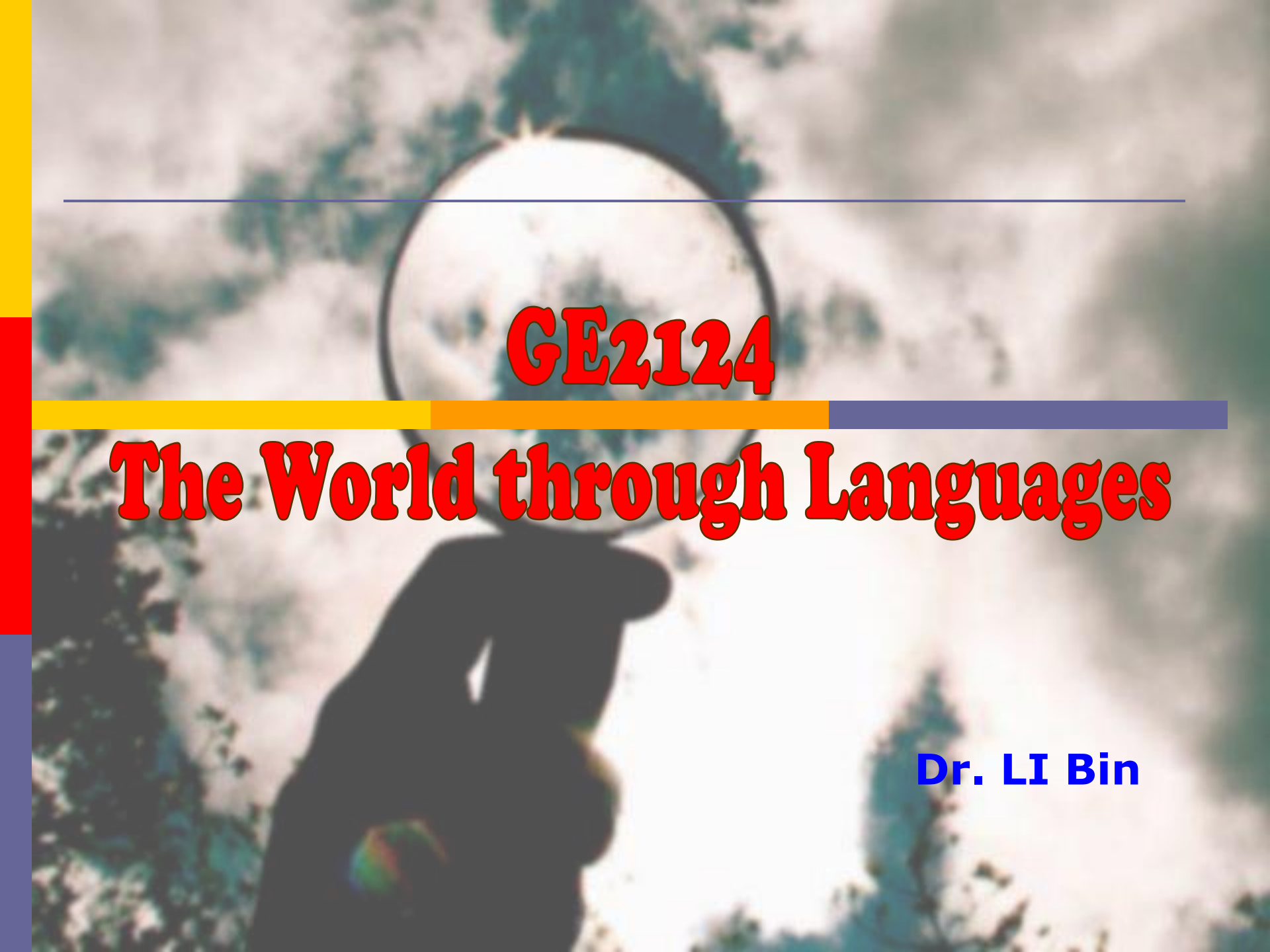


GE2124
The World through Languages

Dr. LI Bin

Review

- The writing system
- Religious, practical, anthropological explanations
- Pictography, ideography, the Rubus Principle
- Classification of writing systems
  - Sound-based: alphabetic, syllabic
  - Meaning-based: logographic

Lecture 3

Animal communication vs. human language

Signals

- Communicative signals
- Informative signals
- Human vs. animal communication
  - Potentials as a means of intentional communication

DOGGIE LANGUAGE signals

ALERT

SCARED

"PLEASE..."

"PEACE!"

"PEACE!"

"PEACE!"


I'LL BE NO THREAT


I'LL BE NO THREAT

I'LL BE NO THREAT

BEING FRIENDLY


LET'S PLAY!

SUBMISSION

CUTE HARMLESS PUPPY

www.doggiedrawings.net

Animals talk

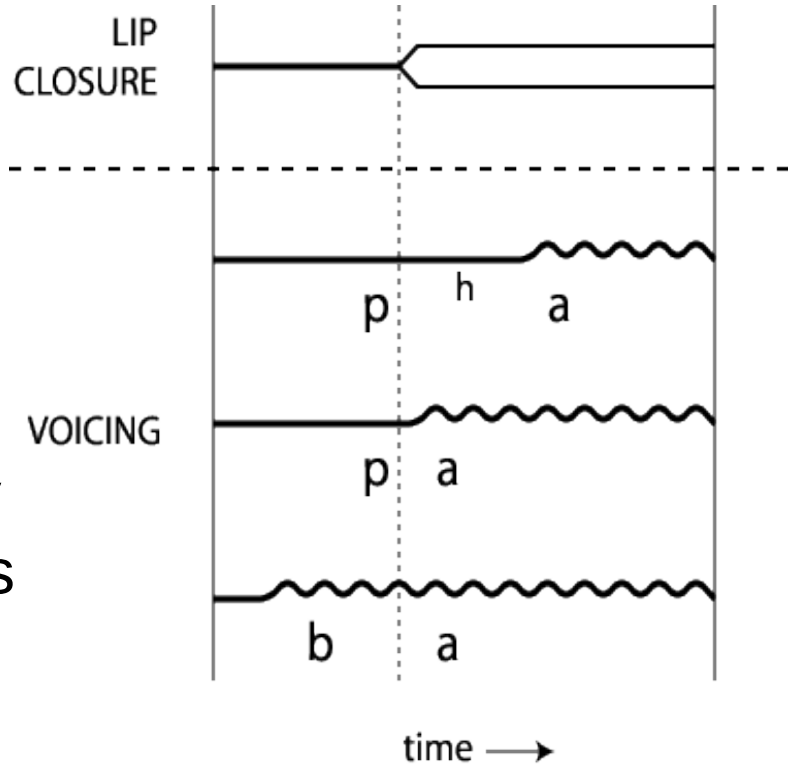
- The Wagging Dance by Honey Bees
- The calling of Prairie Dogs

Animals listen

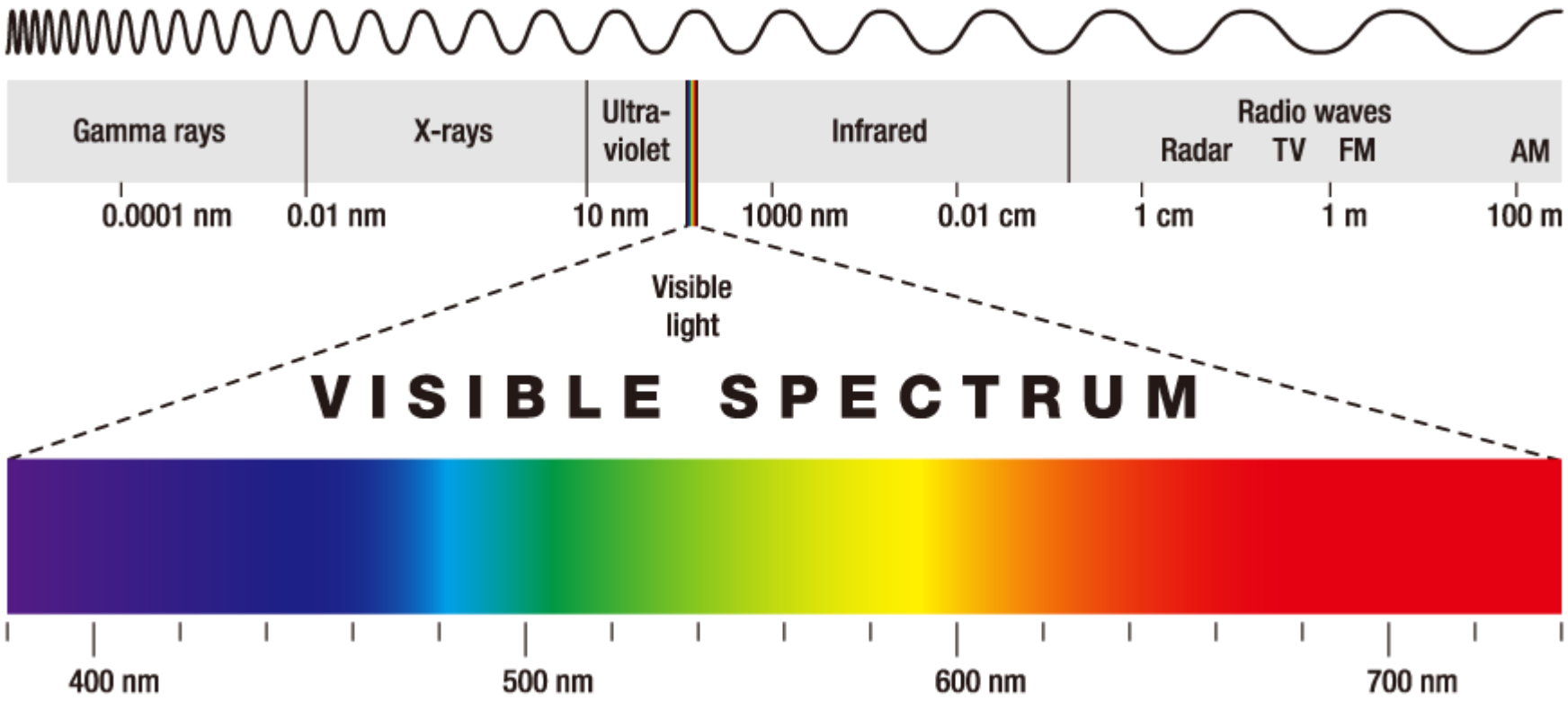
- Kuhl & Miller (1978): tested **chinchillas** and humans with identical stimuli
  - Human Task: identification of English consonants
  - Chinchillas: avoidance conditioning (associate safety and shock with different consonants)

Voice Onset Time

- VOT: the point at which the vocal folds begin to vibrate relative to the release of a stop.
- Three categories:
  - Prevoiced
  - Voiced or voiceless unaspirated
  - Voiceless
- Languages differ in which category is employed to contrast consonants in their systems. Hindi, Korean



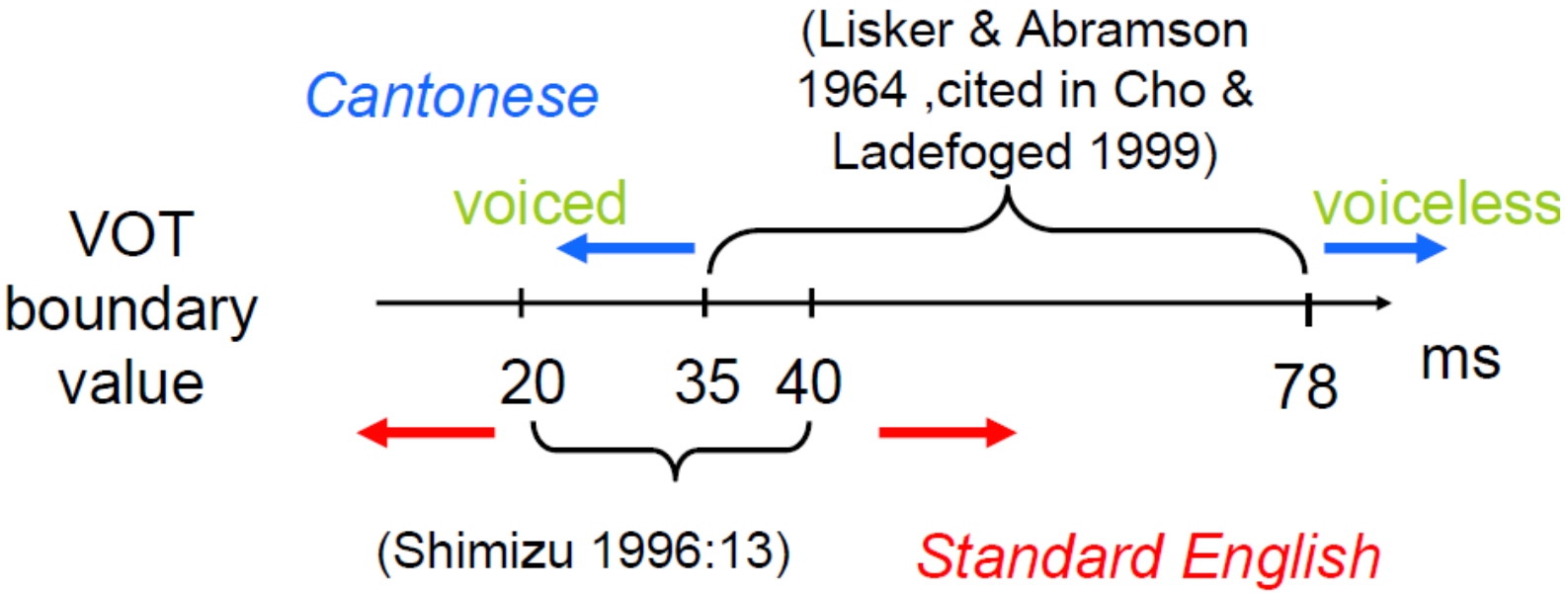
Categorical Perception



https://www.benq.com/en-in/knowledge-center/knowledge/what-is-accurate-color.html

Categorical Speech Perception

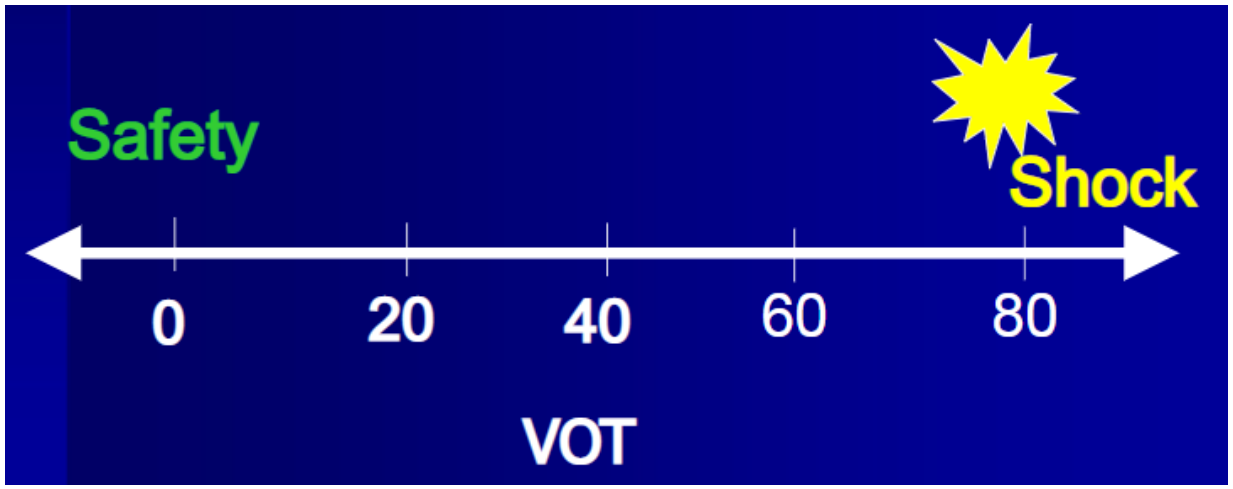
- The ability to notice some phonetic distinctions but ignore other; and to put a set of sounds into a single category.
- Speech sounds are perceived as discrete categories rather than as continua (first experiment: Liberman, Harris, Hoffman, & Griffith, 1957)
- This emerge very early in infants (Eimas, Siqueland, Jusczyk, Vigoritos, 1971). Breakthrough in the study of L1.



Wee & Cheung 2009

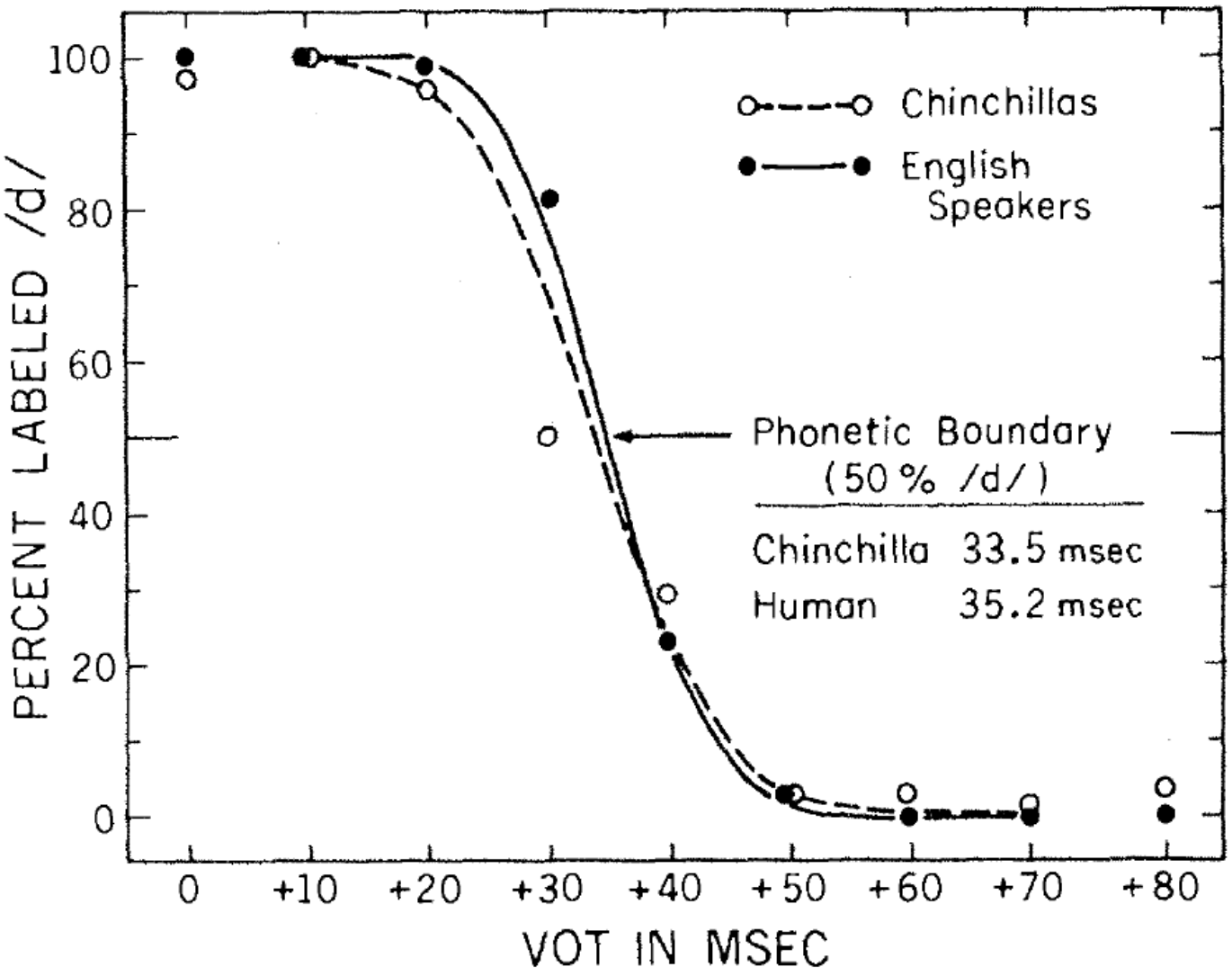
Training chinchillas

- Kuhl & Miller (1978)



a continuum ranging from /da/ to /ta/. The animals were trained on the two "endpoint" stimuli (0 and +80 ms VOT). and then tested with stimuli ranging from +10 to +70 ms in a generalization paradigm (feedback always arranged to indicate a correct response).

How did chinchillas do?

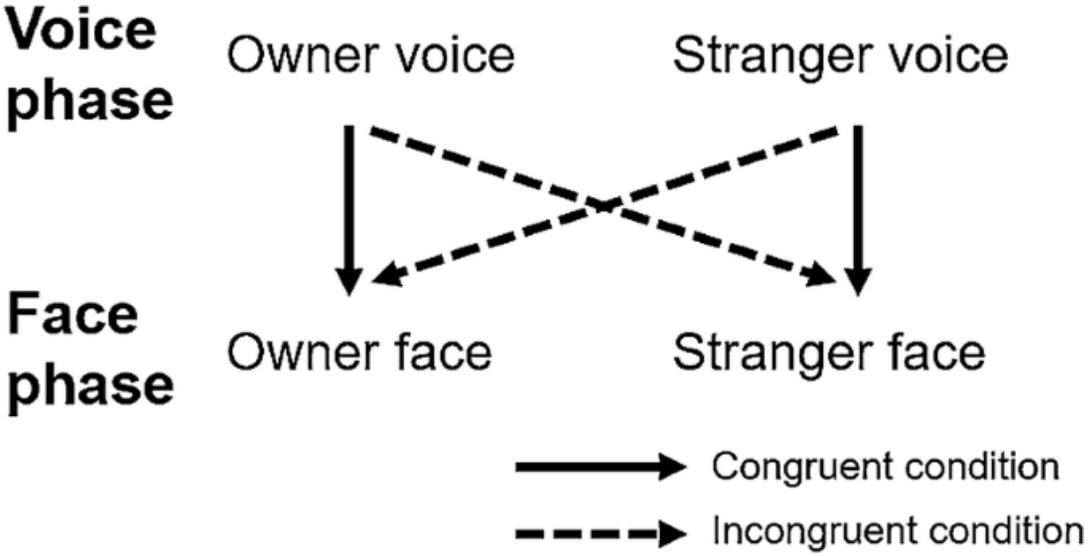


Animals listen

- ***Primates know consonants: macaques, vervet monkeys, chimpanzees***
  - Could tell ra/la apart but different boundaries from human (Sinnott & Brown, 1997)
  - Failed to make use of vowel length to tell consonants apart (Sinnott, Brown, & Borneman, 1998)
  - Failed to group vowels as human infants do (Kuhl, 1991)

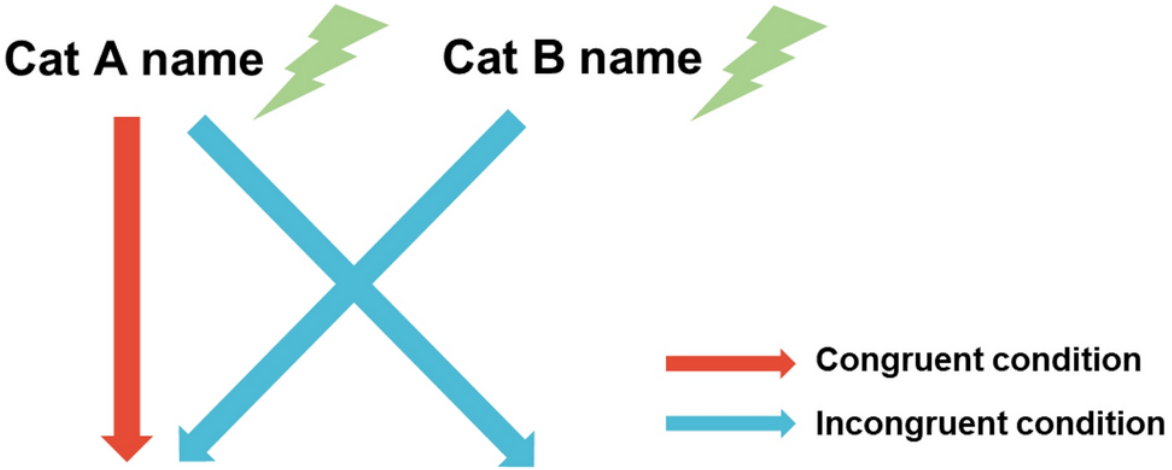
Animals listen

- ***Cats know their names***
  - Saito, A., Shinozuka, K., Ito, Y. et al. Domestic cats (Felis catus) discriminate their names from other words. *Sci Rep* 9, 5394 (2019)
  - Takagi, S., Arahori, M., Chijiiwa, H. *et al.* Cats match voice and face: cross-modal representation of humans in cats (*Felis catus*). *Anim Cogn* 22, 901–906 (2019).



Cats can tell names and faces

- Takagi, S., Saito, A., Arahori, M. *et al.* Cats learn the names of their friend cats in their daily lives. *Sci Rep* 12, 6155 (2022). https://doi.org/10.1038/s41598-022-10261-5




Cat A face

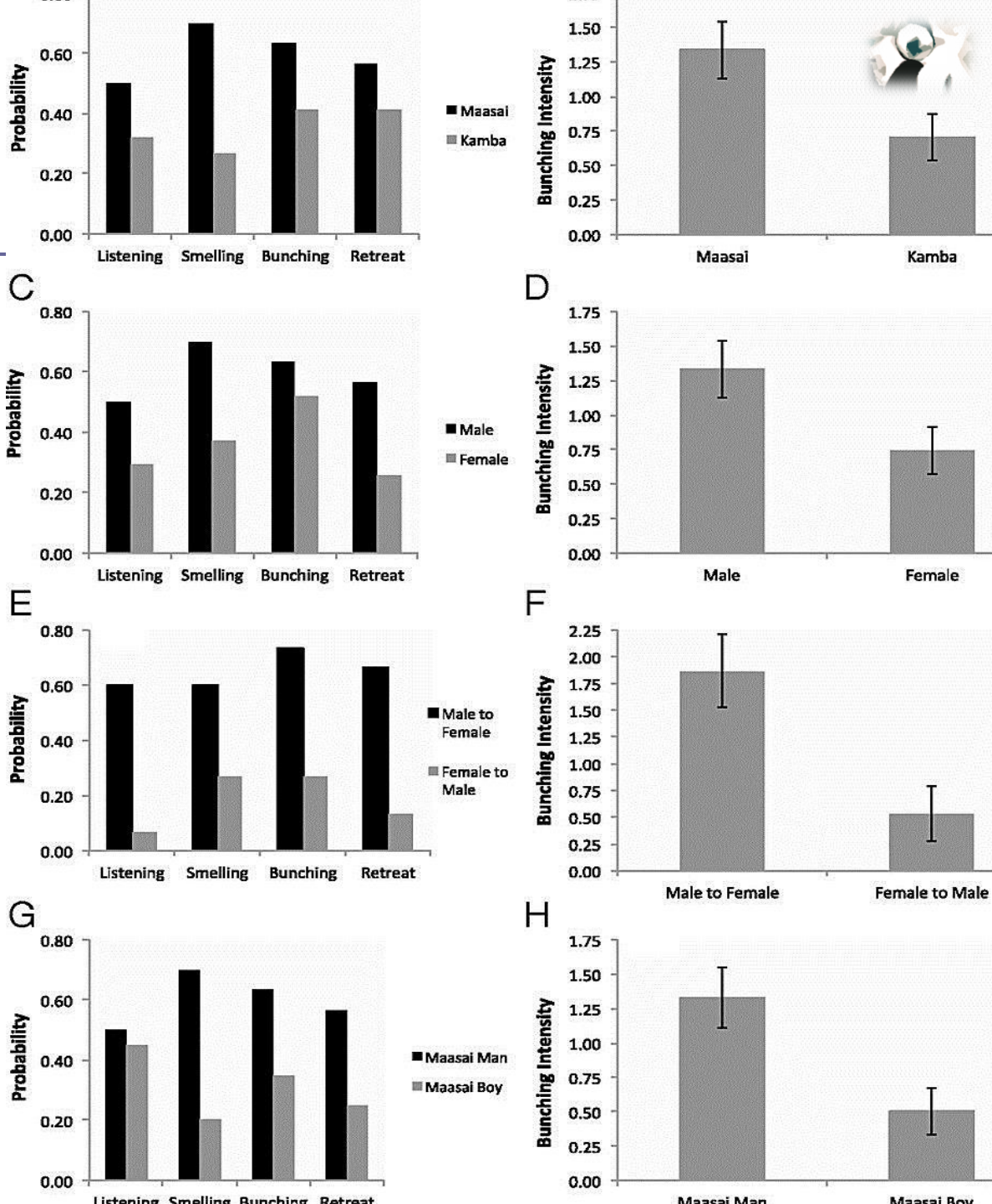

Cat B face

https://www.nature.com/articles/s41598-022-10261-5

Animals listen

- ***Elephants*** can determine ethnicity, gender, and age from acoustic cues in human voices. McComb, et al. (2014). *PNAS*. 111(14): 5433–5438.
  - BBC news : http://www.bbc.com/news/science-environment-26488432

- Distinctive reactions to Masai and Kamba people saying "look, look over there, a group of elephants is coming“
- Same reaction to Masai male voice even if the voice is modified.



Animals listen

We can perceive reality and you may not!

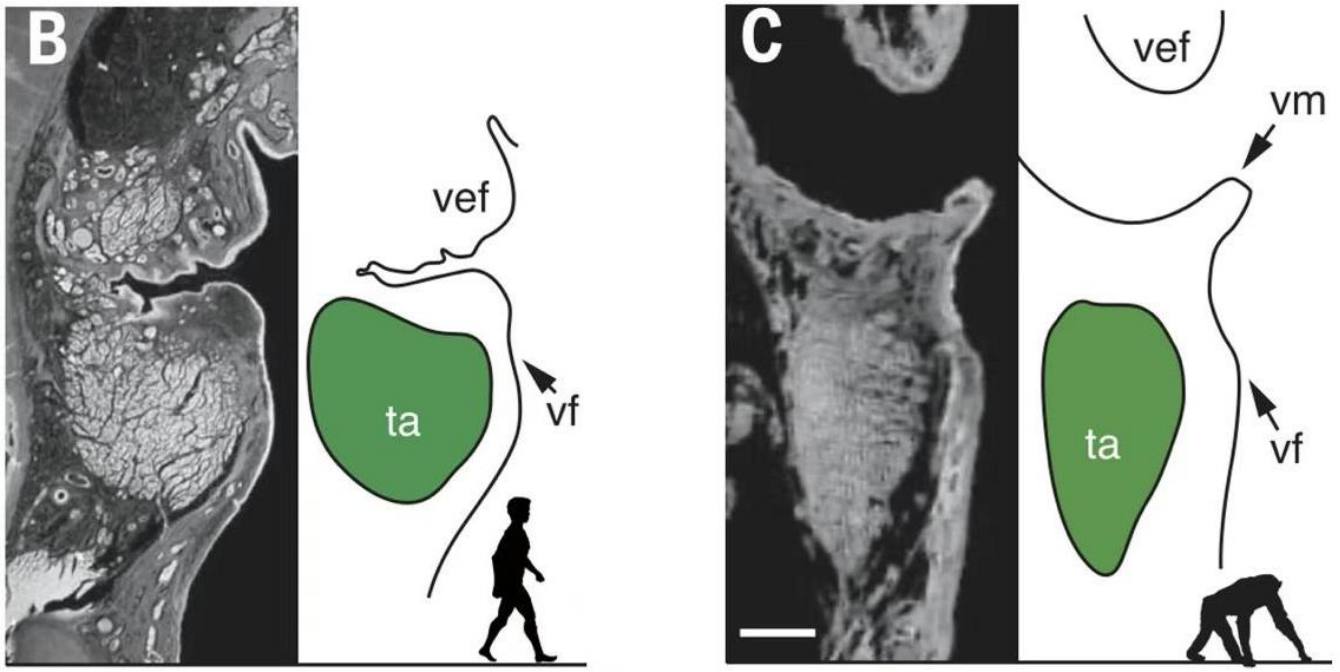
Animals learn - Chimpanzees

- In movies and fictions
- Earlier studies
  - Gua with the Kelloggs in 1930s: researchers' son started to learn Gua's sounds
  - Viki with the Hayes in 1940s: produced 3 words.
- Washoe of the Gardners: American Sign Language
- Sarah of the Premacks: word symbols
- Kanzi of the Savage-Rumbaugh: Lexigram by observing his mother's training, not being taught

- *Speaking?* Einstein- the talking parrot

Less is more

- Nishimura T, Tokuda IT, Miyachi S, Dunn JC, Herbst CT, Ishimura K, Kaneko A, Kinoshita Y, Koda H, Saers JPP, Imai H, Matsuda T, Larsen ON, Jürgens U, Hirabayashi H, Kojima S, Fitch WT. Evolutionary loss of complexity in human vocal anatomy as an adaptation for speech. *Science*. 2022 Aug 12;377(6607):760-763. doi: 10.1126/science.abm1574.



Design features of communication systems

- Shared by all
  - Mode of communication: vocal, gestural, and others…
  - Semanticity and Pragmatic functions
- Exhibited by some animal communication systems
  - Interchangeability: all members (gender, age, etc…)
  - Cultural transmission: generations
  - Arbitrariness: random connection bet. form & meaning
  - Discreteness: meaningful segments/components
- Not found in animal communication systems
  - Displacement
  - Productivity

Arbitrariness

- No ‘natural’ connection between a linguistic form and its meaning/referent. (Note: Onomatopoeia)

- Animal communication:
  - Connection between signals and conveyed messages
  - Limited sets of vocal or gestural forms for particular circumstances

Displacement

- Languages enable and allow people to talk about ideas not relating the immediate place or time.

- Animal communication: Here and Now
- Human languages:
  - Past and future
  - Imaginative and hypothetical notions

Productivity

- Open set; infinite numbers of expressions
- Quiz: Longest word? Longest sentence?

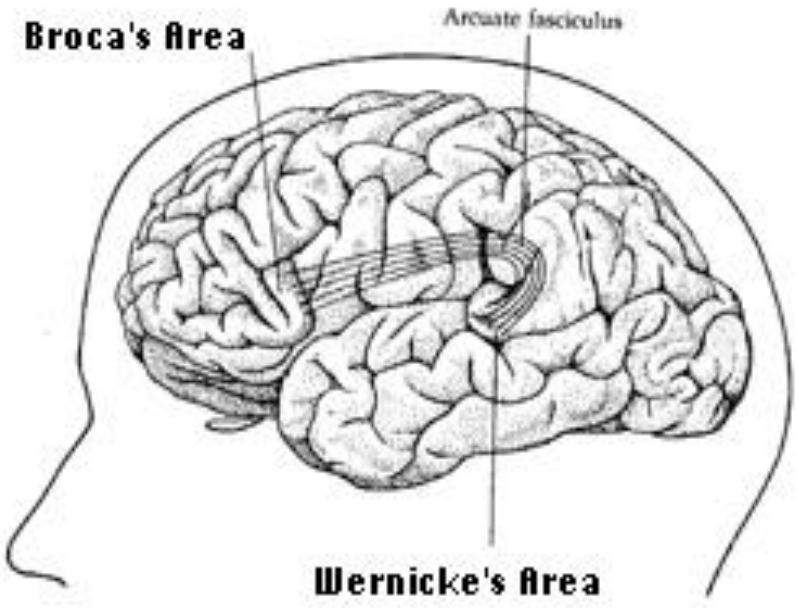
- Animal communication:
  - Fixed set of symbols
  - Fixed referents
  - Novelty?

The Faculty of Language

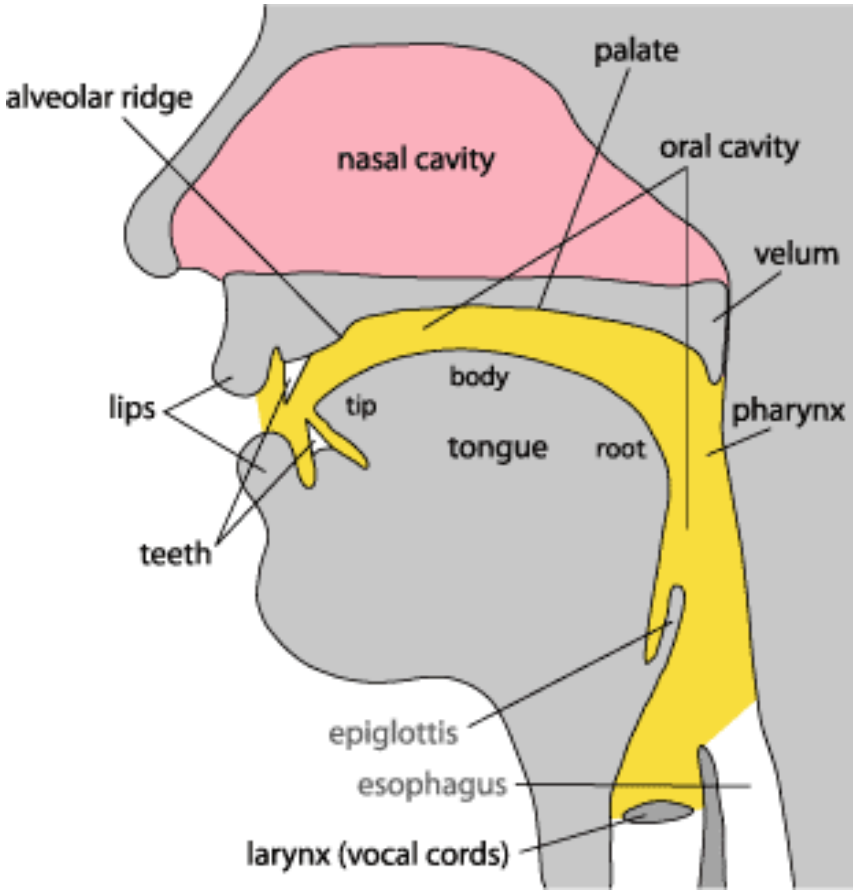
- Marc D. Hauser, Noam Chomsky, W. Tecumseh Fitch. (2002). The Faculty of Language: What Is It, Who Has It, and How Did It Evolve? *Science* 298 (5598): 1569-1579. DOI: 10.1126/science.298.5598.1569

- Charles F. Hockett, (1960) The origin of speech, *Scientific American,* 203: 88–111. Reprinted in: Wang, William S-Y. (1982) *Human Communication: Language and Its Psychobiological Bases*. Retrieved from http://web.stanford.edu/class/linguist197a/hockett60sciam.pdf

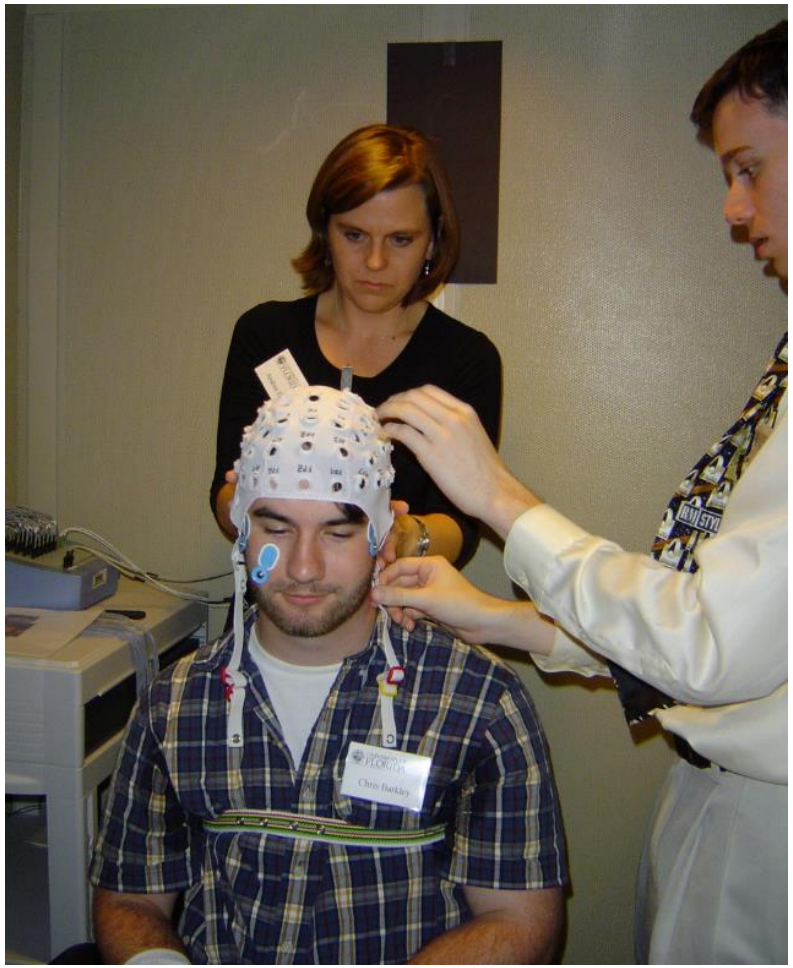
The Articulate Mammal



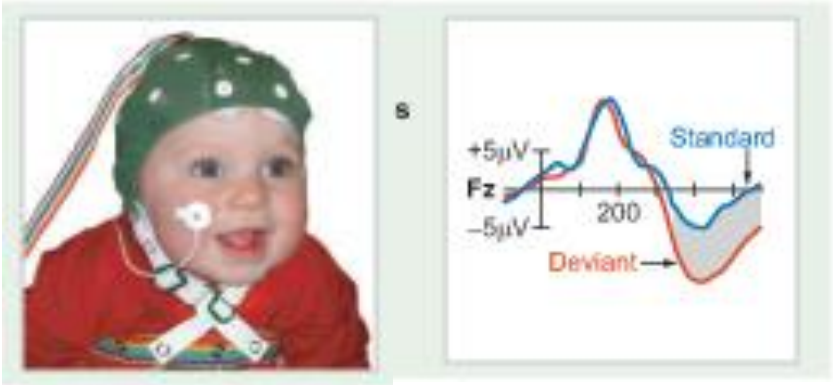
The Articulate Mammal



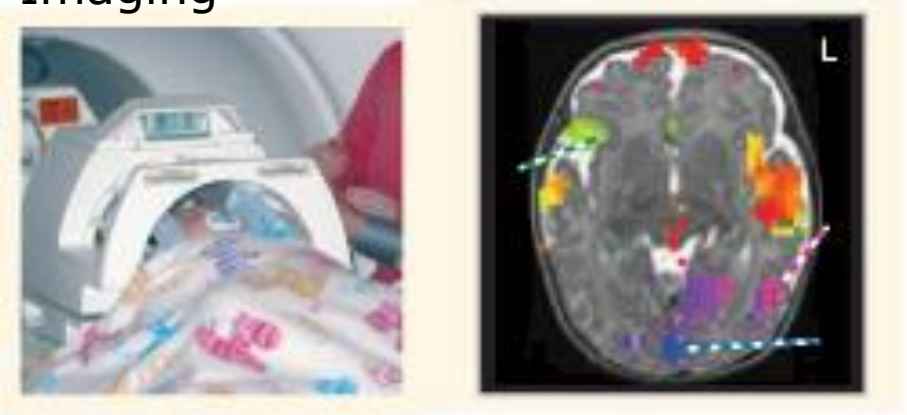
Language and the Brain



ERP: Event-Related Potential



fMRI:: Functional Magnetic Resonance Imaging



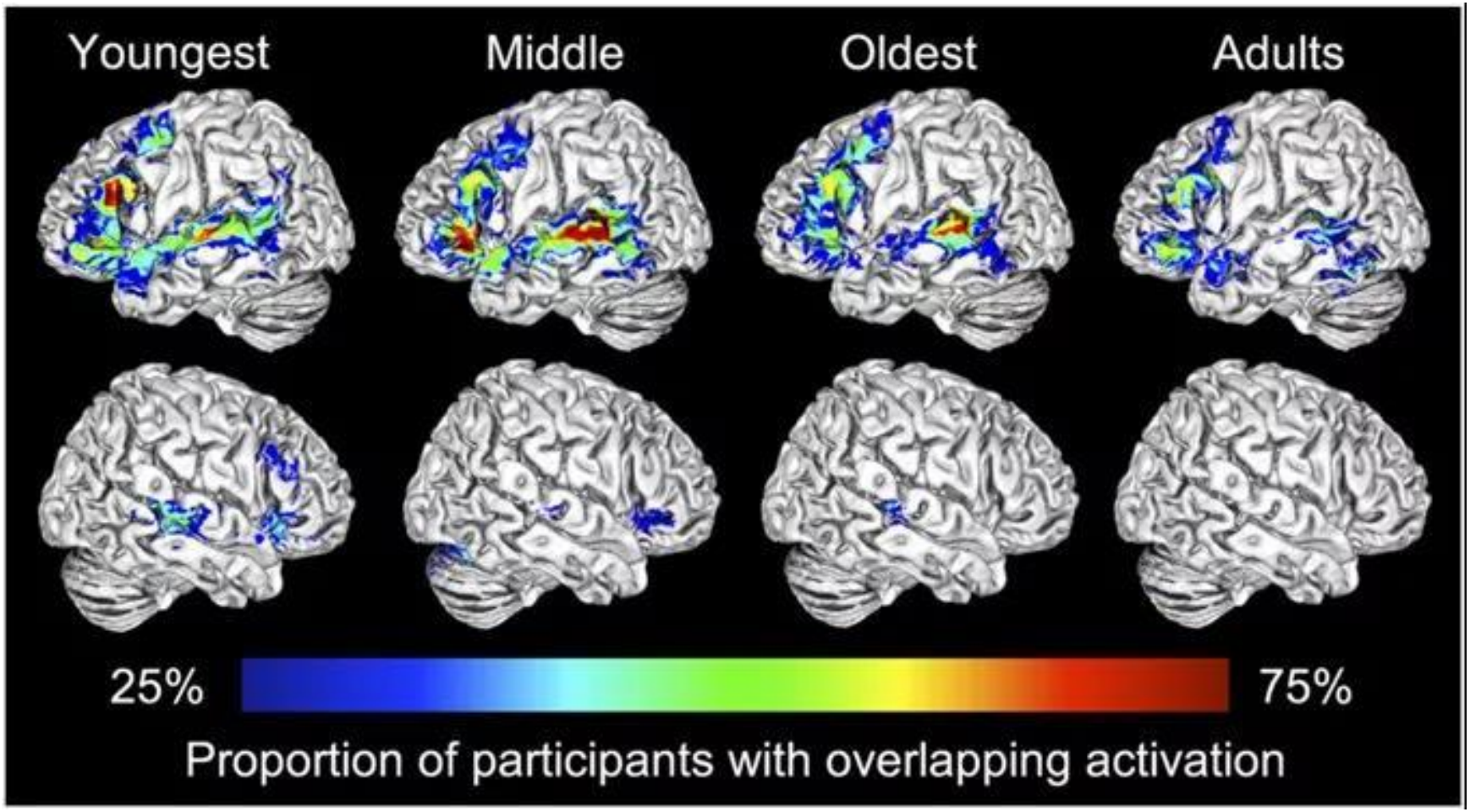
Two Basic Principles

- **Lateralization**:
  - division of tasks
- **Contra-lateralization**
  - asymmetry
- **Plasticity and development**
  - Lateralization at birth or outcome of adaptation?
  - Damage to LH/RH and aphasia among children and adults
  - Both L/RH are activated and involved in language processing.

New Evidence:

Olulade, Seydell-Greenwald, Chambers, Turkeltau, Dromerick, Berl, Gaillard, and Newport (2020). The neural basis of language development: Changes in lateralization over age. *PNAS*. 201905590; DOI: 10.1073/pnas.1905590117

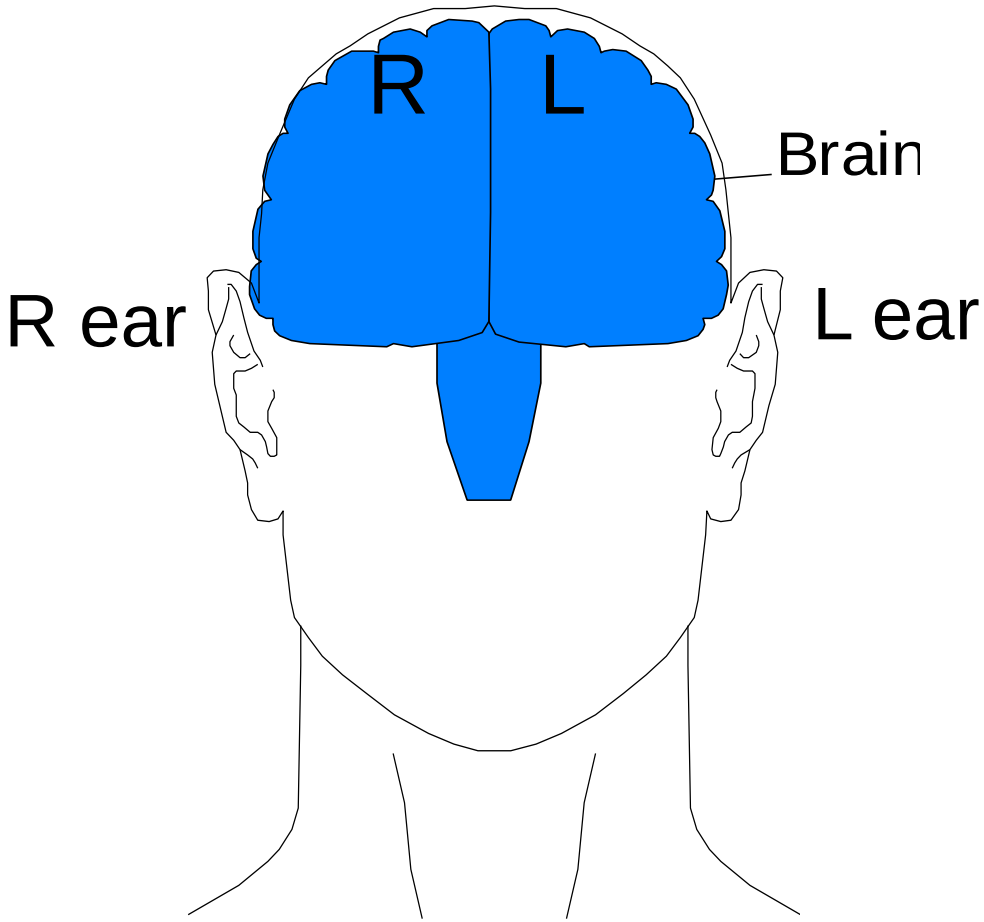
Changes over age



Activation in LH (top) and overlapping in RH (bottom)
Left to right: 4-6, 7-9, 10-13, >18

Dichotic listening

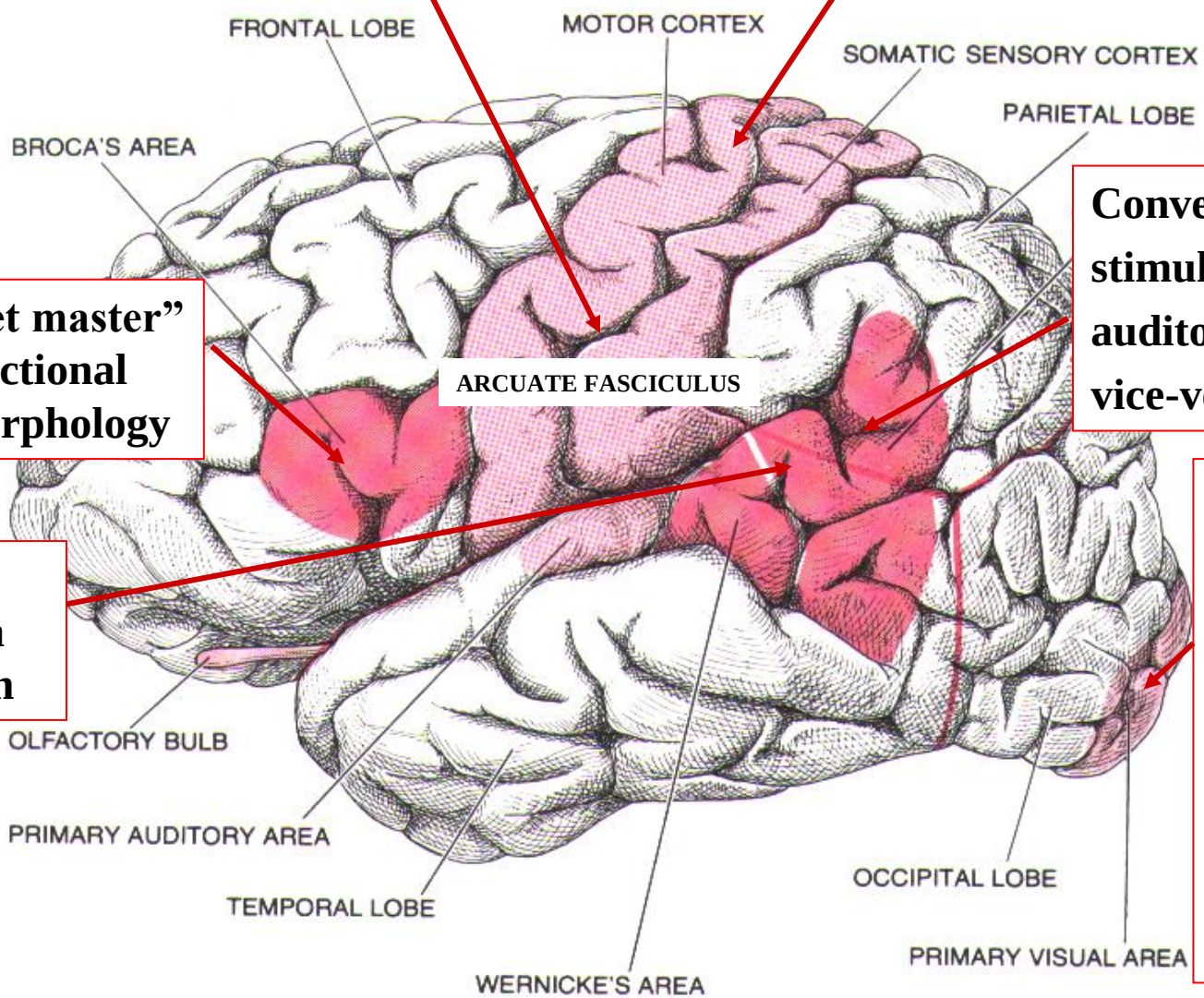
http://www.ljova.com/images/cartoon_headphones.gif


R
L
Brain
R ear
L ear

Physical Features Related to Language

Bundle of nerve fibers
Communication bet. Broca & Wernicke

Carries out Broca's directions



Speech "puppet master"
Syntax & Inflectional
Functional Morphology

Converts visual stimuli into auditory and vice-versa

Language comprehension
Mental Lexicon

Receives visual input and sends it to the Angular Gyrus and Wernicke's Area

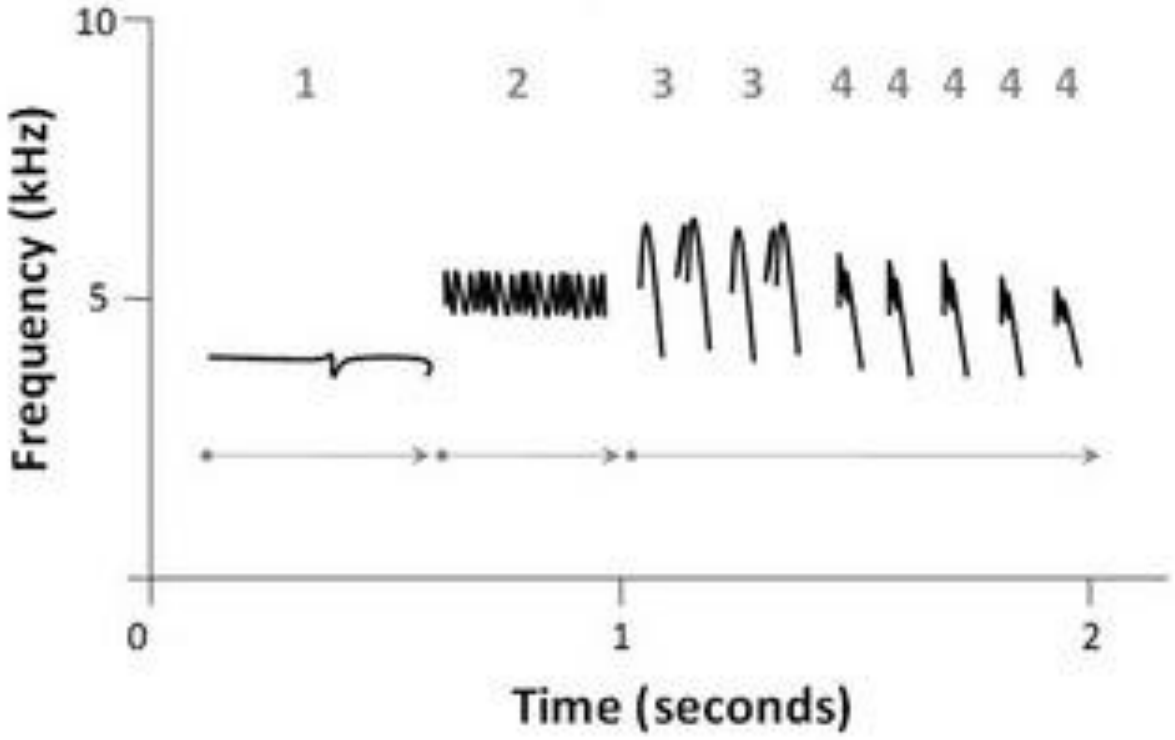
Further reading

- Aitchinson, J. 1998. The Articulate Mammal. Routledge.
- Pinker, S. 1994. *The Language Instinct*. NY: William Morrow.

Exercise_Q1: Dog's signals

- Dogs can send signals such as those illustrated in the picture "signals" in the lecture notes. There are a dozen more such signals identified by the author of the cartoon and dog owners (cartoon illustration: http://imgur.com/a/lLIV2#8).
- List similarities and differences between dogs' communication system and human language. Explain your answer.

Exercise_Q2: Bird's songs



Source: https://www.nature.com/scitable/knowledge/library/the-development-of-birdsong-16133266/

Schematic sound spectrogram of a white-crowned sparrow (*Zonotrichia leucophrys*) song

- Arrows: phrase (or motif); Numbers: syllables made up of notes (or elements), the simplest unit of song.

- Birds' songs consist of a series of notes organized into tunes that appear repeated and organized.
- Such recursive structure is reminiscent of human language. Discuss which design features of human language are present in or absent from birds' songs.

See U back on Feb. 21!

https://www.vecteezy.com/vector-art/26778570-happy-chinese-new-year-2024-greeting-design-with-cartoon-cute-dragon-zodiac-character-holding-mandarin-orange-on-big-number-sign-background