

Evolutionary forces in language change depend on selective pressure, but also on random chance | Indo-European.eu

ANIMAL COMMUNICATION AND HUMAN LANGUAGE

Chapter 1

QUESTIONS

- Do animals have languages?
- What are the unique features of human language?
- What's the basic unit of human language?
- What's the duality of patterning?
- Is human language a result of natural selection?

CHAPTER 1

1. Animal communication system
2. Human language
3. Evolution of language
4. Living fossils

ARE HUMANS ANIMALS?



https://cdn-assets.answersingenesis.org/img/cms/content/contentnode/header_image/are-humans-animals.jpg

Human animal: An animal of the genus Homo.

Nonhuman animal: Any animal outside the genus Homo.

COMMUNICATION

COMMUNICATION

Definition: Any behavior on the part of one organism intended to influence the emotions, thoughts, or behaviors of another organism.

Forms: Speech, facial expressions, body postures, movements, odors, etc.

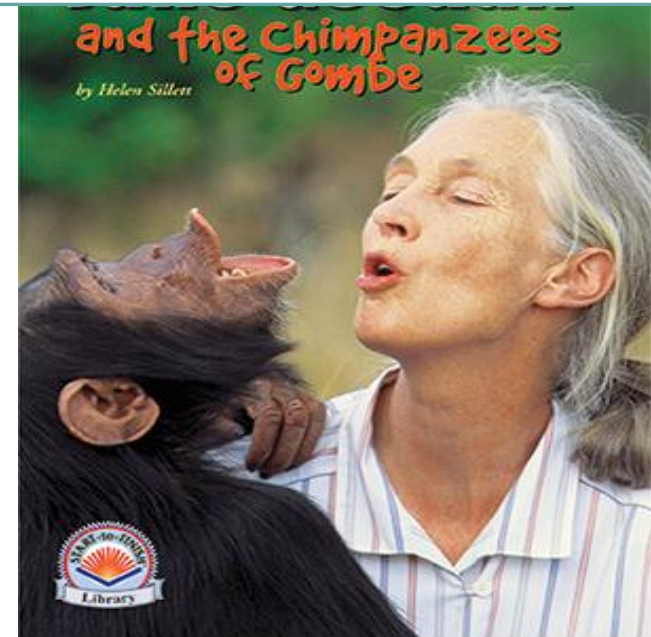
Conspecific and interspecies

1. ANIMAL COMMUNICATION SYSTEMS

Four Fs proposed by ethologists

- Food
- Foe
- Friend
- Finding a mate

who is she?



<https://learningtools.donjohnston.com/wp-content/uploads/2019/04/Jane-Goodall-Cover-for-Website.png>



Smithsonian
CHANNEL 

FOOD

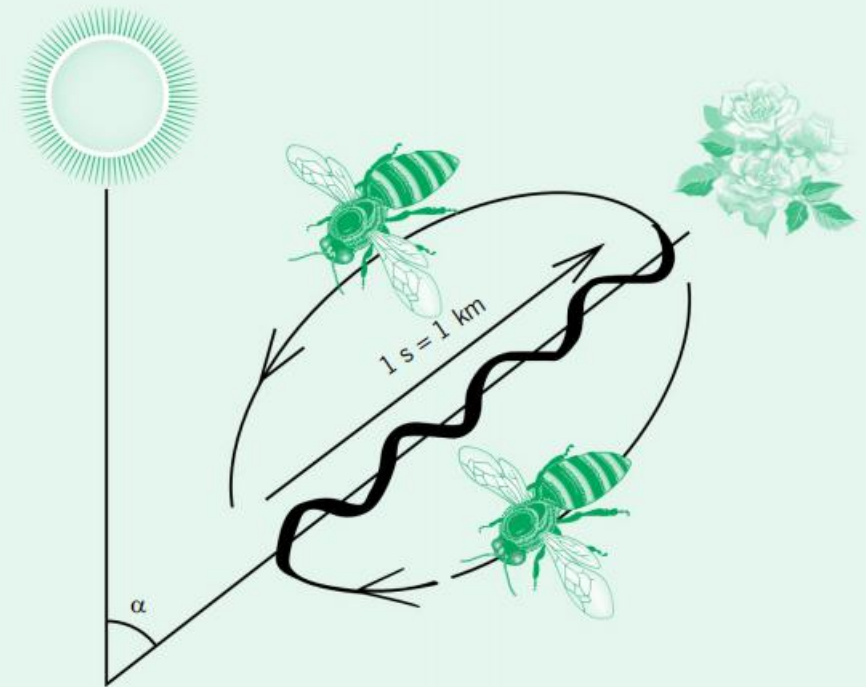
Honeybee Waggle Dance

(https://www.bilibili.com/video/BV1TK4y1k76t?share_source=copy_web)

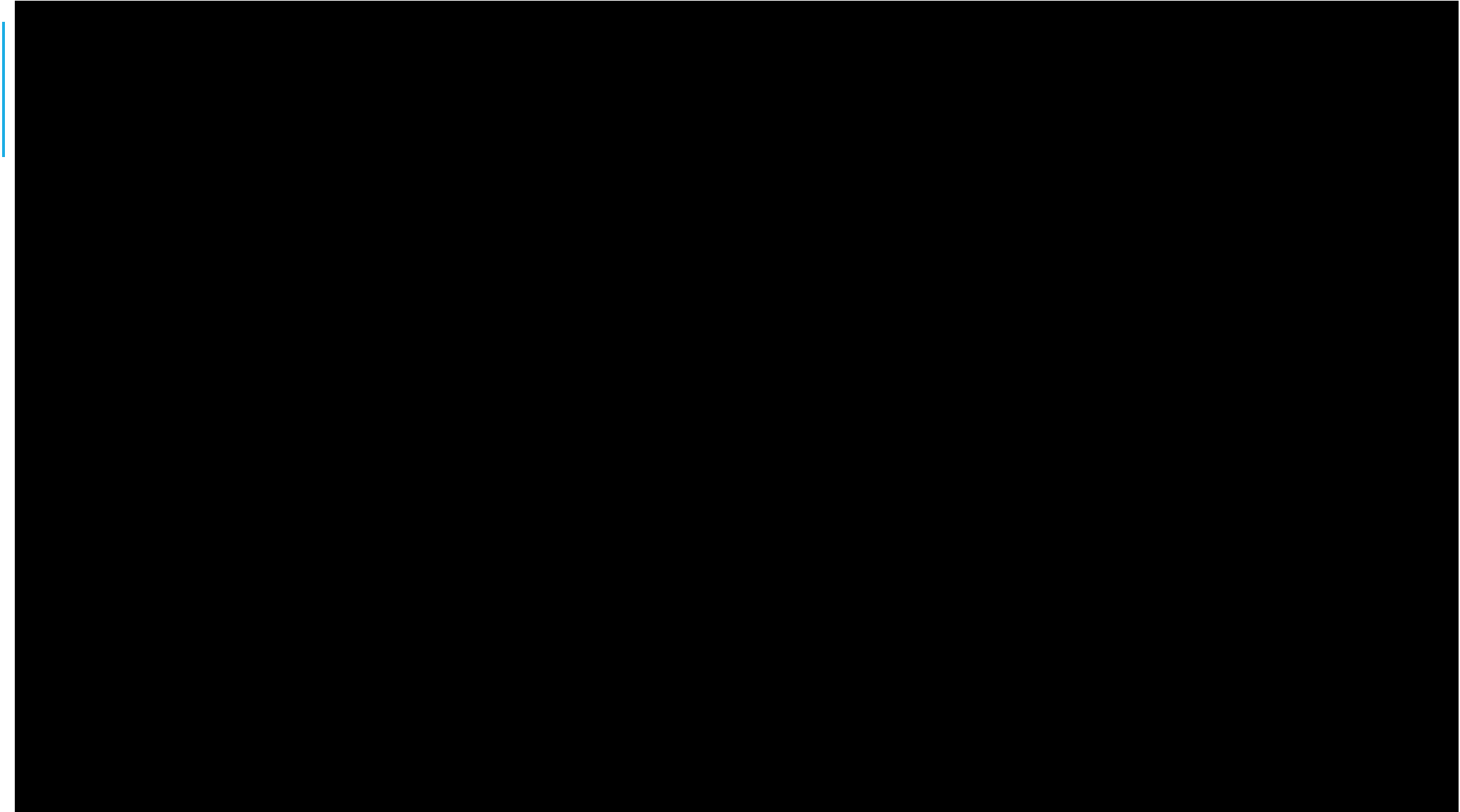
- Direction
- Distance

Figure 1.1 Honeybee Waggle Dance

Honeybees perform a dance to tell hive mates about the location of sources of nectar or water. They communicate two pieces of information: the direction relative to the sun and the distance. The hive mates know where to fly, but they don't know what they'll find when they get there.



Source: © Audriusa / Wikimedia Commons / CC-BY-SA-3.0 / GFDL



(<https://www.youtube.com/watch?v=3isF83rHKFc>)

Snake Alarm Call



Gismo Enclosure encounter a
Puff adder

FOE

- Alarm call: a vocalization to warn other members of the group about approaching predators.
- American red squirrels (solitary creature) chatter
- Vervet monkeys call (social creature): nature+nurture
 - ▣ leopards
 - ▣ eagles
 - ▣ snakes

FOE

- Diana monekys calls (Zuberbühler, Cheney, and Seyfarth, 1999)

- ▣ Research question: Are alarm calls referred to specific predators?

- ▣ Task: Prime-probe task

- ▣ Stimuli: eagle/leopard vocalization; eagle/leopard alarm calls

- ▣ Conditions and design

Conditions	Prime	Measurement1	Probe	Measurement2
Baseline condition	eagle vocalization	number of alarm calls/min	eagle vocalization	No new alarm calls
Test condition	eagle alarm call	number of alarm calls/min	eagle vocaliztion	No response
Control condition	leopard alarm call	number of alarm calls/min	eagle vocalization	New eagle alarm calls

Conceptual Semantics in a Nonhuman Primate

Klaus Zuberbühler, Dorothy L. Cheney, and Robert M. Seyfarth
University of Pennsylvania

Some animal vocalizations have been described as *referential*, or *semantic*, because individuals respond to them as if they designate some object or event. Alternatively, subjects may simply attend to the acoustic features of calls rather than their meanings. Field playback experiments on diana monkeys (*Cercopithecus diana diana*) tested these hypotheses using the calls of leopards and eagles and the males' alarm calls to these predators. In the experiment, 2 calls were played in sequence, separated by 5 min of silence, such that they were either (a) similar in acoustic and semantic features, (b) similar in semantic features only, or (c) different in both acoustic and semantic features. Subjects readily transferred habituation across acoustic but not semantic features, suggesting that they attended to the calls' underlying meanings.

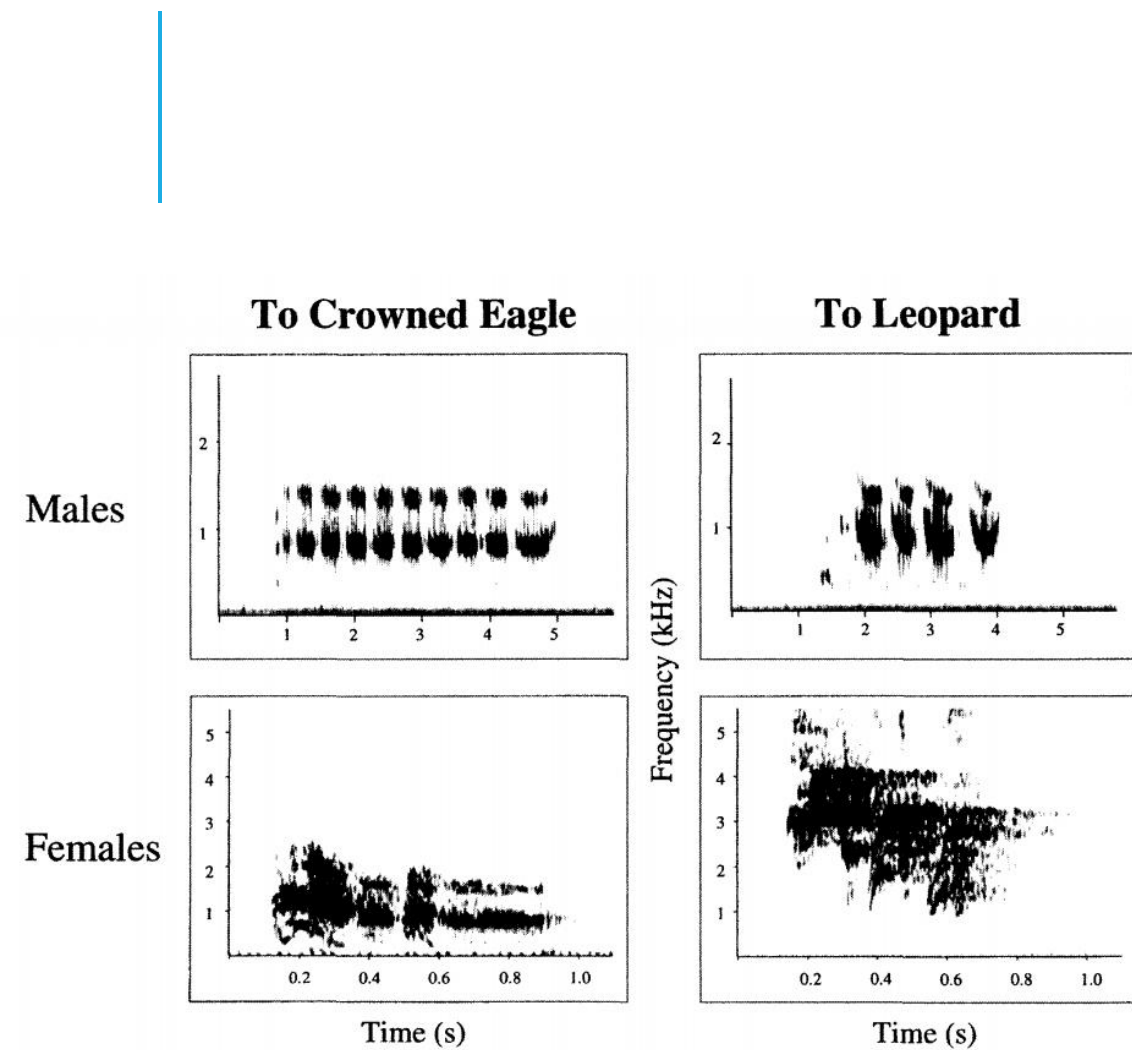


Figure 1. Alarm calls of male and female diana monkeys in response to crowned eagles and leopards.

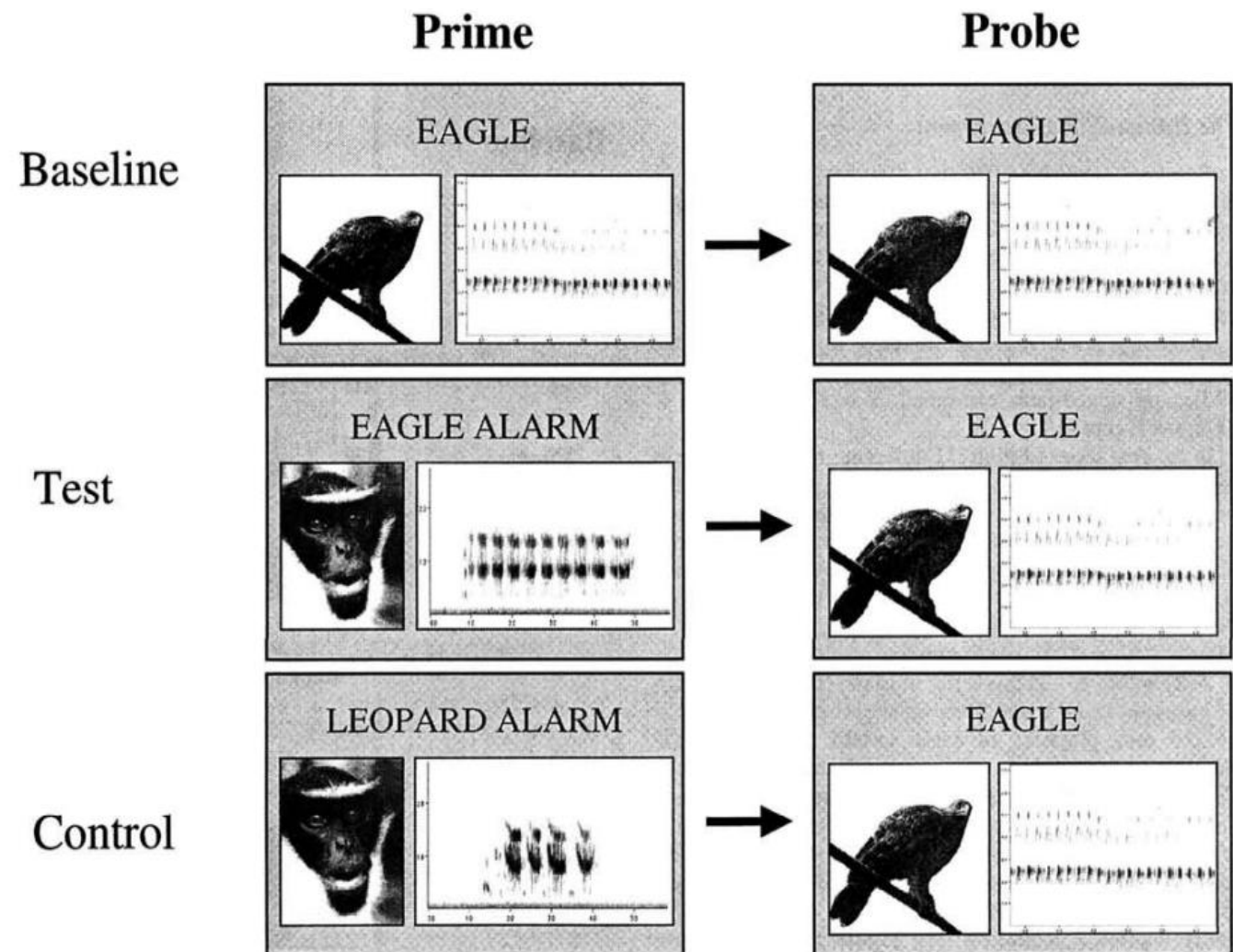
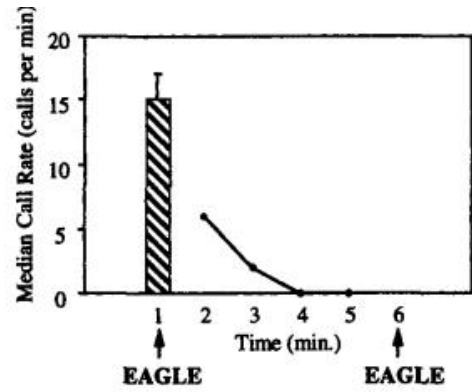
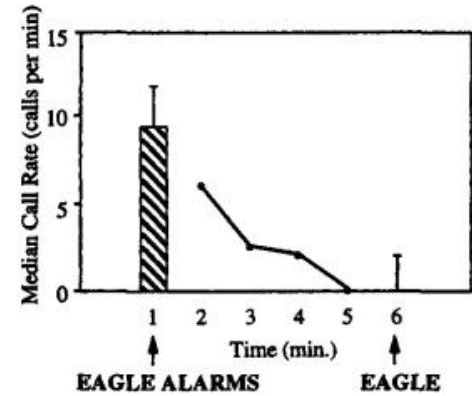


Figure 3. Example of experimental design for one set of playback experiments. Diana monkey groups were tested on two stimuli separated by 5 min of silence. Stimulus pairs differed in similarity of the acoustic and conceptual features across conditions as follows: (a) baseline condition—both the acoustic and the conceptual features remain the same; (b) test condition—the acoustic features

Baseline
N = 11



Test
N = 10



Control
N = 9

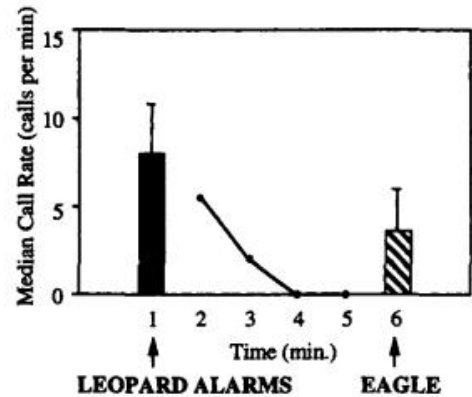
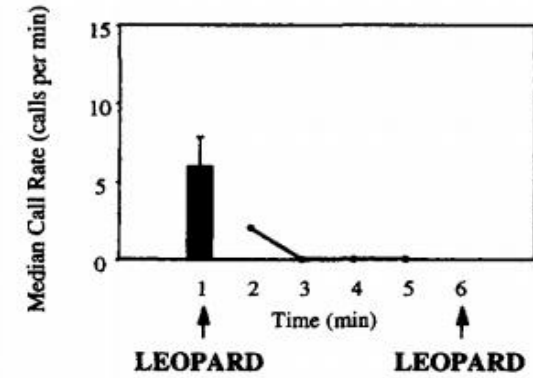
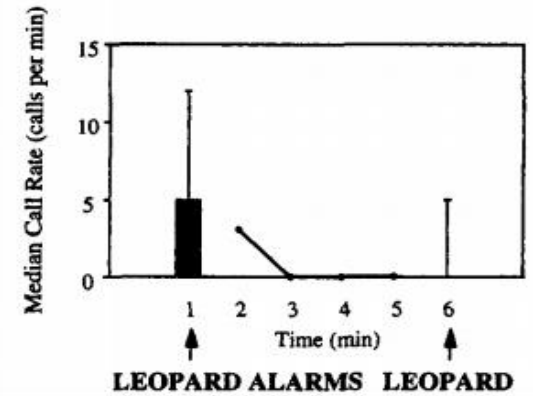


Figure 4. Females' responses to eagle call probes as a function of priming history. In the baseline condition, females are primed with

Baseline
N = 11



Test
N = 9



Control
N = 8

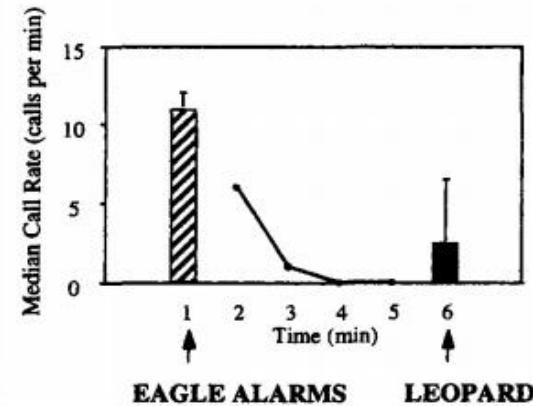
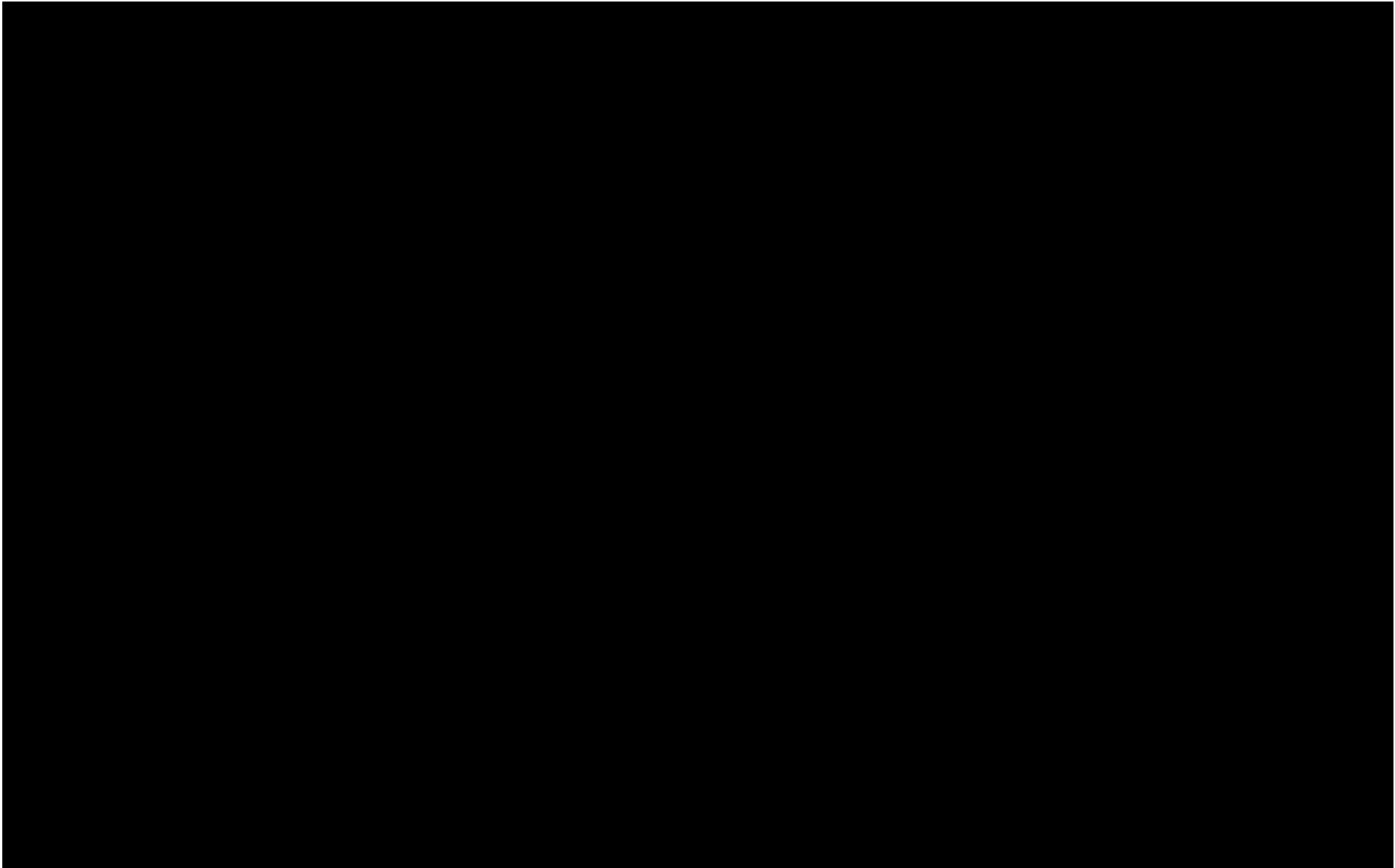


Figure 5. Females' responses to leopard call probes as a function of priming history. In the baseline condition, females are primed



[#KritterKlub](#)

Cow Gets Separated From The Dog That She Raised.. (Part 2) | Kritter Klub



FRIEND

- A dominance hierarchy
 - ▣ A social system in which each member of a group knows who ranks above and who ranks below.
- Mother-infant bonding
- Social grooming



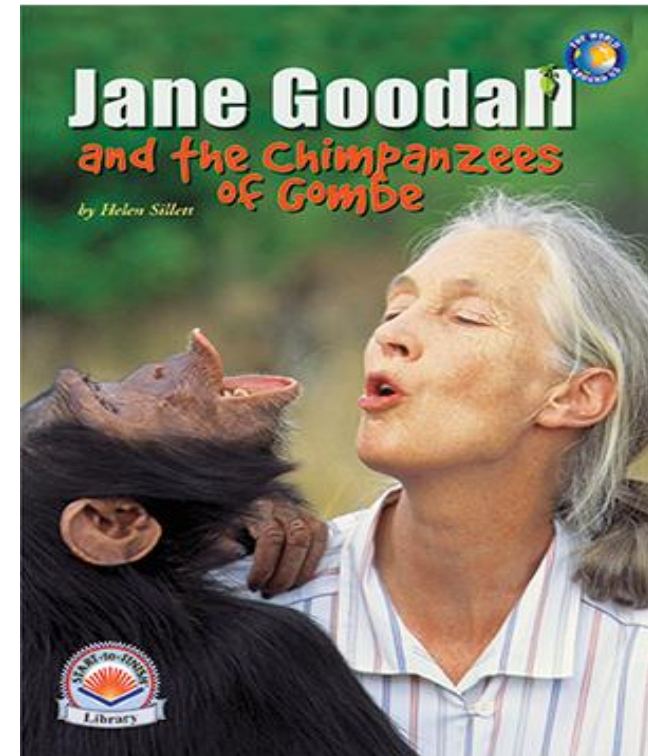
https://upload.wikimedia.org/wikipedia/commons/c/c3/Bonnet_macaque_DSC_0982.jpg

FINDING A MATE: THE GAME OF LIFE



FOUR CHARACTERISTICS OF ANIMAL COMMUNICATION SYSTEMS

- Have a limited range of meanings
- Consist of holophrases that refer to an entire situation
 - ▣ Holophrase: a single vocalization or gesture that refers to the entire situation and not to the specific objects and events in that situation.
- Cannot combine elements to create novel ideas
- Can only refer to the current situation



<https://learningtools.donjohnston.com/wp-content/uploads/2019/04/Jane-Goodall-Cover-for-Website.png>



https://www.thegreatcoursesdaily.com/wp-content/uploads/2020/05/Understanding-the-Misconceptions-of-Science_The-Story-of-Human-Evolution-Were-We-Chimps_QBS_Thumb.jpg



<https://img.zcool.cn/community/020f9f59226079b5b3086ed4a1d49c.jpg>

2. HUMAN LANGUAGE

- Laugh
- Speech
- Rules, structure, and arbitrary symbols
- Pyramid scheme
- Sentences and discourse
- Long, long ago, in a galaxy far, far away

LAUGH

- To build friendship ("I like you.")
- To signal sexual interest
- To serve as punctuations in language communication



https://akm-img-a-in.tosshub.com/indiatoday/images/story/201811/baby_chimp_humans_smile_alike_0.jpeg?BGPYgudMCMto74YXIRS7zRLeezLS.NjF

SPEECH

- Language: Listening, speaking, reading, and writing
 - ▣ Speech: the spoken form of language (primary form)
 - ▣ Signed language (a manual mode)-a distinct language system
 - ▣ Reading and Writing (visual mode)

RULES, STRUCTURE, AND ARBITRARY SYMBOLS

- Language is a communication system
 - ▣ It is governed by rules
 - ▣ It consists of structured components
 - ▣ It makes use of arbitrary symbols
 - Arbitrary symbol: a symbol that bears no resemblance to what it refers to. (honeybee waggle dance)
 - Iconic symbol: a symbol that bears a clear resemblance to what it refers to. (alarm calls)



http://dm.kantsuu.com/UploadFiles_4524/201606/20160622151428930.jpg

DUALITY OF PATTERNING (KOCKETT, 1960)

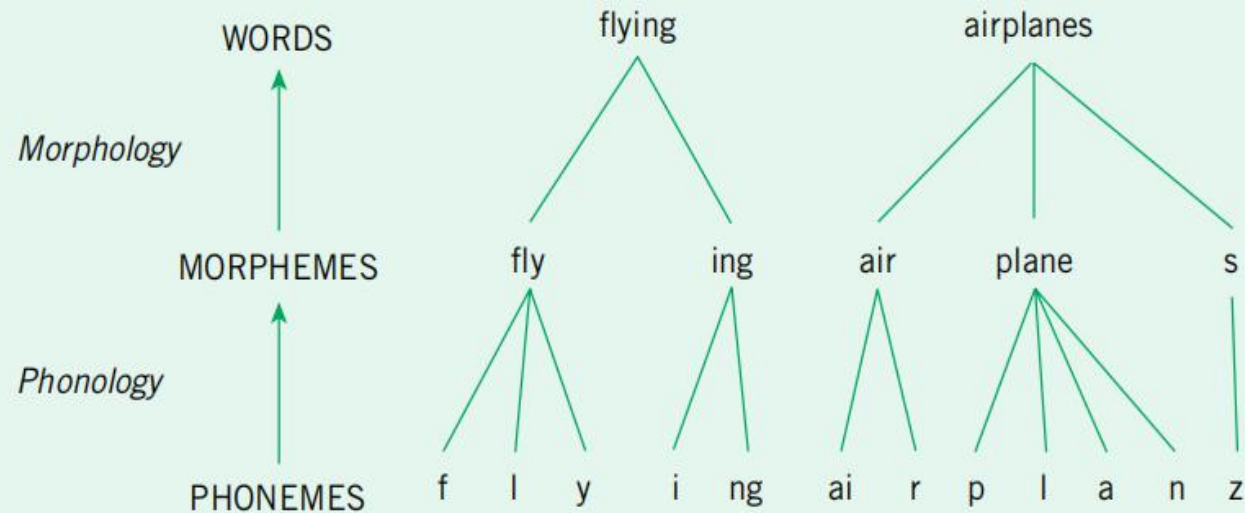
A structuring process that takes units at a lower level and combines them according to rules into new units at a higher level. (Human language)

- As made up of meaningless elements (a limited inventory of sounds or phonemes)
- As made up of meaningful elements (a limitless inventory of words or morphemes)

DUALITY OF PATTERNING (KOCKETT, 1960)

Figure 1.4 Duality of Patterning

Meaningless phonemes, which are the smallest units of speech sound, combine according to the rules of phonology to form morphemes, which are the smallest units of meaning. Morphemes then combine according to the rules of morphology to form words.

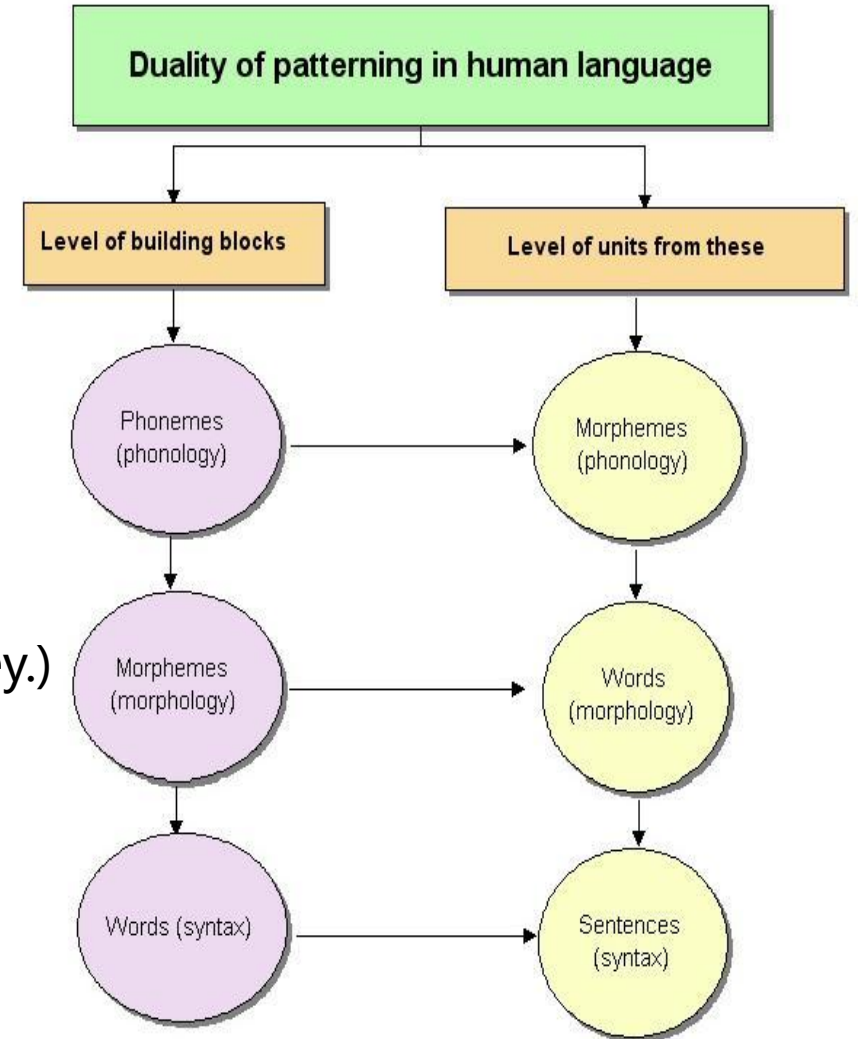


PYRAMID SCHEME

- Phoneme: meaningless speech sounds that serve as the fundamental building blocks of language.
- Phonology: the set of rules for combining phonemes into larger units.
 - ▣ Cat, English
 - ▣ Glunt, obligate, thessily
 - ▣ zwckl, brznsk, uioeaaio

PYRAMID SCHEME

- Morpheme: the basic units of meaning in a language.
 - ▣ Free morpheme (I want to go, but I have no money.)
 - ▣ Bound morpheme (He wants to go, but he has no money.)
- Morphology: the set of rules for combining morphemes together to form words.



A hierarchical structure

https://sheffnersweb.net/blogs/classblogs/dwc/wp-content/uploads/2012/05/Duality_of_Patterning.jpg

SENTENCES AND DISCOUR

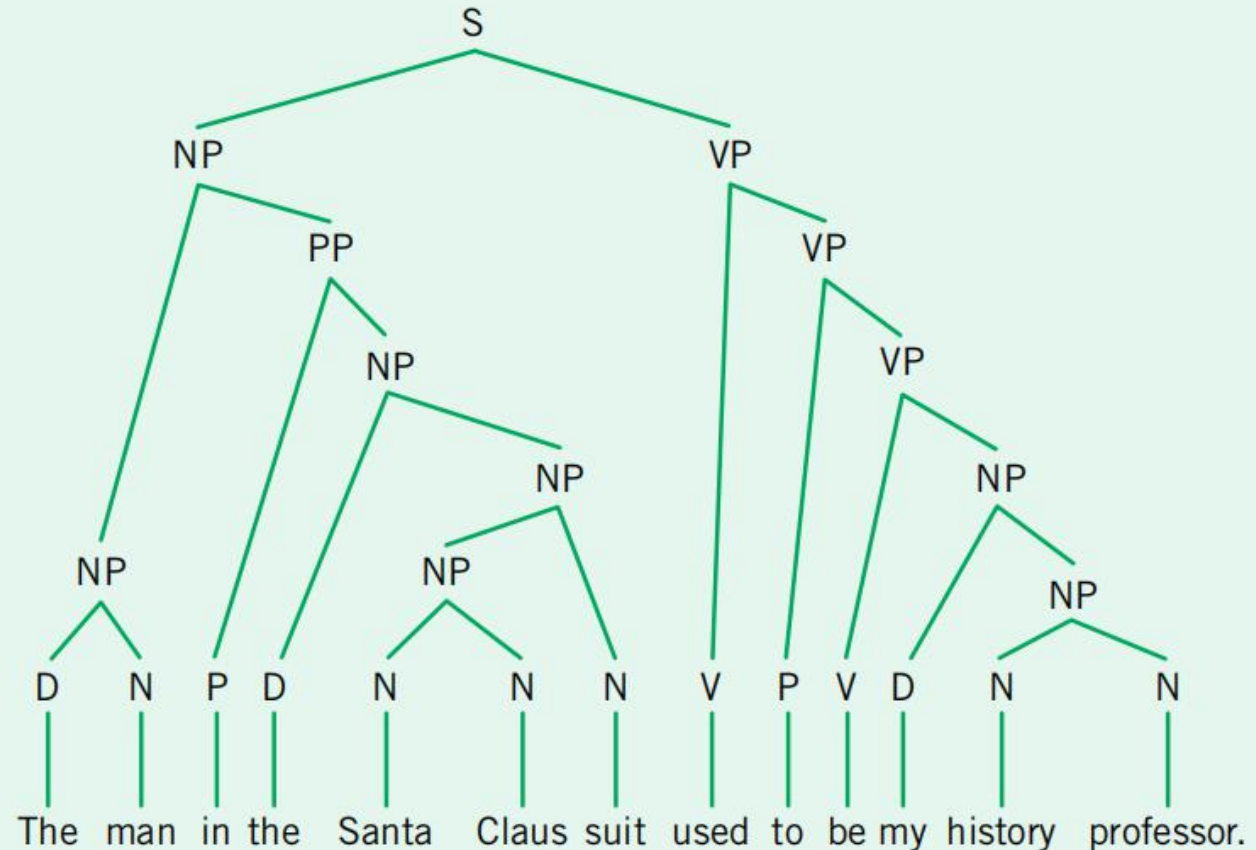
- Human language (A hierarchical structure)
 - ▣ Morphemes-Words-Phrases-Sentences
 - ▣ Syntax: The set of rules for ordering words and phrases
- Working memory constraints
 - ▣ Working memory: a kind of short-term memory for information we are currently thinking about. (Limited capacity)
 - ▣ Working memory capacity (chunking): a procedure for organizing information into larger meaningful units in order to increase working memory capacity



Figure 1.5 Sentence Tree

Tree diagram for the sentence: "The man in the Santa Claus suit used to be my history professor." Note the various instances of recursion in the structure, especially the nesting of noun phrases within noun phrases and verb phrases within verb phrases. Abbreviations: D = determiner, N = noun, P = preposition, V = verb, NP = noun phrase, VP = verb phrase, PP = prepositional phrase, and S = sentence. (We will discuss recursion in Section 1.3.)

Tree Diagram



SENTENCES AND DISCOURSES

- Discourse: a language structure consisting of a sequence of sentences that are ordered according to rules.

- ▣ Conversations have rules for taking turns and changing topics.

- ▣ Narratives have rules for how events need to be ordered.

- 思维松弛：问：您怎么过来的？答：坐船顺水过来，我想喝水，水从山上流下来，山比较高。

- 思维破裂：问：您怎么过来的？答：我想喝水，山比较高。老鼠住在地下。

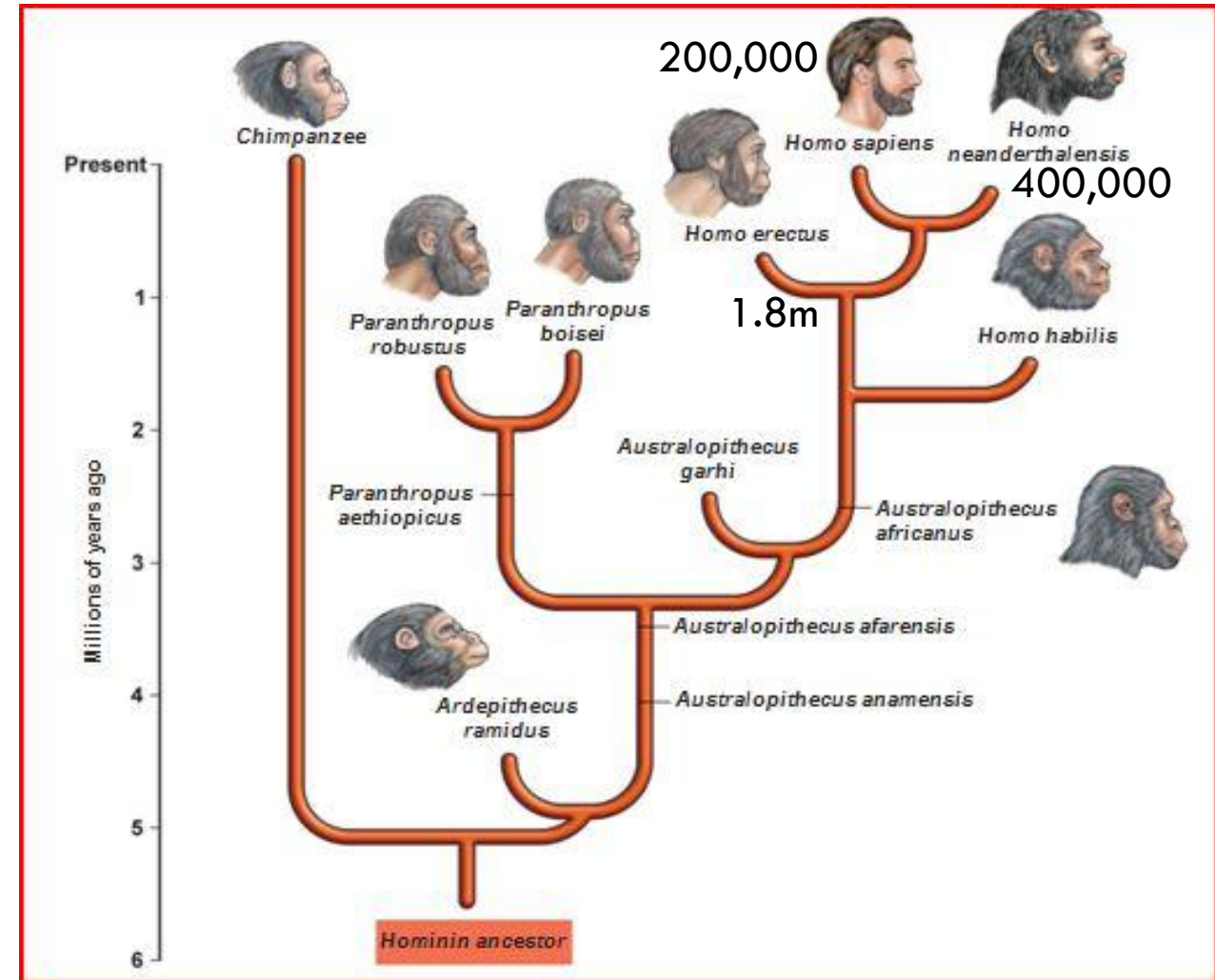
- 思维奔逸：问：您贵姓？答：姓王，大王的王，王者之气，气冲霄汉直捣黄龙，杨子荣打虎上山，（唱）唱不上去了，老了，夕阳无限好，只是近黄昏。

DISPLACEMENT: LONG, LONG AGO, IN A GALAXY FAR FAR AWAY ...

- Animal communication system
 - ▣ Have a limited range of meanings
 - ▣ Consist of holophrases that refer to an entire situation
 - ▣ Cannot combine elements to create novel ideas
 - ▣ Can only refer to the current situation
- Human language system
 - ▣ Is governed by rules
 - ▣ Consists of structured components
 - ▣ Makes use of arbitrary symbols
 - ▣ **Displacement:** The ability to refer to things and events beyond the here and now.

3. EVOLUTION OF LANGUAGE

- Out of Africa
- Hopeful monster
- A language gene
- Long time no see
- Hash, little baby, don't you cry

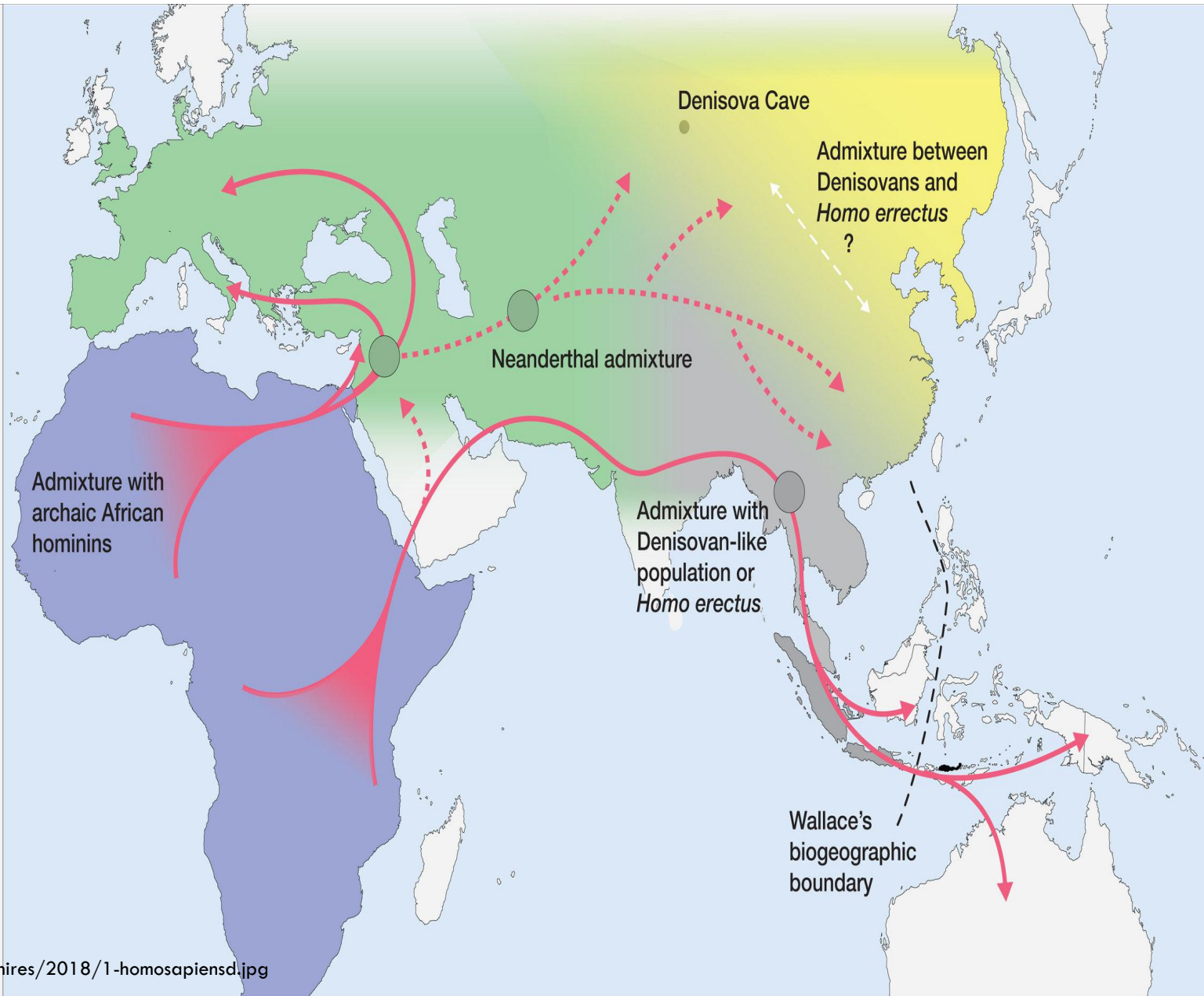


OUT OF AFRICA

- Speciation: the processes involved in the evolution of new species.
 - ▣ Interbreed
- Theories:
 - ▣ Out of Africa theory: The first modern man first evolved in Africa about 200,000 years ago. Further, the single and original Homo sapiens was believed to have travelled out of Africa around 70,000 years ago.
 - ▣ Multi-regional hypothesis: The ancestor, Homo erectus, seeded homo sapien populations all over the world. The rise of modern human is from a continuous exchange of genetic material occurred over a span of hundreds of thousands of years.

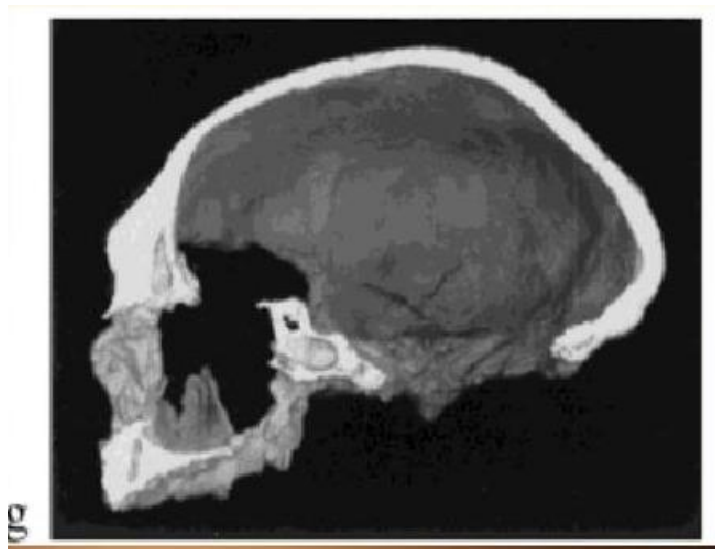
Possible ranges of archaic forms

- Neanderthals
- Denisovans
- Homo erectus*
- Archaic African hominins
- Homo floresiensis*
-  *Homo sapiens* dispersals inferred
-  *Homo sapiens* dispersals speculative

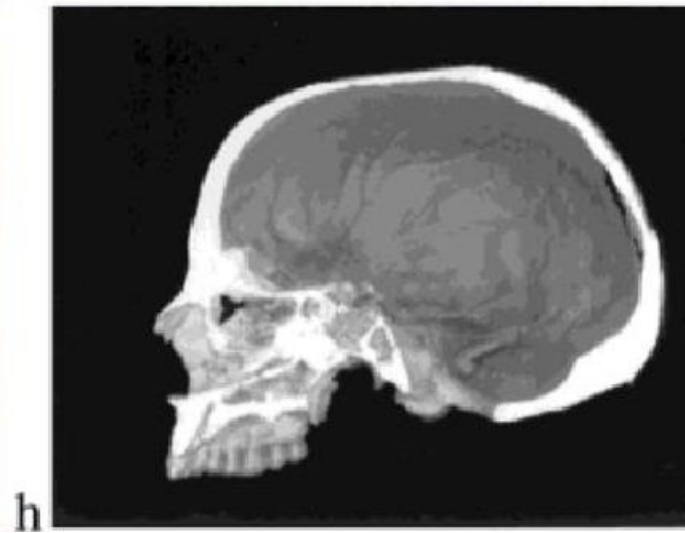


War or Love

Homo neanderthal men



Homo sapiens



<https://image1.slideserve.com/2935441/brain-case-l.jpg>

1 INTERNATIONAL BESTSELLER

"I would recommend *Sapiens* to anyone who's interested in the history and future of our species."

BILL GATES

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WITH NEW
MATERIAL



Sapiens

A BRIEF HISTORY
OF HUMANKIND

Yuval Noah Harari

HOPEFUL MONSTER

- Recursion: the process of extending a pattern by placing it inside itself ($n_1 = n_0 + 1$).
 - ▣ Unlimited: I saw the dog . . . that chased the cat . . . that caught the rat. . . .
 - ▣ Constrained by memory

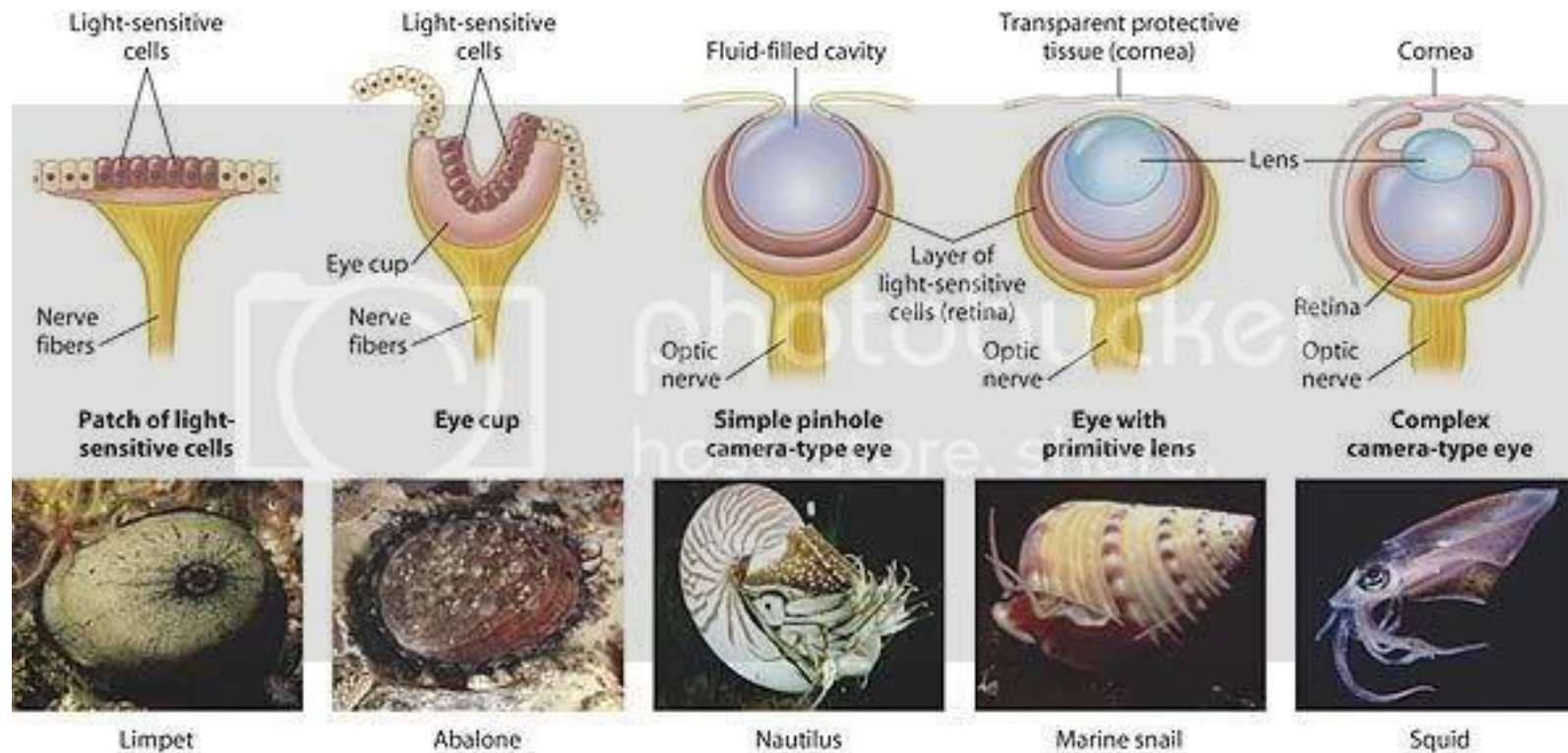
Noam Chomsky (2011): Centrality of syntax
The ability to organize words into phrases and sentences according to recursive rules is the distinguishing feature of language.



the father of modern linguistics
(1928-)

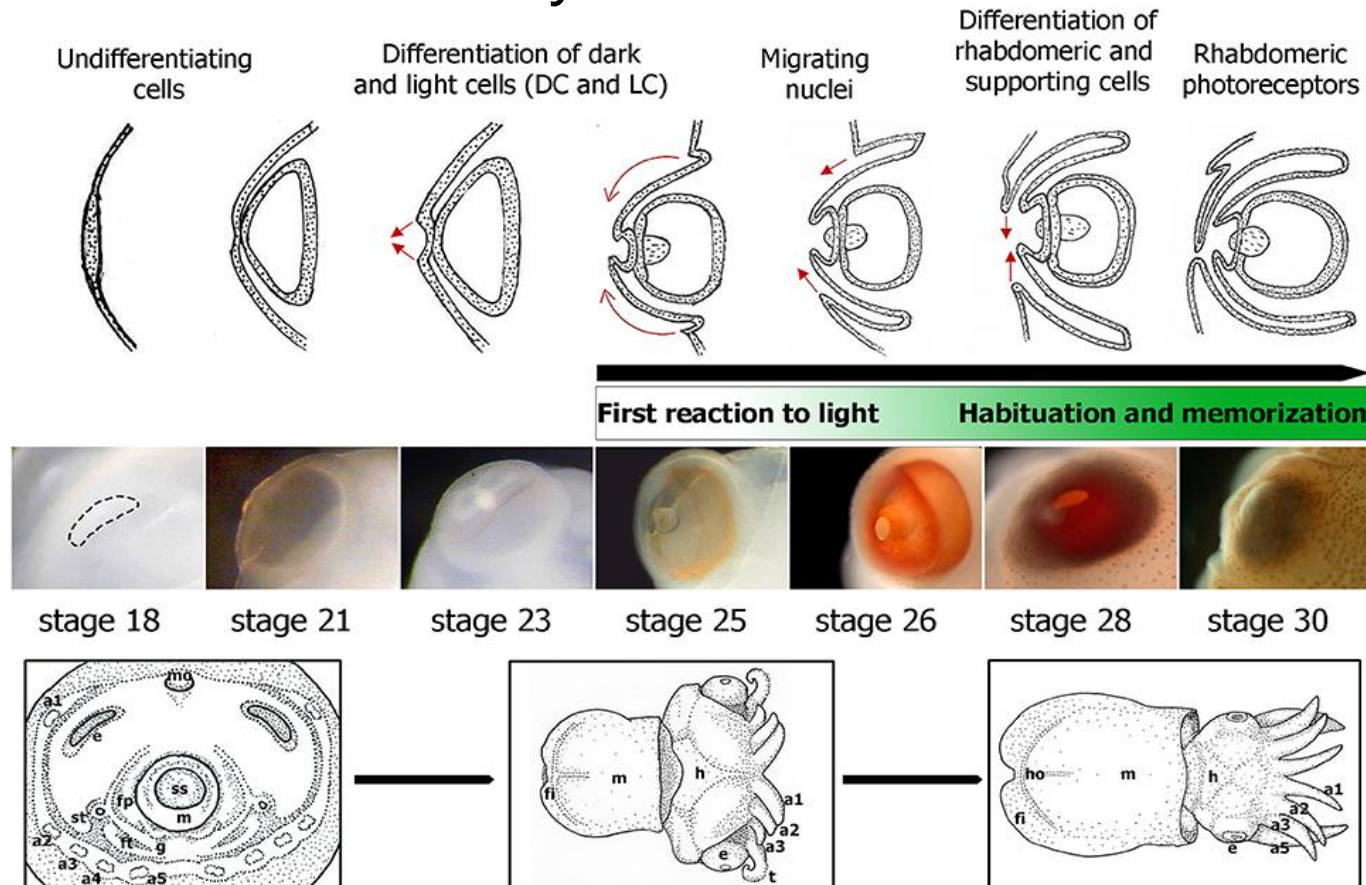
CONTINUITY DEBATE

- Natural selection theory



CONTINUITY DEBATE

- Evolution theory



HOPEFUL MONSTER

- Noam Chomsky (Hauser, Chomsky, & Fitch, 2002)
A hopeful monster hypothesis
Language did not evolve incrementally. Instead a single mutation transformed the pre-human brain into a recursive thinking machine and that this mutation spread quickly throu the population in one or a few generations.
(Philosophical argument, not empirical evidence)



LANGUAGE GENES

- KE family with a language disorder (Gopnik, 1990)
 - ▣ Specific language impairment (SLI): a language processing and production disorder that cannot be attributed to other causes such as brain damage or hearing loss.
 - ▣ FOXP2: social communication across a variety of species.
 - ▣ No single language gene: our ability to speak is likely influenced by many genes that also subserve other functions besides language (Bolhuis et al., 2010).

HUMAN LANGUAGE EVOLUTION

- Continuity theories: a steady transition from animal communication systems to human language.
 - ▣ But no species with communicative skills between those of humans and animals
 - ▣ Fossils and artifacts of ancestral humans cannot tell the communication system they had for sure.
- Discontinuity theories: a sudden transition from animal communications systems to human language.

LONG TIME NO SEE

- Pidgin(皮钦语、混杂语言) : A blending of several language, developing as a contact language of people, who speak different languages, try to communication with one another on a regular basis.——洋泾浜
 - ▣ Limited vocabulary
 - ▣ A simple phonology
 - ▣ Simple subject-verb-object sentences
- Protolanguage: A hypothetical pidgin like language spoken by ancestral humans.(animal communication-protolanguage-language)
 - ▣ “Talking” chimpanzees
 - ▣ Creole(克里奥尔语) : A pidgin language which has become the native language of a group of speakers used in this daily life.

LANGUAGE EVOLUTION: SOCIAL ASPECTS

- Motherese: the type of language caregivers use to interact with their infants (greater range of pitch, more regular rhythms, plenty of repetition)
- Mother tongue hypothesis: maternal vocalizations took on meaning over the course of many generations, developing into a way for family members to communicate (Falk, 2009).
- Singing Neanderthal hypothesis: both music and language derive from the same source, the humming of pre-human social interactions (Mithen, 2005).
- Social grooming hypothesis: gossip for humans serves the same purpose of social network building as does grooming for chimpanzees (Dunbar, 1998)

4. LIVING FOSSILS

- Half an eye
- Me Tarzan, You Jane
- Planet of the apes
- Baby talk
- At a loss for words

HUMAN ARROGANCE AND ANTHROPOMORPHISM

- The definition of language: thought communication (human) or social relationship maintenance (animals)?
- Anthropomorphism (拟人) :human beings tend to assign human-like qualities to animals, natural phenomena, and even abstract concepts (感时花溅泪, 恨别鸟惊心。)
- In the natural realm, continuity rules, and hopeful monsters are rare (Theißen, 2006).

ME TARZAN, YOU JANE

- The

- P

- P

- P

- P

- P

- Pic



- Pidgin-like communicationsystem-protolanguage

- Aphasia: a language deficit due to brain damage

- Non-human animals can learn simple pidgins.

TEACH LANGUAGE TO A NONHUMAN PRIMATE

● Chimpanzees

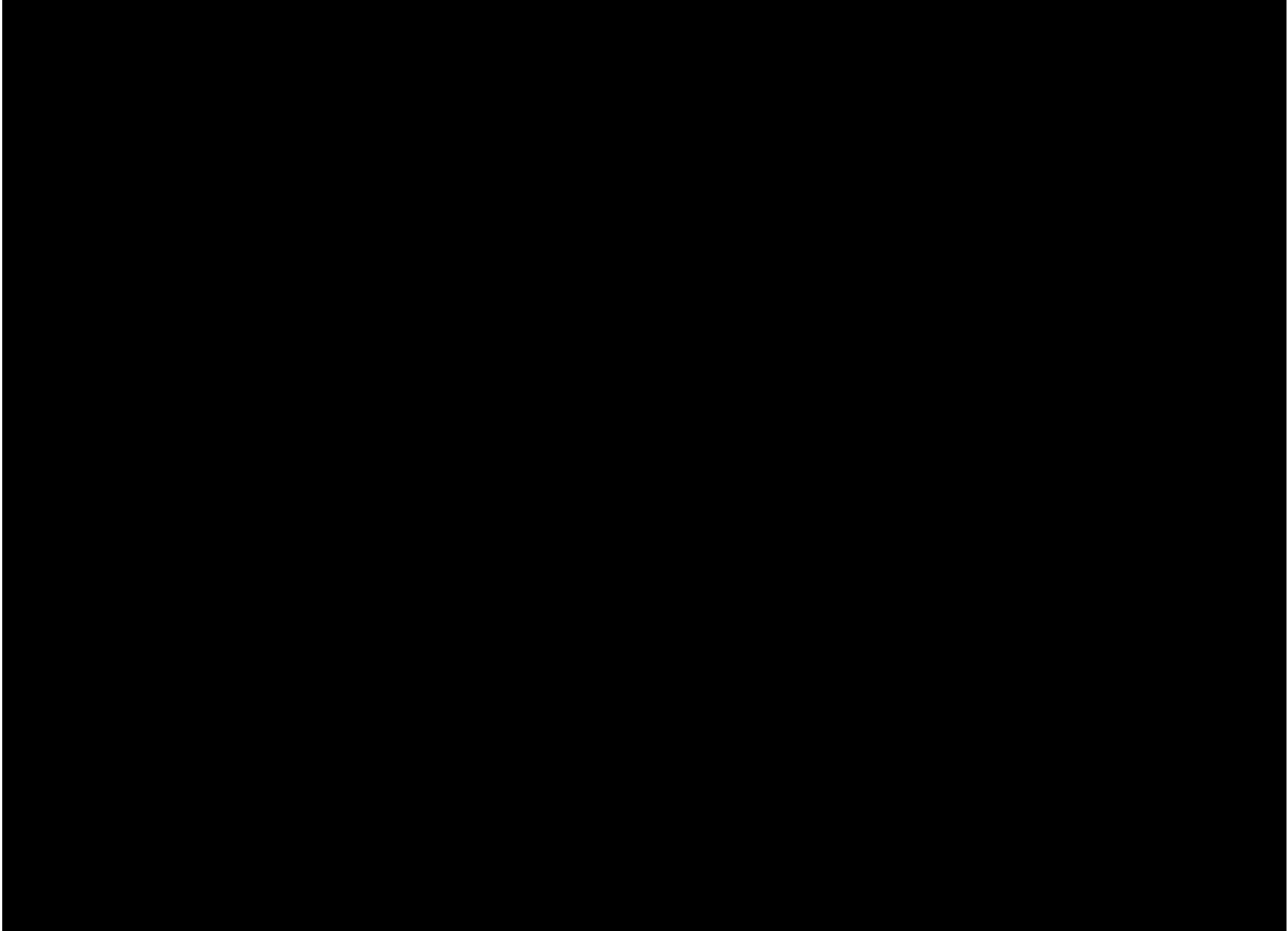
- ▣ Gua (Kellogg & Kellogg, 1933): raised with infant Donald (Behaviorism).
- ▣ Viki (Hayes, 1951): learned speech (Physical limitation: vocal tract)
- ▣ Washoe (Gardener & Gardener, 1969): American sign language
 - Operant conditioning and observational learning
 - Word combination: "water" + "bird"
- ▣ Koko (Bonvillian & Patterson, 1993): over 100 words; combine signs to express novel meanings.
- ▣ Sarah (Premack & Premack, 1984) & Lana (Rumbaugh, 1977): learn syntax via lexigrams

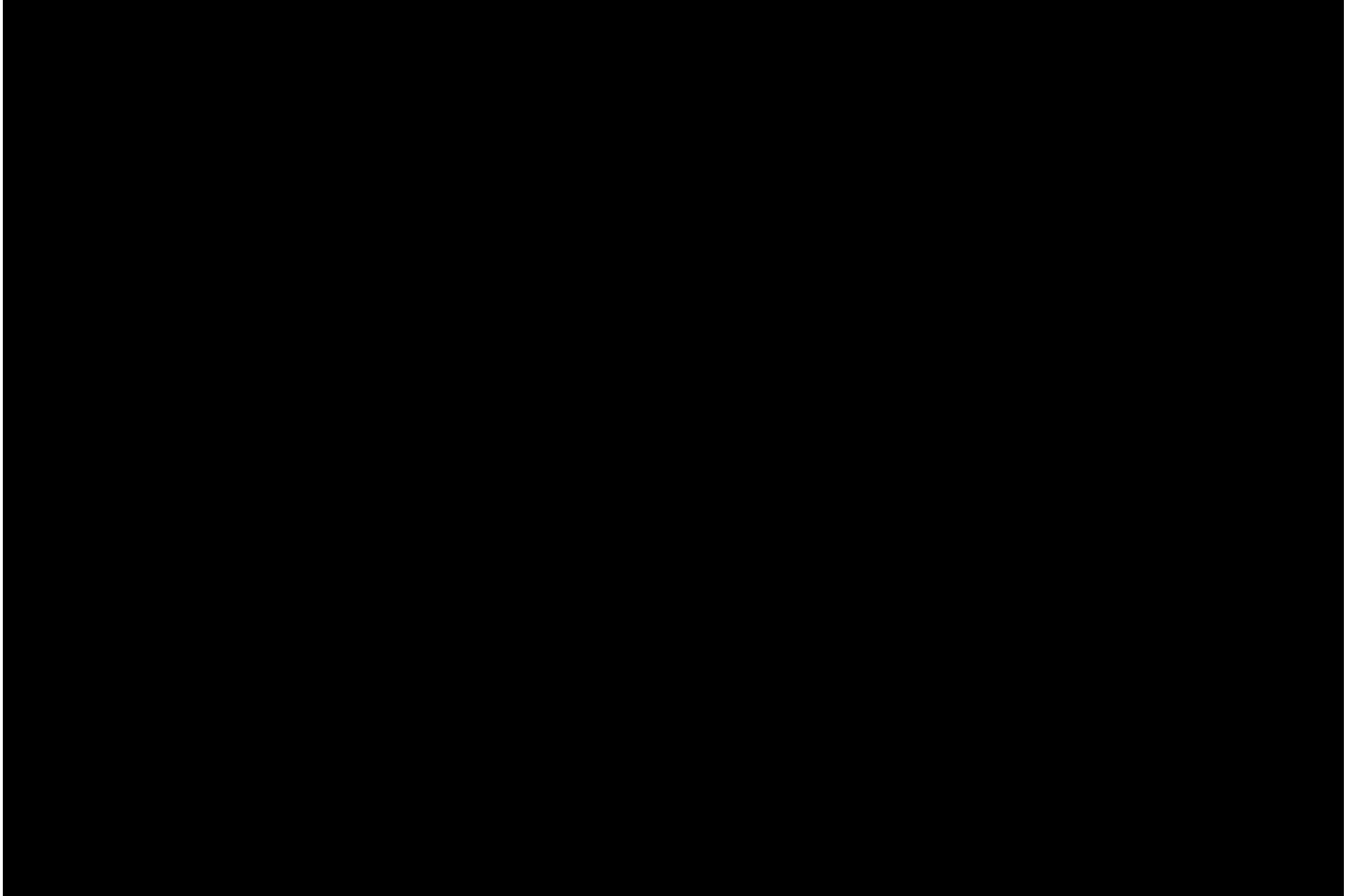


The Ape and the Child
<https://www.edubloxtutor.com/kellogg/>

● Bonobo

- ▣ Kanzi (Savage-Rumbaugh, Shanker, & Taylor, 1998): observation learning; listening comprehension.

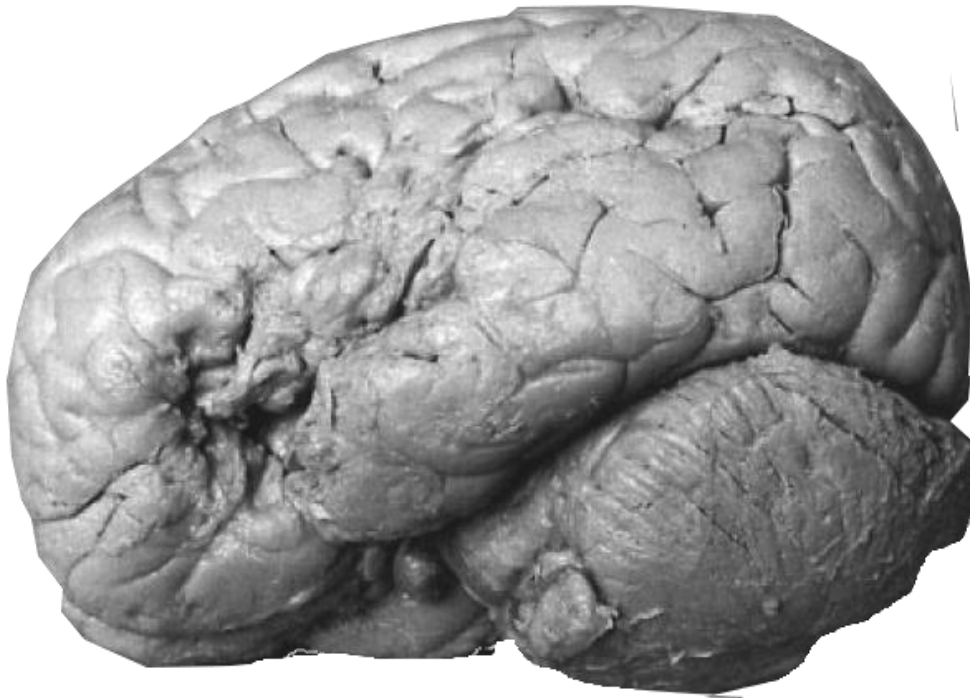




BABY TALK: LANGUAGE EVOLUTION

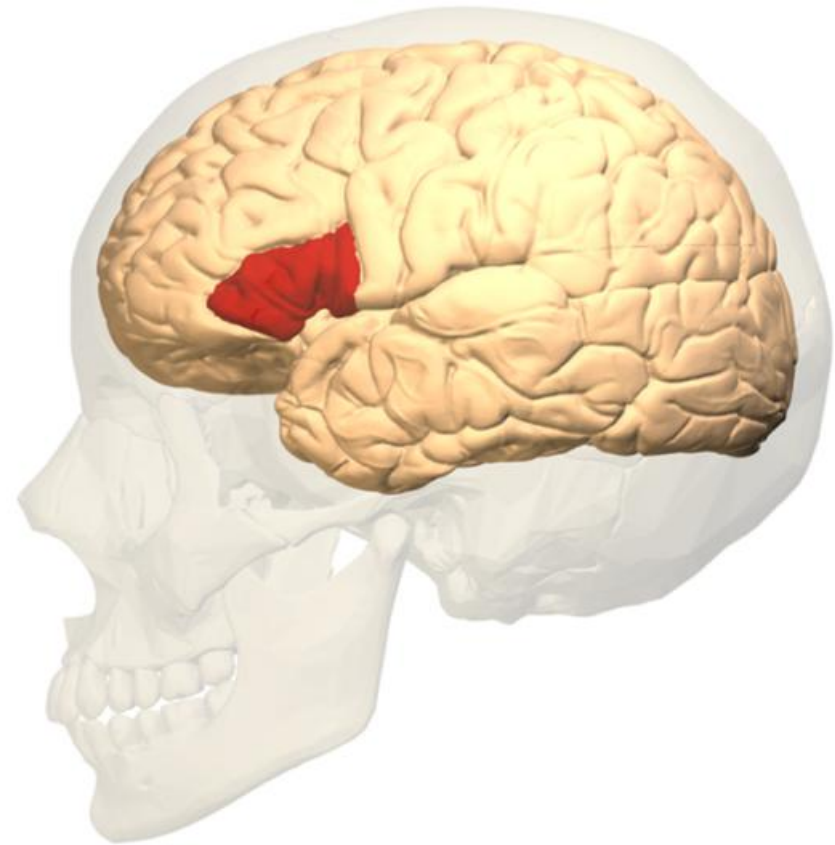
- Before first birthday: Cooing, babbling, first word (holophrase)
- Vocabulary spurt: a time in which the child begins learning new words at a rapid pace, usually starting around 18 months (two-word combinations: pidgins).
- 5-6 years old: competent speaker of the native language.
- Pidgins as a sort of living fossil
 - Pidgin-like communicationsystem-protolanguage
 - Aphasia: a language deficit due to brain damage
 - Non-human animals can learn simple pidgins.

LANGUAGE LOSS: BROCA'S APHASIA



Reported by Paul Broca (1861)

<http://auditoryneuroscience.com/sites/default/files/BrocasBrain.png>



https://images.saymedia-content.com/.image/t_share/MTc0NjM5MTY0NDM1MDE1NjI1/cognitive-neuropsychology-broca-wernicke.png

HOMework 2

- 《语言、演化与大脑》（王士元，商务印书馆）