cultural models
 - Language contains a “hidden metaphysics”
 - Language is a culturally-determined system of patterns that creates the categories by which individuals not only communicate but also think



Why Do We Speak?



- *“Each mother tongue teaches its users a unique way of seeing and feeling the world, and of acting in the world” (Marshall McLuhan)*
- *“The greatest propaganda in the world is our mother tongue, that is what we learn as children, and which we learn unconsciously. That shapes our perceptions for life.” (Marshall McLuhan)*

Why Do We Speak?



- Language and Thought
 - The joke "I will see you when (if) i come back from my trip" makes no sense in the German language ("when" and "if" are the same word, "wenn")

Why Do We Speak?



- Lev Vygotsky (1934)
 - Language is a way to organize (internally) the world
 - Language guides the child's cognitive growth
 - Cognitive faculties are internalized versions of social processes
 - Children develop under the influence of both biology and society

Instruments used by Human Beings according to Vygotsky		
Symbolic Instrument	Language is a symbolic instrument	Language belongs to the Realm of Epistemology
Instruments of Technology	Technology is an ontological instrument	Technology belongs to the Realm of Ontology

Why Do We Speak?



- Lev Vygotsky (1934)
 - The individual is the result of a dialectical cooperation between nature and history, between the biological sphere and the social sphere
 - Language is a way to transmit mind to weaker individuals and across generations

Why Do We Speak?



- Katherine Nelson (1996)
 - Language is the medium through which the mind becomes part of a culture
 - Language is the medium through which the shared meanings of society take over the individualistic meanings of the child's mind
 - Society takes over the individual mind, and it does so through language.

Why do We Speak

- There is too much:
 - Western languages are about 50% redundant
 - We can guess the meaning of most sentences from a fragment of them
 - English still adds an “s” to the third person singular of a verb (“he eats”)

Why do We Speak

- There is too little:
 - Linguistic communication is inefficient
 - Two computers can simply exchange in a split second an image or a text, pixel by pixel or character by character, without any loss of information
 - Alfred Korzybski (1933): there are fewer words than experiences





Why do We Speak

- Language has always been a way to determine someone's place of birth
- It is surprisingly difficult to imitate a dialect
- Language may have been a powerful tool to recognize members of the same tribe even before it became a powerful tool to philosophize.

What do We Speak

- **Phonetics** studies the physical aspects of speech sound
- **Phonology** studies the way these sounds make sense
 - Nicholas Trubetzkoy (1920s): the "phoneme" is the elementary unit of speech
 - Roman Jakobson (1939): the phoneme is defined by a set of distinctive features

What do We Speak

- **Syntax** studies the structure of language, the fact that only some combinations of words are valid.
- **Semantics** studies the meaning that those valid combinations create.
- **Pragmatics** studies why we speak the way we speak, the purpose of speaking.
- These are relatively independent of who is speaking

What do We Speak

- **Phonetics** studies the sounds that we make when we speak
 - A string of words can be pronounced in an infinitely large number of ways at an infinitely large number of speeds, using an infinitely large number of variations of pauses and accelerations.
 - No two speakers pronounce the same sentence with the exact same sounds, and even the same speaker cannot pronounce the same sentence twice using the exact same sounds.

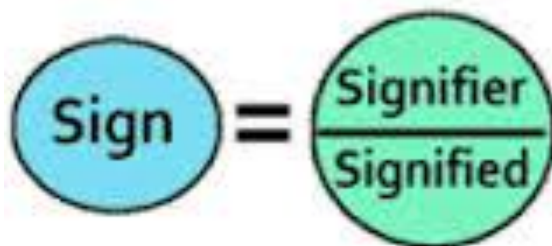
What do We Speak

- What defines a language?
- There is no definition of what the English language is
- If you want to find out whether a word is English or not, you have to check a dictionary
- If you want to find out whether a sentence is English, the individual words are not enough.
 - "Mangiare is not an English word" is an English sentence
 - "Xgewut is not a meaningful word" is an English sentence
 - What makes a sentence English?

What do We Speak



- Ferdinand DeSaussure (1913)
 - the "parole": an actual utterance in a language
 - the "langue": the entire body of the language
 - Semiology: the “science that studies the life of signs within society”
 - The sign consists of the signifier (the sound) and the signified (the concept)
 - The value of a sign is determined by all the other signs in the langue



‘TREE’

Signifier

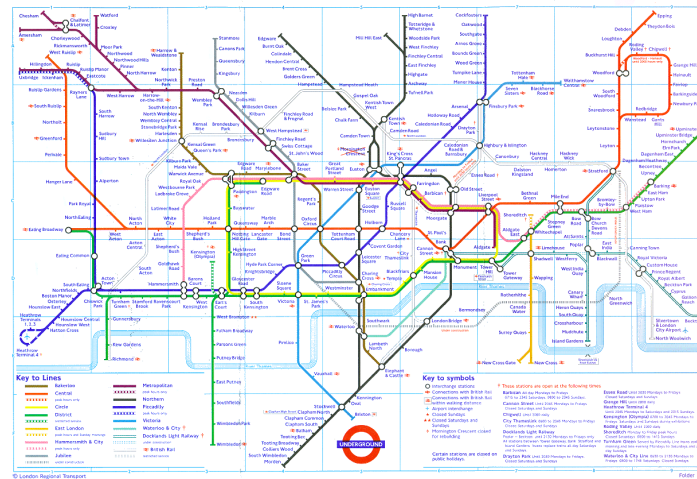


Signified

What do We Speak



- Ferdinand DeSaussure (1913)
 - Structuralism: the phenomena of human life (e.g, language) are intelligible only inasmuch as they are part of a network of relationships
 - A sign is meaningful only within the entire network of signs
 - The meaning of a sign is its relationship to other signs



Generative Grammar

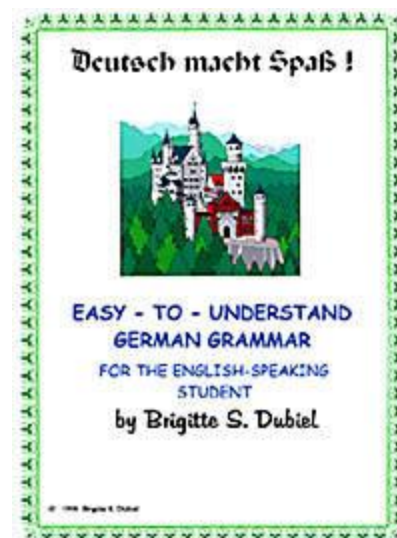


- Noam Chomsky (1957)
 - Performance vs competence
 - We understand sentences that we have never heard before
 - We can tell right away whether a sentence is correct or not, even when we do not understand its meaning
 - We are capable of saying far more than we will ever say in our entire lifetime.
 - "performance" = all sentences that an individual will ever use
 - "competence" = all sentences that an individual can utter, but will not necessarily utter

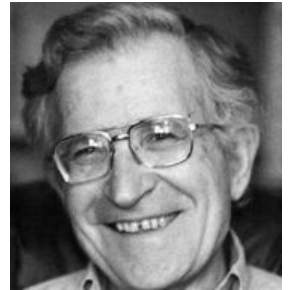
Come to church
Come ti chiami

Generative Grammar

- Noam Chomsky (1957)
 - A language is defined by a grammar
 - The number of sentences in a language is potentially infinite
 - But there is a finite system of rules that defines which sentences can potentially be built and determines their meaning
 - That system of rules is what defines a language
 - Grammar = rules that account for all valid sentences of the language



Generative Grammar



- Noam Chomsky
 - Application of formal logic to linguistics
 - Analyzing language is transformed into a mechanical process of generating more and more formal strings, just like when trying to prove a mathematical theorem
 - How to derive all possible sentences of a language from an abstract structure
 - Language = set of sentences
 - Sentence = finite string of words from a lexicon
 - Grammar = set of rules that can generate all possible sentences in that language

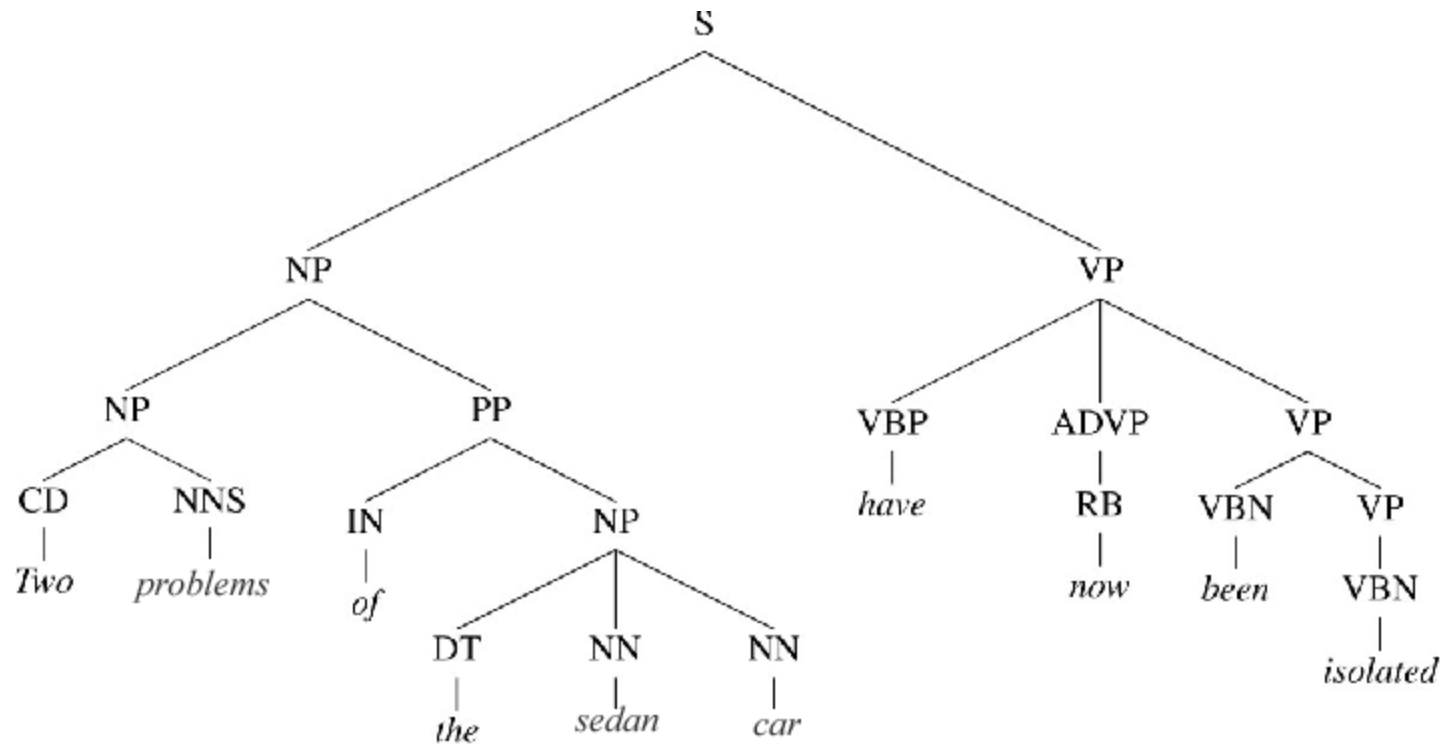
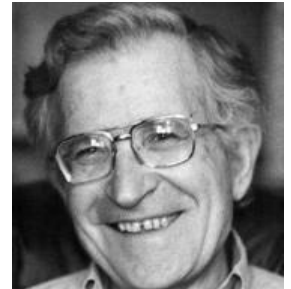
Generative Grammar



- Noam Chomsky
 - A “phrase structure” is defined by the constituents of the sentence: article, noun, verb...
 - A phrase structure grammar is equivalent to a Turing machine
 - Understanding is like proving a mathematical theorem
 - Understanding is a by-product of a mechanical process of generating more and more formal strings

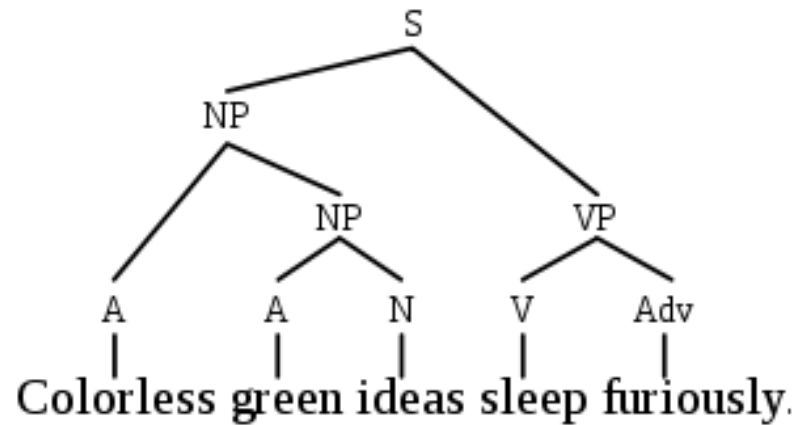
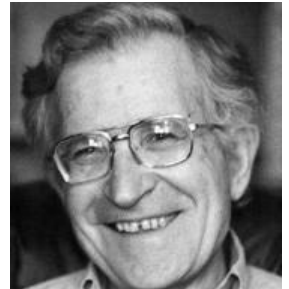
Generative Grammar

- Noam Chomsky
 - Phrase marker

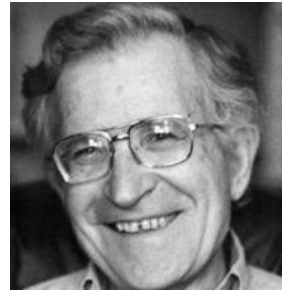


Generative Grammar

- Noam Chomsky
 - The phrase marker is independent of meaning (syntax only, no semantics)

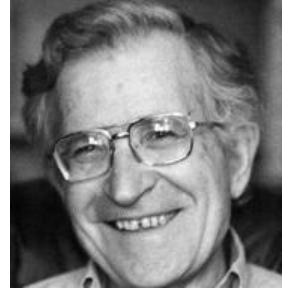


Generative Grammar



- Noam Chomsky
 - "Deep structure" = fundamental relationships among components
 - actor: piero
 - acted upon: tomato
 - action: eat
 - "Surface structure" = the sentences that are actually uttered
 - piero eats the tomato
 - the tomato is eaten by piero
- Understanding = transforming surface structures into deep structures

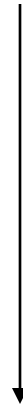
Generative Grammar



- Noam Chomsky
 - An important assumption:
 - Independence of syntax from semantics
(well-formed vs meaningful sentence)

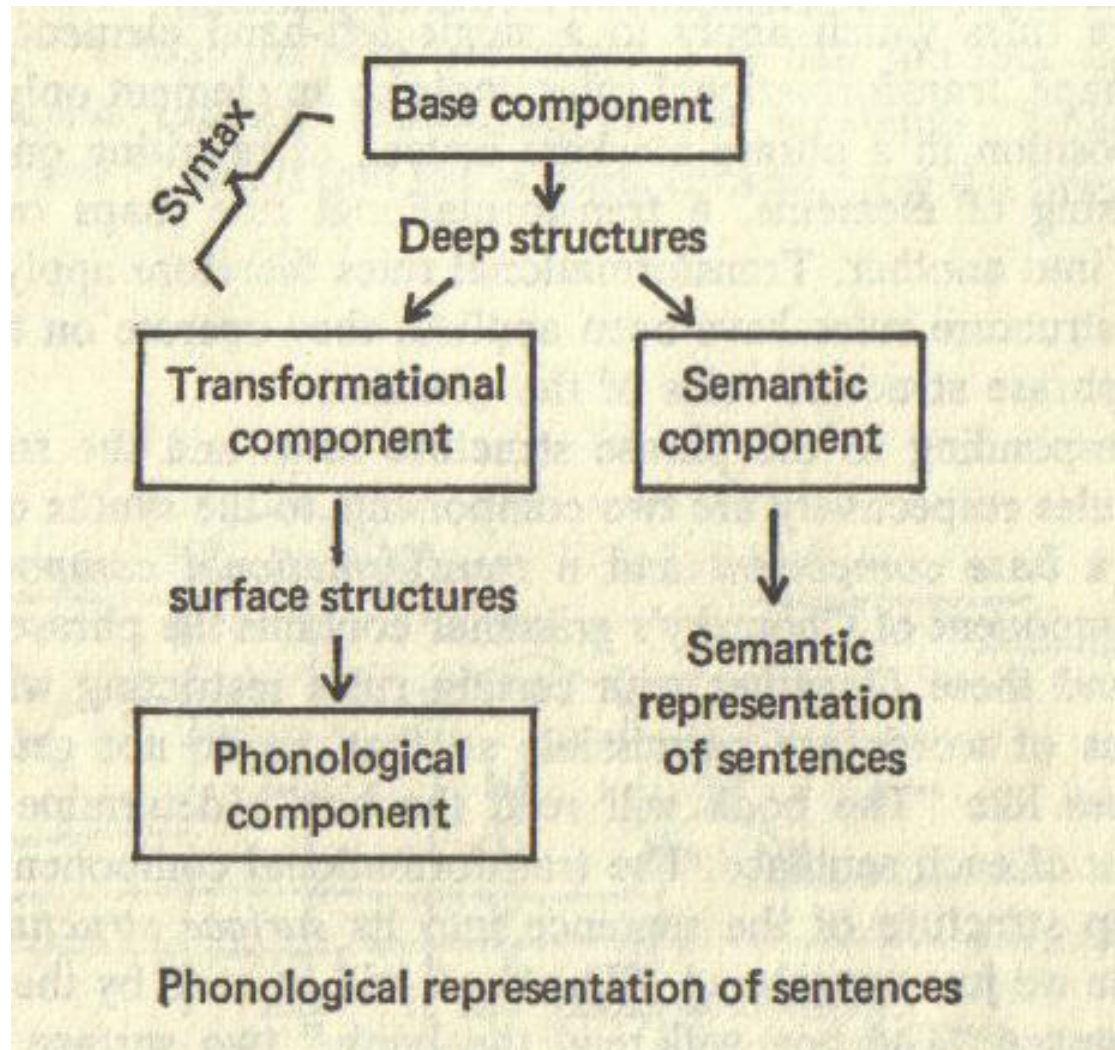


The barking meat eats dogs



The barking dog eats meat

Standard Theory



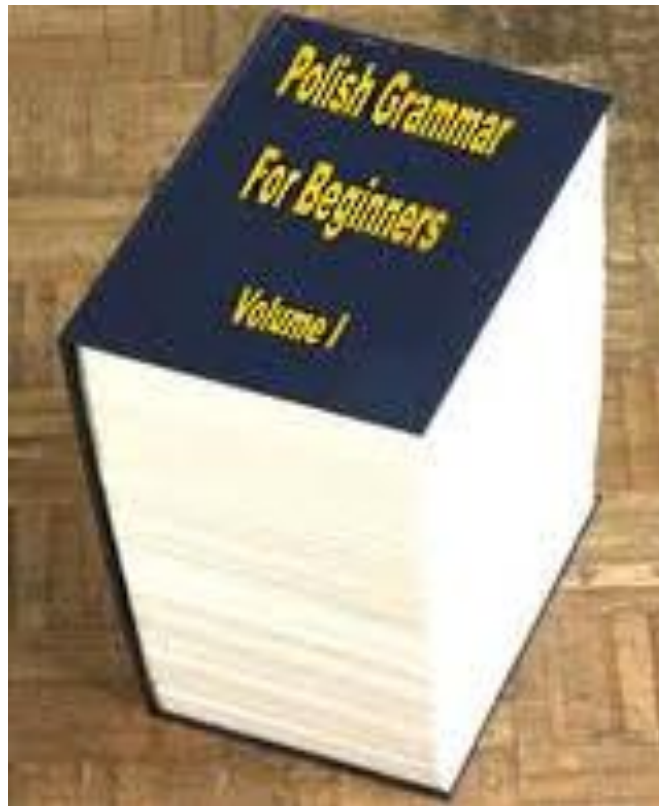
Standard Theory

- Grammar =
 - syntactic component: phrase structure rules, lexicon and transformational component
 - semantic component: assigns a meaning to the sentence
 - phonologic component: transforms it into sounds
- Sentence =
 - d-structure: the one generated by phrase-structure rules
 - s-structure: obtained from the d-structure by applying transformational rules
 - p-structure: a phonetic structure
 - logical form: semantic component

Generative Grammar



Unfortunately every grammar has its exceptions...



Universal Grammar

- Mark Gold's theorem (1967):
 - No amount of correct examples of sentences are enough to learn a language
 - It is mathematically impossible for a child to have learned the language she speaks

Universal Grammar

- Noam Chomsky (1981):
 - There exists universal linguistic knowledge
 - Learning a language = innate knowledge plus experience
 - A child is genetically programmed to learn a language, and experience will simply determine which one
 - Language "happens" to a child, just like growth
 - Universal grammar = linguistic genotype

Chomsky's Influence



- Ray Jackendoff (1993)
 - The acoustic signal of someone's voice speaking to us is not broken down into sentences and words: it tends to be a continuous flow of sounds.
 - Only a hearer equipped with the proper decoding device (the universal grammar) can turn that noise into syntactic structures
 - The same argument about universal grammars can be applied to all facets of human nature
 - Vision too is controlled and enabled by a mental grammar, by a genetic predisposition to recognize objects and situations
 - We can understand a virtually unlimited set of visual situations

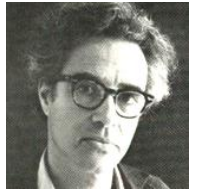
Chomsky's Influence



- Ray Jackendoff (1993)
 - Thought too is constructed by using a "universal grammar of concepts".
 - We can think a virtually unlimited number of thoughts
 - Without innate knowledge to guide, direct, prune and so forth our mental life, it would be difficult to speak, see and think.
 - The brain contains several modules, each specialized in a cognitive function and each driven by a "universal grammar".

Chomsky's Influence

- Eric Lenneberg: Growth and development apply to language faculties just like to any other organ of the body
- Jerry Fodor: Mental modules perform linguistic processing
- Jerrold Katz: A dictionary of lexical items ("grammatical marker" + "semantic marker") + projection rules
- Anna Wierzbicka: universal semantic primitives



Chomsky's Influence



- Steven Pinker (1994):
 - We think in mentalese, not in English or Chinese.
 - It is only when we have to pack information for another human being that we use the language of our community
 - In doing so we have to limit our message to what can be said in that language
 - “Knowing a language is knowing how to translate mentalese into strings of words, and viceversa”

Chomsky's Influence



- Steven Pinker (1994):
 - Humans are equipped with a language instinct
 - Our brains are hardwired to recognize "meaningful" words out of a stream of sounds
 - Different speakers pronounce the same words in different ways.
 - The same speaker can pronounce the same word in different ways depending her mood

Chomsky's Influence



- Steven Pinker (1994):
 - Children do not simply repeat the sentences that they have been taught: children come up with their own sentences.
 - That is what animals cannot do
 - Human language is controlled by the neocortex, whereas animal "language" is controlled by the brain stem and the limbic system
 - Humans too have this primitive form of language (a scream of terror, a burst of laughter, etc)
 - But humans are also capable of combinatorially combining sounds

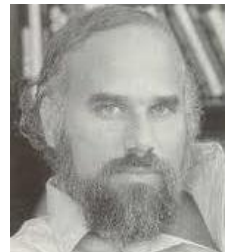
Case Grammars

- Chomsky's deep structure of language is closer to the essence of concepts
- Case-frame grammar (Charles Fillmore, 1967)
 - sentence = representation of relationships
 - cases as roles
 - cases are universal, language-independent
 - two sentences whose meaning is equivalent must have the same representation
- Modal operators (David Dowty, 1979)
 - "do", "become" and "cause" as the foundations for building the meaning of every other verb
 - mathematical calculus on thematic roles



Case Grammars

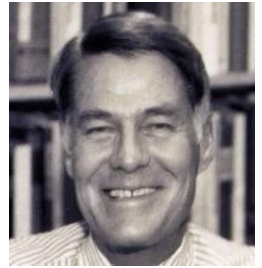
- Space-time primitives (Ray Jackendoff, 1983)
 - the meanings of all verbs be reduced to a few, such as "motion" and "location"
- Conceptual dependency (Roger Schank, 1975)
 - decompose verbs into elementary concepts
 - reveal things that are not explicit in the surface form of the utterance
 - Shifts from the way words have been assembled to what is being described



Other Grammars

- Yehoshua Bar-Hillel's categorial grammar (1953)
- Richard Montague's intensional semantics (1974)
- Gerald Gazdar 's generalized phrase-structure grammar“, based on Intensional Logic (1985)
- Ronald Langacker's cognitive grammar (1986)
 - Phonology and semantics, mediated by syntax
 - Cognitive units are created by experience and used as wholes
- Gilles Fauconnier's mental spaces (1994)
 - We construct mental spaces as we speak
 - Mental spaces allow for alternative views of the world
- George Lakoff's cognitive linguistics (1994): language is grounded in our bodily experience

Other Language Theories



- Roger Brown (1977)
 - Jean Piaget's "constructivism": language acquisition follows the acquisition of cognitive skills
 - Language is acquired via a "law of cumulative complexity"
 - First the child's mind develops the representation of the world in terms of objects and actions, then the child learns to speak
 - That initial speech (of one-word sentences) is "semantic"
 - Chomsky's "universal grammar" is an illusion due to the fact that all children are programmed to develop through the same stages



Other Language Theories

- Elizabeth Bates (1979)
 - Language is not "one" isolated phenomenon but the result of a number of cognitive developments, each of which affects more than one cognitive faculty and the sum of which accounts for the development of all cognitive faculties, including language.
 - There is no "universal grammar" à la Chomsky. There is a global development of interconnected cognitive skills
- George Lakoff's cognitive linguistics (1994)
 - Language is grounded in our bodily experience



Other Language Theories

- Donald Loritz (1999)
 - Rhythm is the "central organizing mechanism" of language
 - The sequence in which a child learns both phonology and morphology is based on the development of rhythms
 - Children learn to walk before they learn to talk
 - Their learning of talking improves after they have learned to walk
 - Walking introduces a "rhythmic dipole" into the child's brain
 - "Babbling gets rhythm and becomes speech"

Understanding Discourse

- Ambiguity (rose, play, light)
- Anaphora (you, here, now)
- Metaphor, metonymy
- Pragmatics

Understanding Discourse

Soviet virgin lands short of goal again

Prostitutes appeal to Pope

Panda mating fails - veterinarian takes over

Killer sentenced to die for second time

Miners refuse to mine after death

(Newspaper headlines)

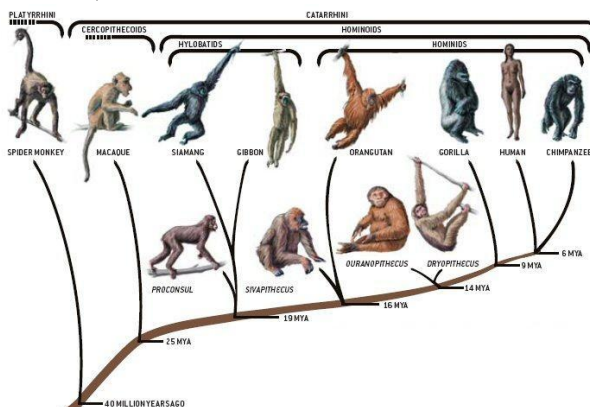
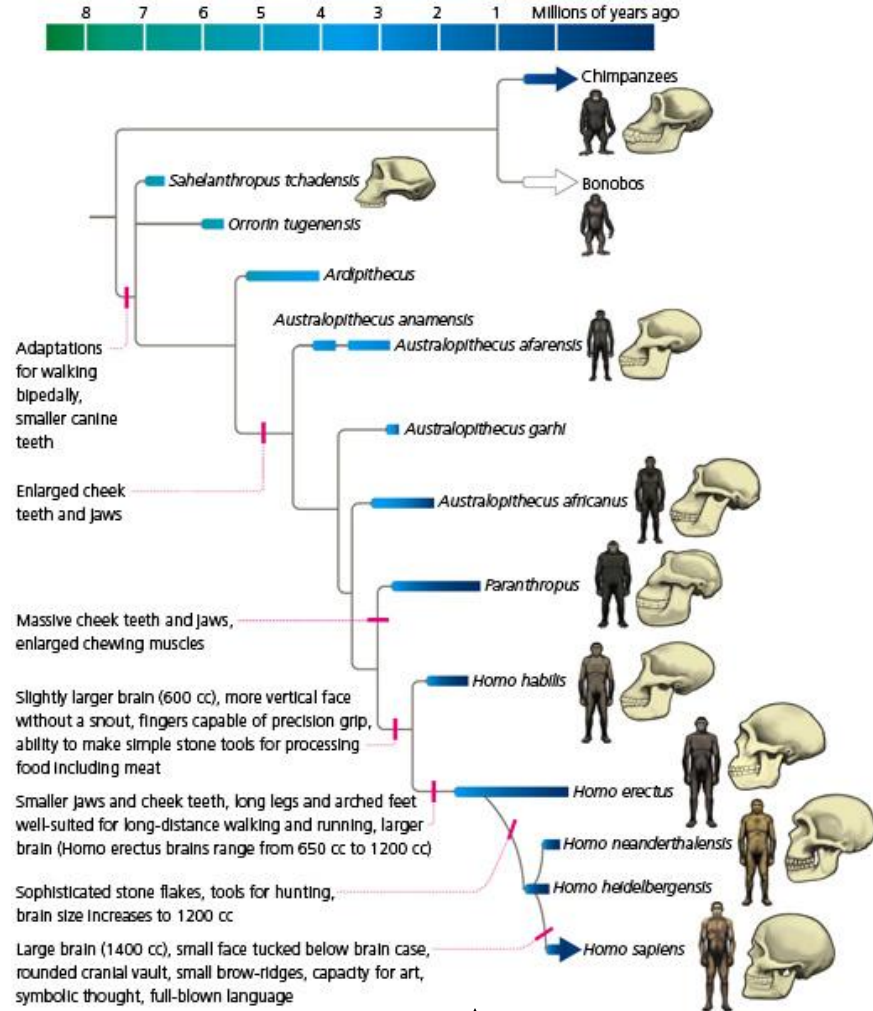
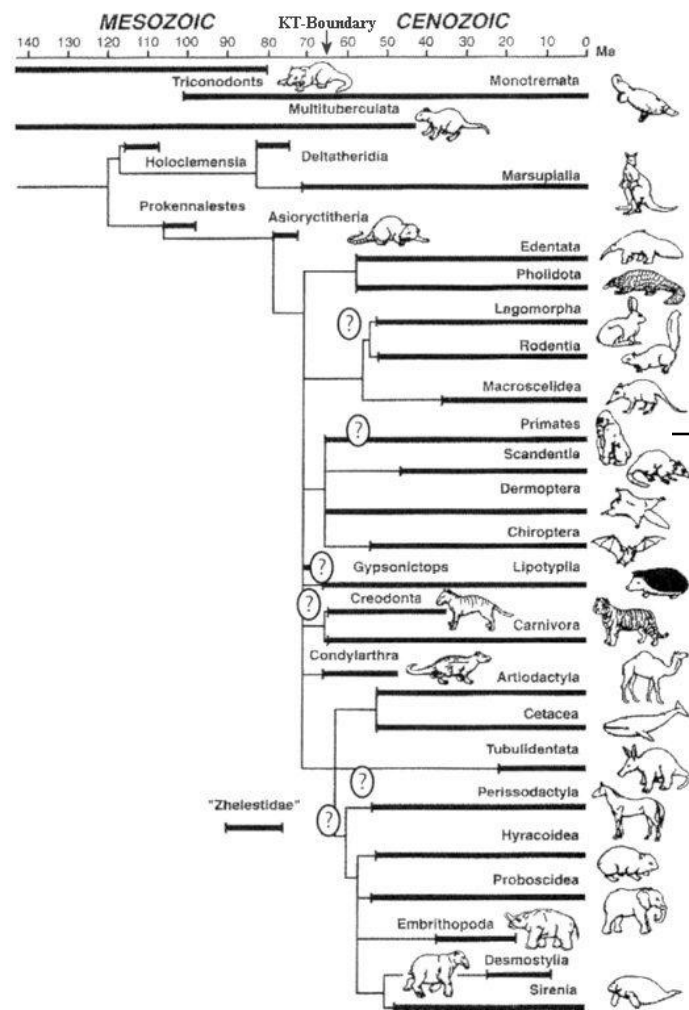


Origins of Language

- Charles Darwin: languages seem to evolve the same way that species evolve
- The real issue: how did non-linguistic animals evolve into a linguistic animal?

Origins of Language

- When did language arise?



Origins of Language

- James-Mark Baldwin
 - Species capable of learning are better at evolving
 - Language is an efficient tool for learning



Origins of Language



- Susanne Langer (1942)
 - Ritual and magic are symbolic activities that, from an animal's point of view, are hopelessly senseless
 - An animal would never dance around a fire the way a man dances around a fire to make something happen
 - Animals have a direct relationship to events in their world.
 - Humans construct huge symbolic universes that separate them from reality.

Origins of Language



- Susanne Langer (1942)
 - The reason humans do such strange things with symbols is that humans are symbolic systems at a biological level
 - We just cannot help abstracting the world (i.e., thinking).
 - We abstract everything into symbols
 - Speech is the most economical way of rapidly producing many symbols via bodily movement
 - Speech only requires movements of the lips and the tongue.
 - Verbal language is not the only "language" we employ. It is just the most efficient.

Origins of Language

- Susanne Langer (1942)
 - Communication is a by-product of symbolization
 - Our brains create symbols all the time
 - At the physical level no two people see the same thing but all people form the same symbol
 - It turns out that symbols constitute a very effective way to communicate
 - Language's mission is to transform experience into symbols (concepts)



Origins of Language

- Susanne Langer (1942)
 - Babies tend to babble spontaneously, whereas other primates don't
 - A child has to learn to speak the language of the parents, but the child is already speaking from the very first moment of life
 - Her babbling constitutes a language, albeit a language that only that child can understand
 - Her parents teach the child a language that is to be shared with the community.
 - They don't teach the child to speak: they teach the child to speak a specific language.



Origins of Language

- Susanne Langer (1942)
 - Singing and dancing came first
 - The language of children fluctuates violently in tone
 - Singing and speaking became two different things; and today we teach children not to scream, not to cry, not to jubilate, and so forth, thus progressively eliminating the "singing" quality of language
 - Humans are singing and dancing animals



Origins of Language



- Susanne Langer (1942)
 - We often confuse the importance and the origin of a phenomenon
 - The mind creates symbols all the time
 - Then some of its symbolic activity turns out to be important for some practical activity
 - We think that speech is for communicating, when in reality communication was just a by-product of speech.
 - Music was yet another manifestation of the mind's endless symbol processing, but then became important to express feelings that couldn't be expressed by speech alone

Origins of Language



- Co-evolution (Ralph Holloway, 1967)
 - Ancient hominids still had a small brain like apes but could already do things that an ape's brain couldn't do like full bipedalism
 - Brain reorganization must have preceded brain evolution
 - That reorganization was due to positive feedback between “mental” evolution and bodily evolution
 - Language and the brain coevolved

Origins of Language



- A by-product of socialization (Nicholas Humphrey, 1983)
 - Social intelligence is the form of intelligence that is unique to humans
 - Language was born out of the need to socialize

Origins of Language

- An evolutionary accident (Philip Lieberman, 1984)
 - The brain is the result of evolutionary improvements that progressively enabled new faculties
 - Language arose when speech and syntax were added to older communication systems
 - Language is a relatively recent evolutionary innovation
 - Speech allowed humans to overcome the limitations of the mammalian auditory system
 - Syntax allowed humans to overcome the limits of memory



Origins of Language



- Symbolic representation (Derek Bickerton, 1992)
 - The primitive, emotion-laden "call system" is still in our brain (we still cry, scream, laugh, swear, etc)
 - Language did not evolve from emotions
 - Language is fundamentally different:
 - the symbolic: a word stands for something
 - the syntactic: words can be combined to mean more than their sum

Origins of Language



- Symbolic representation (Derek Bickerton, 1992)
 - Syntax is what makes our species unique
 - Other species can also "symbolize", but none has shown a hint of grammar
 - Thus **language is not due to socialization**, otherwise it would also have developed in other primates
 - The combinatorial power of human language is what makes it unique

Origins of Language



- Symbolic representation (Derek Bickerton, 1992)
 - Animal communication is holistic: it communicates the whole situation
 - Human language breaks down the situation
 - Animal communication is limited to what is relevant to survival
 - Humans can communicate about things that have no relevance at all for our survival
 - Human and animal communication are completely different phenomena

Origins of Language



- Symbolic representation (Derek Bickerton, 1992)
 - Human language did not evolve from animal communication but from representation systems
 - It has a different purpose and it requires a different brain region
 - Human language was so advantageous that it drove a phenomenal growth in brain size
 - The emergence of language even created the brain regions that are essential to conscious life

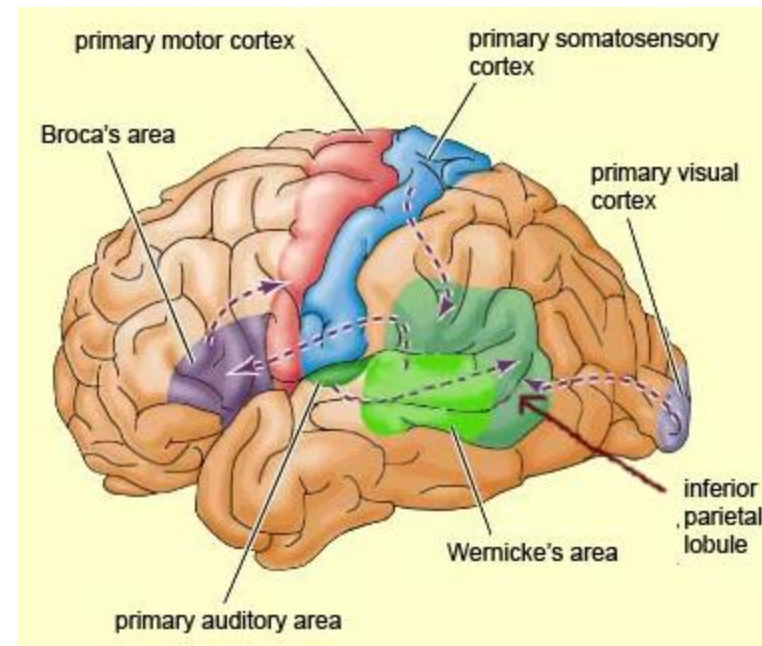
Origins of Language



- Symbolic representation (Derek Bickerton, 1992)
 - We cannot recall any event before we learned language
 - We can remember thoughts only after we learned language
 - Language seems to be a precondition to all the other features that we rank as unique to humans
 - Language created consciousness

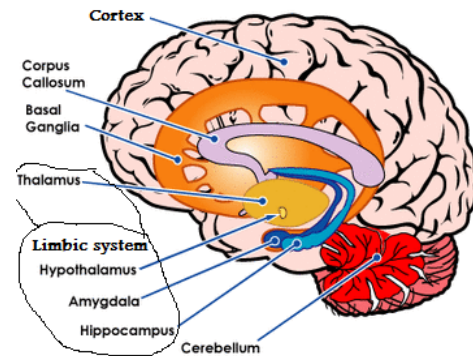
Origins of Language

- An evolution of emotions (Rhawn Joseph, 1993)
 - The inferior parietal lobe of the left hemisphere is one of the youngest regions of the brain
 - It is also one of the last organs to mature in the child
 - It is massively connected with the auditory, visual, and somatosensory cortices
 - Its neurons are “multimodal”: they can simultaneously process different kinds of inputs (visual, auditory, movement, etc).



Origins of Language

- An evolution of emotions (Rhawn Joseph, 1993)
 - This lobe enables us to understand a word as both an image, a function, a name and many other things at the same time.
 - This lobe enabled language, tool making, art
 - The same organ enables the language of gesturing, that we share with many animals
 - The original site of language was the limbic system, that we share with other mammals
 - Originally, language was purely emotional
 - The limbic system embodies a universal language that we all understand, a primitive language made of calls and cries



Origins of Language

- Cementing the group (Robin Dunbar, 1996)
 - Language brings more benefits to the listener than to the talker
 - If that were the main purpose of language, it would have caused the evolution of a race of listeners, not of talkers, and far less of gossipers.
 - Language served to cement the group
 - Humans who spoke had an evolutionary advantage (the group) over humans who did not



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Origins of Language

- Cementing the group (Robin Dunbar, 1996)
 - Apes cement social bonds by grooming the members of their group.
 - Humans "gossiped" instead of grooming each other.
 - Later humans began to use language also to communicate information
 - Dialects developed for a similar reason: to rapidly identify members of the same group



Origins of Language

- A by-product of the hand (Frank Wilson, 1998)
 - The evolution of the human hand to **handle objects** enabled a broad range of new activities...
 - ... that, in turn, fostered an evolution of the brain (the brain could think new thoughts)...
 - ... that resulted in the brain of modern humans
 - The human brain (and only the human brain) organizes words into sentences, i.e. does syntax, because of the hand



Origins of Language



- A Sexual Organ (Geoffrey Miller, 2000)
 - Individuals should have no motivation to share key information since they are supposed to compete (survival of the fittest)
 - Individuals who simply delivered knowledge to competitors would not have survived.
 - Humans, instead, compete to be heard
 - Therefore language originally did not have a social function
 - What has evolved dramatically in the human brain is not the hearing apparatus but the speaking apparatus.

Origins of Language

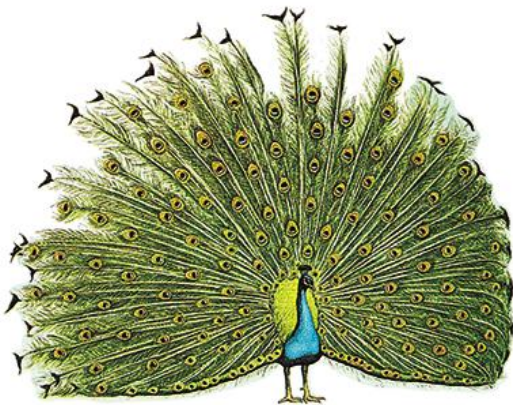


- A sexual organ (Geoffrey Miller, 2000)
 - The human mind was largely molded by sexual selection and is therefore mainly a sexual ornament.
 - Culture, in general, and language, in particular, are simply ways for males and females to play the game of sex
 - Language is a form of sexual display just like any other organ (bull horns or peacock tails) that served that function
 - When language appeared, it quickly became a key tool in sexual selection, and therefore it evolved quickly.

Origins of Language



- A sexual organ (Geoffrey Miller, 2000)
 - Language is unique to humans the same way that the peacock's tail is unique to peacocks
 - It is pointless to try and teach language to a chimpanzee the same way that it is pointless to expect a child to grow a colorful tail.



Jokes



- Jokes?
 - What is a joke?
 - Why do we tell jokes?
 - What is in a joke?
 - In order to understand a joke one must master the whole power of the language

Tools



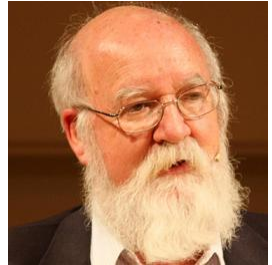
- Richard Gregory (1981)
 - Language is but one particular type of "tool"
 - A human is both a tool-user and a tool-maker
 - Tools are extensions of the limbs, the senses and the brain
 - There are "hand" tools (such as level, pick, axe, wheel, etc) and "mind" tools, which help measuring, calculating and thinking (such as language, writing, counting)
 - Tools are extensions of the body. They help us perform actions that would be difficult for our arms and legs.
 - Tools are also extensions of the mind. Writing extended our memory

Tools

- Richard Gregory
 - Information as "potential intelligence" and behavior as "kinetic intelligence"
 - A tool "confers" intelligence to a user: it turns some potential intelligence into kinetic intelligence.
 - Tools increase intelligence as they enable a new class of behavior
 - A person with a tool is a person with a potential intelligence to perform an action



Tools



- Daniel Dennett (1998)
 - "Darwinian creatures" (all living beings) were selected by trial and error on the merits of their bodies' ability to adapt
 - "Skinnerian creatures" were also capable of independent action and therefore could enhance their chances of survival by finding the best action (are capable of learning from trial and error)
 - "Popperian creatures" (most mammals and birds) can play an action internally in a simulated environment before they perform it in the real environment and can therefore reduce the chances of negative effects

Tools



- Daniel Dennett
 - "Gregorian creatures" (humans) are capable of creating tools, in particular they master the tool of language
 - Gregorian creatures benefit from technologies invented by other Gregorian creatures and transmitted by cultural heritage, unlike Popperian creatures who benefit only from what has been transmitted by genetic inheritance.
 - Human intelligence (the intelligence of Gregorian creatures) is due not to a larger brain but to the ability to "off load" as much as possible of our cognitive tasks into the environment: we construct "peripheral devices" in the environment to which those tasks can be delegated

Tools

- Timothy Taylor (2010)
 - Humans should not have survived evolution at all because reproduction is so dangerous, complicated and (in the past) lethal (for both baby and mother), and then because children require so much attention
 - It seems irrational that the most vulnerable ape ended up dominating every other species
 - Technology is the solution to this apparent contradiction.



VS



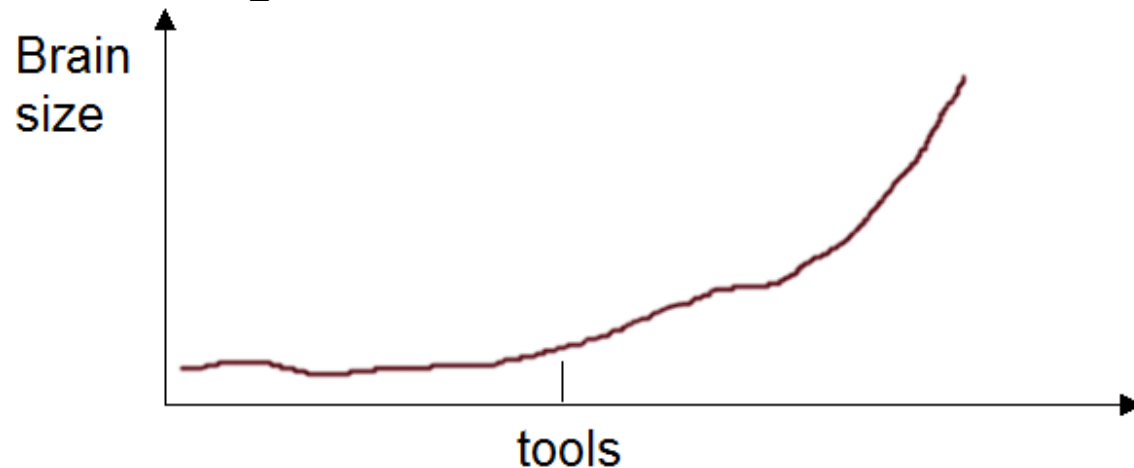
Tools

- Timothy Taylor (2010)
 - The upright posture freed the hands, and allowed humans to make tools
 - That altered the normal course of evolution
 - Technology introduced a parallel (non blind) algorithm next to Darwin's (blind) algorithm
 - Technology evolved humans
 - Humans got weaker while becoming more dependent on technology ("self-domestication")



Tools

- Timothy Taylor (2010)
 - Survival of the weakest is made possible by tools
 - Brain size started increasing after technology happened
 - The rapid growth of the human brain was due to competition for technological supremacy.
 - Tools made possible larger brains. Tools made possible intelligence.



Exaptation

- Vilayanur Ramachandran (2011)
 - Different specialized areas for lexicon, syntax (Broca's area) and semantics (Wernicke's area)
 - Language evolved by exaptation (from functions that originally evolved for different purposes, not communication purposes) and by cross-activation (of neighboring brain regions)
 - The inferior parietal lobe evolved originally for cross-modal abstraction, since it has to mediate signals coming from the touch, vision and hearing regions of the brain; and then later this feature became an independent skill, the ability to think abstract thoughts.
 - The brain "translates" an image into a sound simply because the brain maps that represent the two are adjacent and interfere

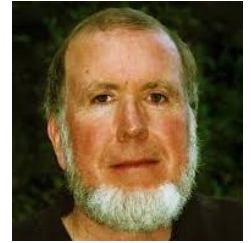


Exaptation

- Vilayanur Ramachandran (2011)
 - By exaptation, the brain function of building tools out of parts evolved into the brain function that creates the tree structure of linguistic syntax: sentences too are constructed out of parts.
 - The original language may have been the language of building tools, not the language of speaking words.



Tools



- Kevin Kelly (2010)
 - The "technium" is the set of all interconnected technologies collectively created by humans.
 - The evolution of the technium is driven by forces that are similar to the ones that drive the evolution of life
 - Technology parasites on human minds in order to survive, reproduce and evolve, just like memes do.



Summary

- Language and thought influence each other
- Noam Chomsky: the generative grammar
- Universal grammar or language instinct
- Origins of Language
 - A by-product of symbolization
 - A by-product of socialization
 - An evolutionary accident
 - Symbolic representation
 - An evolution of emotions
 - Cementing the group
 - A meme
 - A by-product of the hand
 - A sexual organ
 - A tool

Break



*"Those who can make you believe absurdities
can make you commit atrocities"*
(Voltaire)

Semiotics

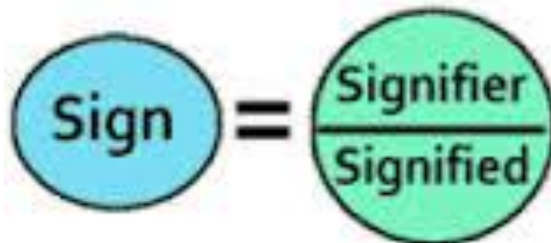
- Charles Sanders Peirce (1883)
 - Index (a sign which bears a causal relation with its referent),
 - ashes burning in an ashtray mean that someone was recently in the room
 - clouds looming on the horizon mean it is about to rain
 - Icon (which bears a relation of similarity with its referent),
 - a photograph of a sporting team
 - Symbol (whose relation with its referent is purely conventional)
 - the banner of a sporting team



Semiotics



- Ferdinand DeSaussure (1913)
 - Phoneme: the basic unit of language
 - Morpheme: the basic unit of signification
 - Mytheme: the basic unit of myth
 - The content of a sign is split into two parts: one is connected to an object in the real world (ontology) and the other is connect to the effect of the sign in the mind of a potential interpreter



'TREE'

Signifier

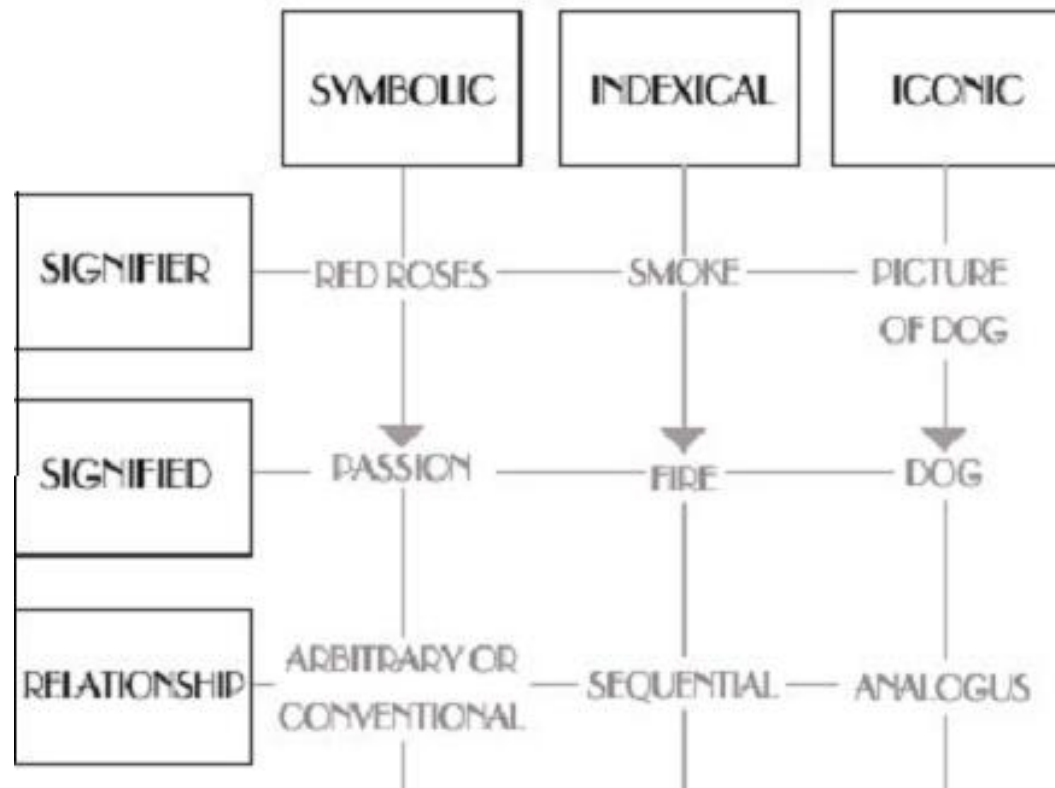


Signified

Semiotics



- Ferdinand DeSaussure (1913)



Semiotics

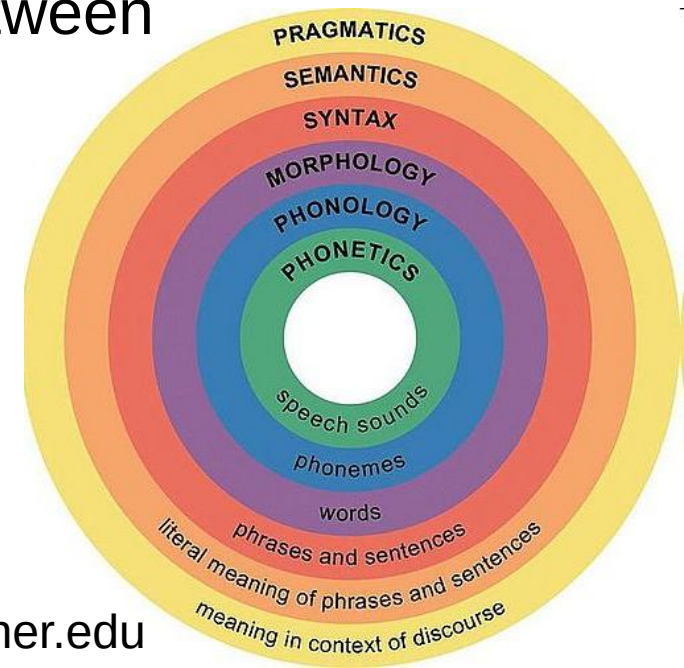


- Charles Morris (1938)
 - Syntax studies the relation between signs and signs
 - Semantics studies the relation between signs and objects
 - Pragmatics studies the relation between signs, objects and users

Syntax: “the” is an article, “meaning” is a noun, “of” is a preposition, etc

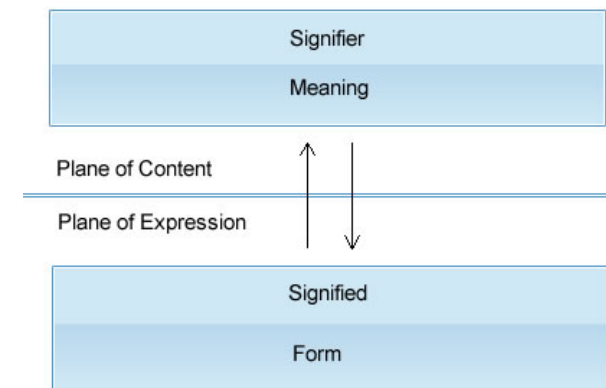
Semantics: “Piero is a writer” means that somebody whose name is “Piero” writes books

Pragmatics: “Piero is a writer” may have been uttered to correct somebody who said that Piero is a carpenter)



Semiotics

- Louis Hjelmslev (1943)
 - Language is a system of signs
 - Saussure's signifier and signified: expression plane and content plane
 - Form and substance
 - Form of content, form of expression, substance of content, and substance of expression
 - Content substance is the concept
 - Expression substance is the material (e.g., sound)
 - Meaning and form occupy the same mental space but exist on different planes

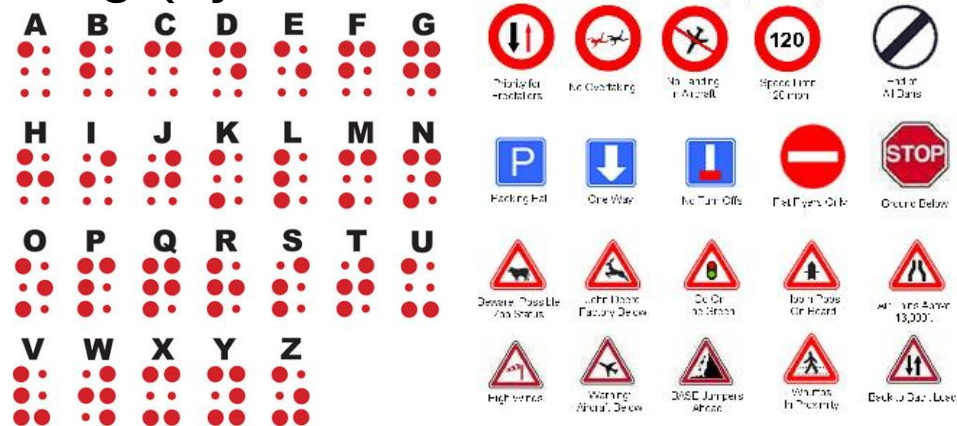


Semiotics

- Luis Prieto (1964)
 - A “code” is a set of symbols (the “alphabet”) and a set of rules (the “grammar”).
 - The code relates a system of expressions to a set of contents
 - A “message” is a set of symbols of the alphabet which has been ordered according to the rules of the grammar
 - A sentence is a process of encoding (by the speaker) and decoding (by the listener)



A	.-	M	--	Y	-.--	6	-...-
B	-...	N	-.	Z	---.	7	-...-
C	-.-	O	---	Ä	.-.-	8	---.
D	-..	P	.-.	Ö	---.	9	---.
E	.	Q	---.	Ü	..--	.	.-...-
F	...-	R	..-	Ch	----	,	-...-
G	-.	S	...	0	-----	?	..--.
H		T	-	1		!	..-
I	..	U	..-	2	..---	:	---...
J	.-..	V	...-	3	...--	"	.-...-
K	-.-	W	.-	4	-	'	.-...-
L	...-	X	---.	5		=	-...-

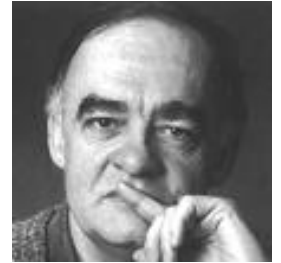


Semiotics



- Tom Sebeok (1976)
 - Semiotics is a branch of communication theory that studies messages, whether emitted by objects (such as machines) or animals or humans
 - Human sign behavior has nothing special that can distinguish it from animal sign behavior or machine sign behavior

Semiotics



- Merlin Donald (1991)
 - At the beginning there was only episodic thinking: early hominids could only remember and think about episodes
 - Later, they learned how to communicate and then they learned how to build narratives.
 - Symbolic thinking came last

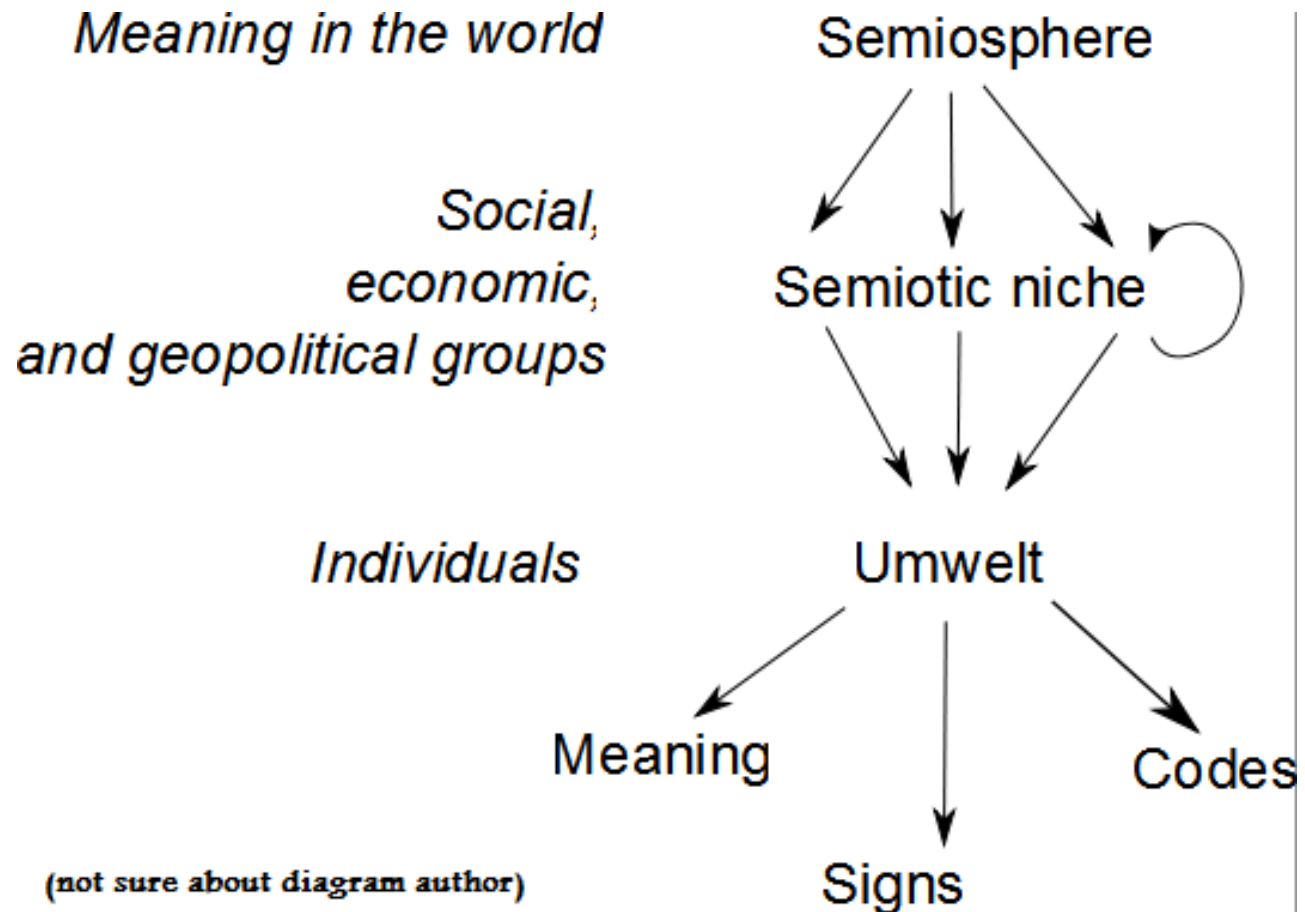
Semiotics

- Jesper Hoffmeyer (1996)
 - First there were stories, and then little by little individual words rose out of them
 - Language is fundamentally narrative in nature
 - Language is corporeal
 - The unit of communication among animals is the whole message, not the word
 - "Semiosphere": every living being must adapt to its semiosphere or die
 - At all levels, life must be viewed as a network of sign processes



Semiotics

- Semiosphere



Metaphor: How We Speak

That conference was a zoo

I don't see the end of the tunnel

You're a weasel

She's a tiger

Cross that bridge when you get there

The needle in a haystack

The bottleneck

She's a walking dictionary

This job is a piece of cake

This is a nightmare

He's a vampyre



*"Good news.
The test results show it's a metaphor."*

Metaphor: How We Speak

- Metaphor: to transfer properties from a “source” to a “destination”
- Metaphor is pervasive
- Paradox: if the speaker tries to make communication as "rational" as possible, why would she construct a metaphor instead of just being literal?

Metaphor: How We Speak

All thought is metaphorical
(George Lakoff, 1980)



All language is metaphorical
(Michael Arbib, 1986)



Metaphor was pivotal for the
development of the human mind
(Steven Mithen, 1996)



Metaphor: How We Speak

Metonymy: when a term is used to indicate something else

“The White House pledged not to increase taxes”

Metaphor is a way to conceive something in terms of another thing

Metonymy is a way to use something to stand for something else

Metaphor: How We Speak

- Understanding metaphors:
 - how do we determine its truth value (taken literally, metaphors are almost always false)
 - how do we recognize an expression as a metaphor (metaphors have no consistent syntactic form)

Metaphor



- Michel Breal (1897)
 - Metaphor is indispensable to express a concept for which words do not exist in the language
 - Entire domains are mapped onto other domains for lack of appropriate words
 - For example, the domain of character is mapped into the domain of temperature: a hot temper, a cold behavior, a warm person, etc.

Metaphor

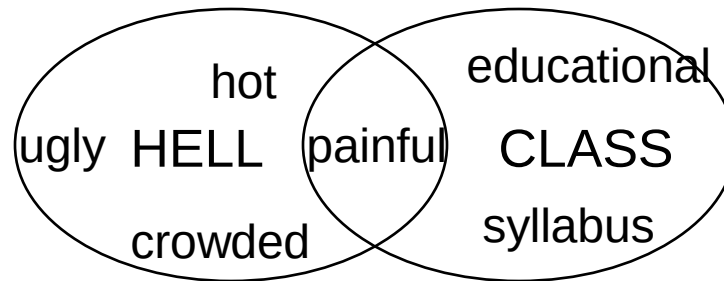


- Max Black's "interactionist" theory (1955):
 - Literal language: two concepts can be combined to obtain another concept without changing the original concepts (e.g., "fun" and "class" form "fun class")
 - Metaphorical language: two concepts are combined so that they form a new concept (e.g., "this class is hell")
 - The two concept change each other (both "class" and "hell" acquire a different meaning)
 - The two concepts trade meaning
 - A metaphor consists in **a transaction between two concepts**

Metaphor



- Max Black's "interactionist" theory (1955):
 - Metaphor is a means to reorganize the properties of the destination
 - Metaphor does not express similarities: it creates similarity
 - Metaphors model the world
 - Language is dynamic: over time, what is literal may become metaphoric and viceversa



Metaphor



- Eva Kittay (1987):
 - Meaning is a field: the meaning of a word is determined by all the other related words
 - Metaphor is a process that transfers semantic structures between two semantic fields: some structures of the first field create or reorganize a structure in the second field
 - Literal and metaphorical interpretations point to two distinct semantic fields

Metaphor



- James Martin (1990):
 - Metaphor is simply a linguistic convention within a linguistic community, an "abbreviation"
 - Primitive classes of metaphors are used to build all the others
 - A metaphor is therefore built and comprehended just like any other syntactic structure



Metaphor

- Fairy tales
 - Every time we tell children a fairy tale, we are lying to them. Those characters do not exist. Santa Claus does not exist.
 - Children "learn" something from those fairy tales, but what they learn is not the literal meaning of those stories
 - Children understand that what they are supposed to learn is not the literal meaning



Metaphor

- Politics
 - Every argument between two people usually involves some kind of exaggeration
 - "Depleted uranium killed one million Iraqi children"
 - The listener routinely "decodes" those exaggerations.
 - It never truly ends: Adults still tell each other "fairy tales".



Metaphor

- When learning a foreign language, we tend to use simple sentences with no metaphors
- Metaphorical language requires mastering the language skills first, and is proportionate to those skills
- This is what the traditional theory predicted: metaphor is for poets, for language specialists

Metaphor



- George Lakoff (1980)
 - All language is metaphorical
 - All metaphors are ultimately based on our bodily experience

Metaphor



- George Lakoff (1980)
 - Metaphor grounds concepts in our body
 - Metaphor enables us to reduce (and therefore understand) abstract concepts to our physical experiences in the world
 - Metaphor is an intermediary between our conceptual representation of the world and our sensory experience of the world

Metaphor



- George Lakoff (1980)
 - Metaphor relates an entire conceptual system (eg, traveling) to another conceptual system (eg, love) - "our marriage isn't going anywhere"
 - Metaphor projects the cognitive map of a domain (the vehicle) onto another domain (the tenor) for the purpose of grounding the latter to sensory experience

Metaphor



- George Lakoff (1980)
 - Most concepts are understood in terms of other concepts
 - A more abstract domain is explained in terms of a more concrete domain
 - The more concrete the domain, the more "natural" it is for our minds to operate in it
 - Mental life is fundamentally metaphorical in nature

Metaphor



- George Lakoff
 - Metaphor = the process of experiencing something in terms of something else
 - All metaphors are ultimately based on our bodily experience
 - All our concepts are of metaphorical nature and are based on our physical experience
 - We understand the world through metaphors, and we do so without any effort, automatically and unconsciously

Metaphor



- George Lakoff (1980)
 - Language was created to deal with physical objects, and later extended to non-physical objects by means of metaphors Language is grounded in our bodily experience
 - Language is embodied - its structure reflects our bodily experience
 - Grammar is shared (to some degree) by all humans for the simple reason that we all share roughly the same bodily experience

Metaphor



- George Lakoff
 - Metaphor is pervasive because it is biological: our brains are built for metaphorical thought
 - Metaphorical language is but one aspect of our metaphorical brain
 - Our brains evolved with "high-level" cortical areas taking input from "lower level" perceptual and motor areas
 - "Metaphor" refers to a physiological mechanism: the ability of our brain to turn perceptual and motor knowledge into abstract knowledge

Pragmatics: Why We Speak

"The size of the lie is a definite factor in causing it to be believed"
(Adolf Hitler)

Pragmatics : Why We Speak



- Ludwig Wittgenstein (1940s):
 - To understand a word is to understand a language
 - To understand a language is to master the linguistic skills

Pragmatics: Why We Speak

The pragmatic goal of language is to
understand the “reason” of a speech

What are the speaker’s motive and goal?

"Do you know what time it is"

Pragmatics: Why We Speak

- Speaking involves two people
- Language is cooperation
- Speaker's motive and goal are part of meaning
- There is no speech without a context
- The purpose of a speech in a given context is to generate some kind of action
- Speech acts: action intended to achieve a goal, through some kind of plan, given some beliefs about the state of things

Pragmatics: Why We Speak

Indexicals: “I, here, now” (they may be true or false depending on the context)

Implicatures: facts implied by a sentence (“the Pope held mass in St. Peter’s square” implies that the Pope is alive)

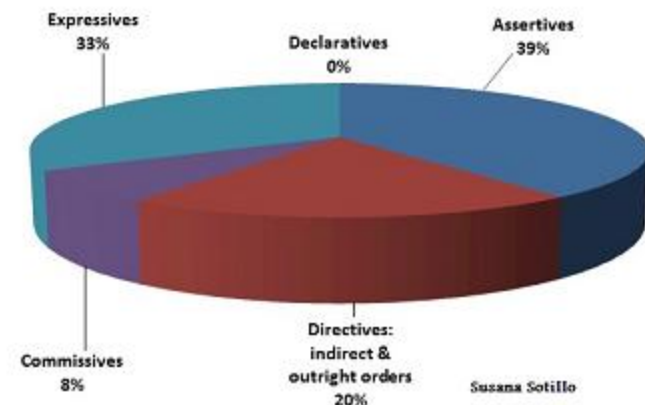
Presuppositions: facts that are presupposed by a sentence (“I am writing a will” implies that humans don’t live forever)

Pragmatics: Why We Speak



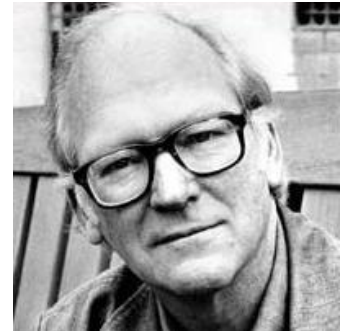
- John Langshaw Austin (1962):
 - "Locutionary" act (the words employed to deliver the utterance)
 - "Illocutionary" act (the type of action that it performs, such as warning, commanding, promising, asking)
 - "Perlocutionary" act (the effect that the act has on the listener, such as believing or answering)

Figure 1. Types of Illocutionary Acts



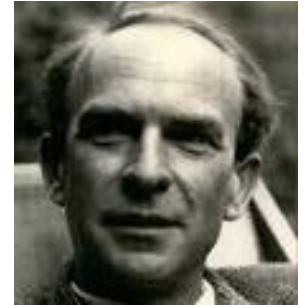
Pragmatics: Why We Speak

- Donald Davidson (1974)
 - “Principle of charity” (Neil Wilson): the interpretation to be chosen is the one in which the speaker is saying the highest number of true statements



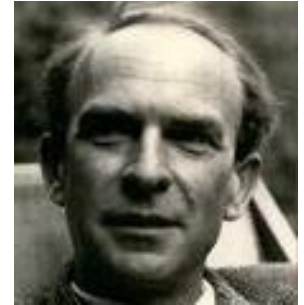
Pragmatics: Why We Speak

- Paul Grice (1975)
 - Language has meaning to the extent that some conventions hold within the linguistic community
 - The speaker and the hearer cooperate
 - The speaker wants to be understood and cause an action
 - There is more to a sentence than its meaning: a sentence is "used" for a purpose
 - The significance of an utterance includes both what is said and what is implicated (implicatures)



Pragmatics: Why We Speak

- Paul Grice (1975)
 - Four maxims help the speaker say more than what she is saying
 - Provide as much information as needed in the context, but no more than needed (quantity)
 - Tell true information (quality)
 - Say only things that are relevant to the context (relation)
 - Avoid ambiguity as much as possible (manner)



Pragmatics: Why We Speak

- "Conduit Metaphor":
 - Linguistic expressions are vehicles for transporting ideas along a conduit which extends from the speaker to the listener
 - Each word contains a finite amount of a substance called meaning
 - The speaker assembles the meaning, loads the vehicle and sends it along the conduit
 - The listener receives the vehicle, unloads it and unscrambles the meaning



(Randall Whitaker)

Pragmatics: Why We Speak

- Michael Reddy (1979)
 - The transfer of thought is not a deterministic, mechanical process.
 - It is an interactive, cooperative process



Pragmatics: Why We Speak



- Jerome Bruner (1986)
 - Two kinds of thinking: the paradigmatic and the narrative
 - One is reasoning, and the other one is narrating.
 - One produces logical arguments whose goal is truth.
 - The other one produces stories whose goal is plausibility.

Pragmatics: Why We Speak



- Jerome Bruner (1986)
 - Human psychology is the key element of the latter
 - Human civilization has developed sophisticated analyses of how to think in the paradigmatic way (for example, mathematical Logic), but has little to say about how to think in the narrative way (how to write good stories)

Pragmatics: Why We Speak



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Pragmatics: Why We Speak

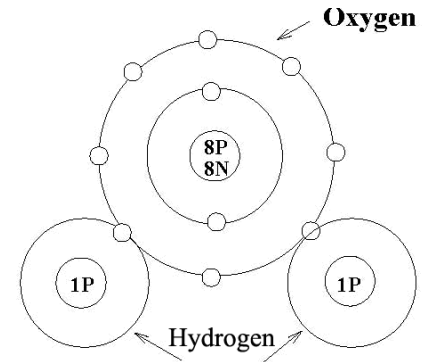
- Dan Sperber and Deirdre Wilson (1995)
 - Understanding an utterance consists in finding an interpretation that is consistent with the principle of relevance
 - The hearer is out to acquire relevant information
 - The speaker tries to make his utterance as relevant as possible
 - “Relevance” constrains the coherence of a discourse and enables its understanding
 - The process of comprehending an utterance is a process of hypothesis formation and confirmation

Meaning

*"To find something interesting,
you merely have to look at it long enough"*
(Flaubert)

Meaning

- What is the meaning of “water”?
 - H_2O
 - Substance that makes you wet
 - Liquid that flows in rivers
 - Ice when it warms up
 - One of the four fundamental elements with fire, air and earth
 - A drink



Meaning

- What is the meaning of “clock”?
 - An object whose function is that of marking the time (which could be a sundial)?
 - Or an object whose structure is round, has two hands and 12 numbers (which could be a toy clock that does not perform any actual function)?



Meaning

- Gottlob Frege (19th c.)
 - Sense and reference: "the star of the morning" and "the star of the evening" have two different senses but the same referent (Venus)
 - Intension (all the objects that are red) and extension (the fact of being red)
 - Model-theoretic semantics: models of the world yield interpretations of sentences in that world



Meaning

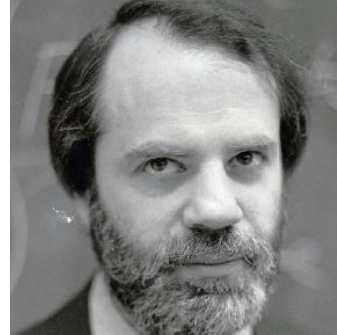
- Problems:
 - “I am Piero Scaruffi” is true or false depending on who utters it
 - “I am right and you are wrong” has two completely opposite meanings depending on who utters it
 - What is the meaning of “I am lying”?

Meaning

- Correspondence theory of truth: a statement is true if it corresponds to reality
- Alfred Tarski: a definition of true requires a meta-language
- The meaning of a proposition is the set of situations in which it is true



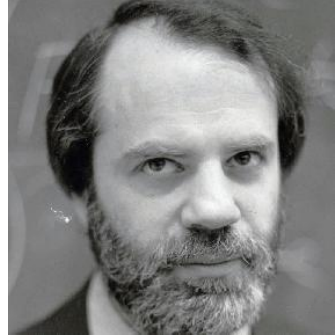
Meaning



- Possible-world semantics (Saul Kripke)
 - Modal logic adds two truth values to true and false
 - "possible" (something that is true in at least one world)
 - "necessary" (something that it is true in all worlds)
 - Classical Logic: "Piero Scaruffi is the author of the Divine Comedy" and "Piero Scaruffi is a billionaire" have the same extension, because they are both false
 - Modal Logic: they have different extensions, because the former is impossible (I was not alive at the time), whereas the latter is also false but could be true

Meaning

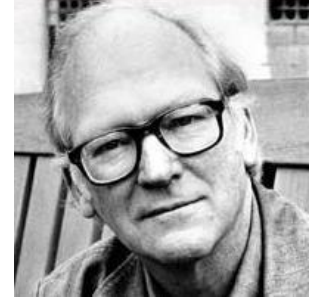
- Saul Kripke
 - “Causal theory of naming”: names are linked to their referents through a causal chain
 - If it turned out that water is not H₂O, I would still recognize water as water



Meaning

- Situation semantics (John Barwise and John Perry)
 - Sentences stand for situations, rather than for truth values

Meaning



- Truth-conditional semantics (Donald Davidson)
 - The meaning of a sentence is defined as what it would be if the sentence were true
 - To know the meaning of a sentence is to know the conditions under which the sentence would be true

Holism

- Pierre Duhem
 - Hypotheses cannot be tested in isolation from the whole theoretical network in which they appear There are infinite interpretations of a discourse depending on the context



Holism



- "Under-determination" theory (Willard Quine)
 - An hypothesis is verified true or false only relative to background assumptions
 - For every empirical datum there can be an infinite number of theories that explain it
 - Science simply the combination of hypotheses that seems more plausible
 - Science is but self-conscious common sense

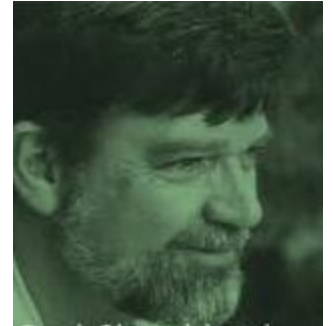
Holism



- "Under-determination" theory (Willard Quine)
 - There are infinite interpretations of a statement depending on the context
 - The meaning of a statement is the method that can verify it empirically
 - But verification of a statement within a theory depends on the set of all other statements of the theory
 - Each statement in a theory partially determines the meaning of every other statement in the same theory.
 - The meaning of a sentence depends on the interpretation of the entire language

Holism

- Paul Churchland
 - A space of semantic states, whose dimensions are all the observable properties.
 - Each expression in the language is equivalent to defining the position of a concept within this space according to the properties that the concept exhibits in that expression
 - The semantic value of a word derives from its place in the network of the language as a whole.



Against Holism

- The meaning of a sentence is the way of verifying it
 - Verificationism (Michael Dummett)
 - Jaakko Hintikka's "game-theoretical semantics"
 - Philip Johnson-Laird's procedural semantics

Against Holism



- Externalism (Hilary Putnam)
 - Inhabitants of Earth and Twin Earth think of two different substances both called “water” that look and feel the same
 - They are thinking about two different things, while their mental states are absolutely identical
 - Meaning is not in the mind
 - If some day we found out that Chemistry has erred in counting the electrons of the atom of gold, this would not change what gold is
 - The meaning of the word “gold” is the social meaning that a community has given it.

Summary

- Communication is pervasive in nature. We are not the only ones who communicate: everything does.
- Human language is unique though in many ways
- Speech is continuous and still we figure out how to partition it into words
- Our competence vastly exceeds our performance
- Chomsky, Pinker, etc: we are born with a language instinct
- We speak multiple languages and don't understand other people's languages
- We use things like metaphors (fairy tales are technically lies)
- We still retain the animal-kind of communication (screams, smiles, etc)

Summary

- There are hypotheses that human language is more than communication
 - Sapir & Whorf: language delivers an entire culture to the child who learns it
 - Cementing the group (one's accent and expressions reveal her birthplace)
 - Sexual selection
 - A vast symbolic apparatus at work (Langler's theory)
- Phonetics
- Syntax
- Semantics
- Pragmatics

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Language

"I told him to be fruitful and multiply, but not in those words"
(Woody Allen)

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