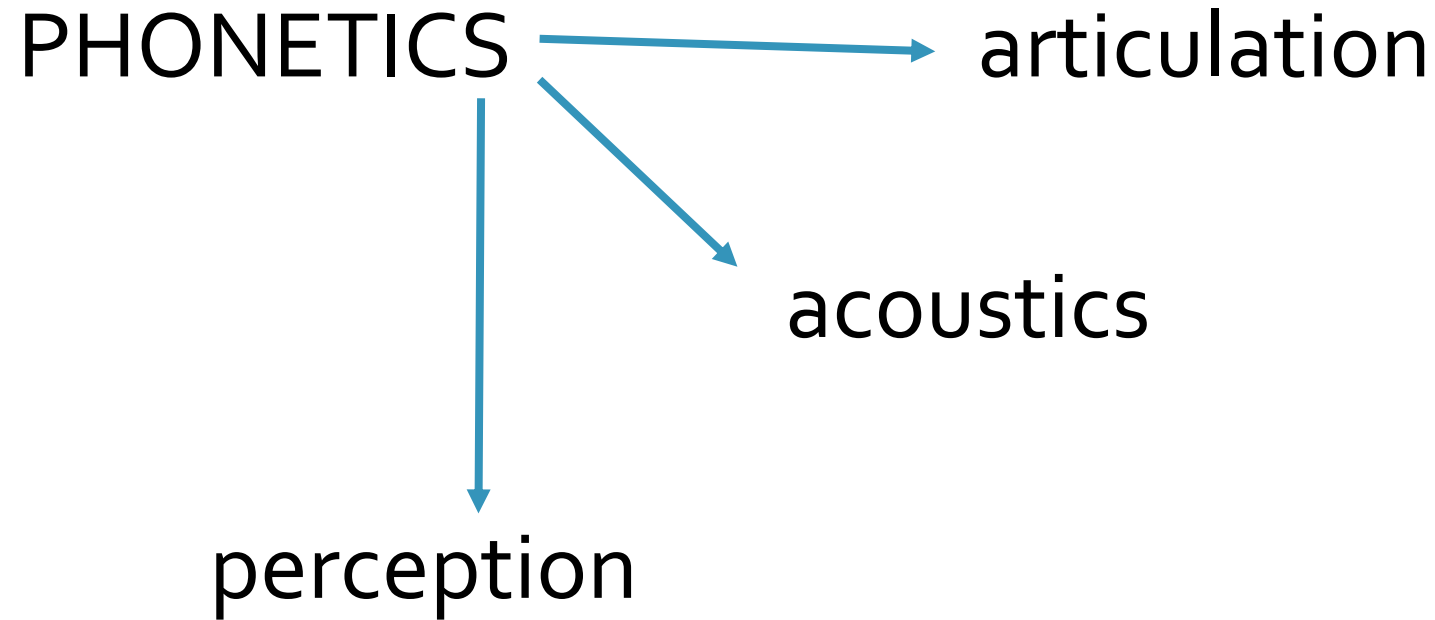


# Speech perception

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# What can we study?



# Outline

1. The peripheral auditory system
2. Audition
3. Perception

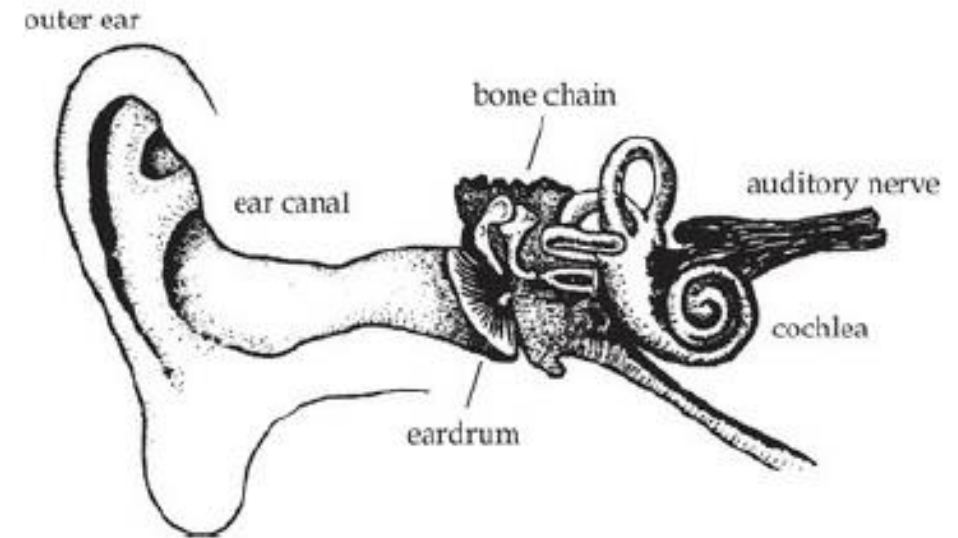
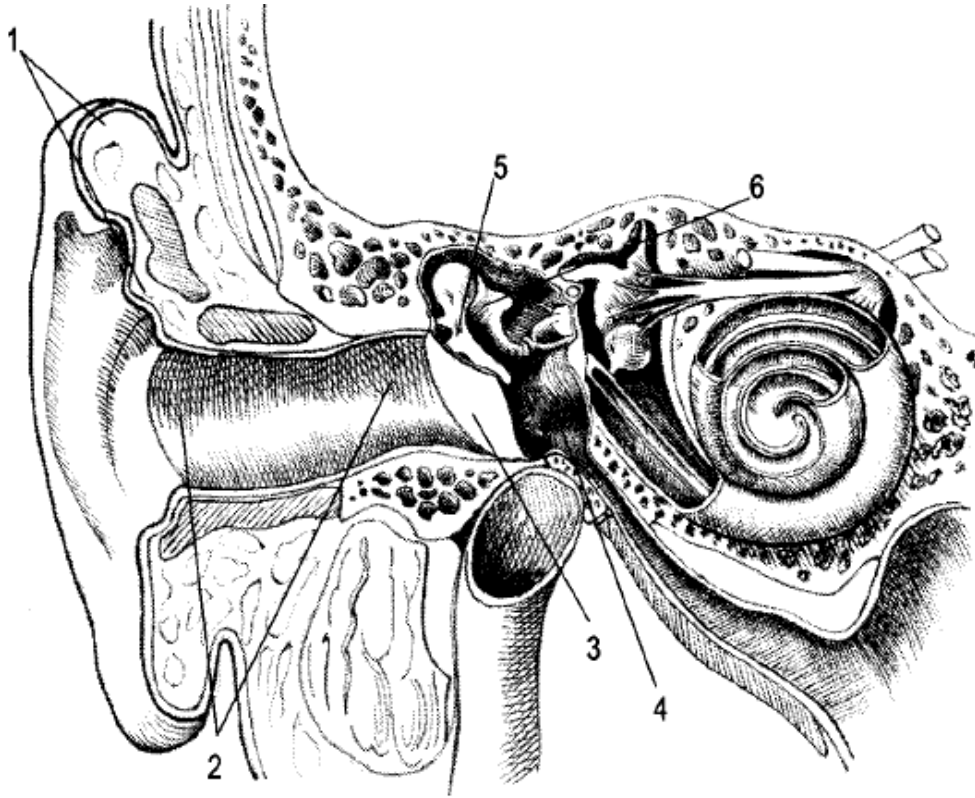
Sound in the air?

Sound for the brain?


Speech sound for the brain?

# The peripheral auditory system

Outer ear, middle ear, inner ear



# What happens next

- 
1. The peripheral auditory system
  2. Auditory nerve, subcortical structures
  3. Auditory cortex

# The peripheral auditory system

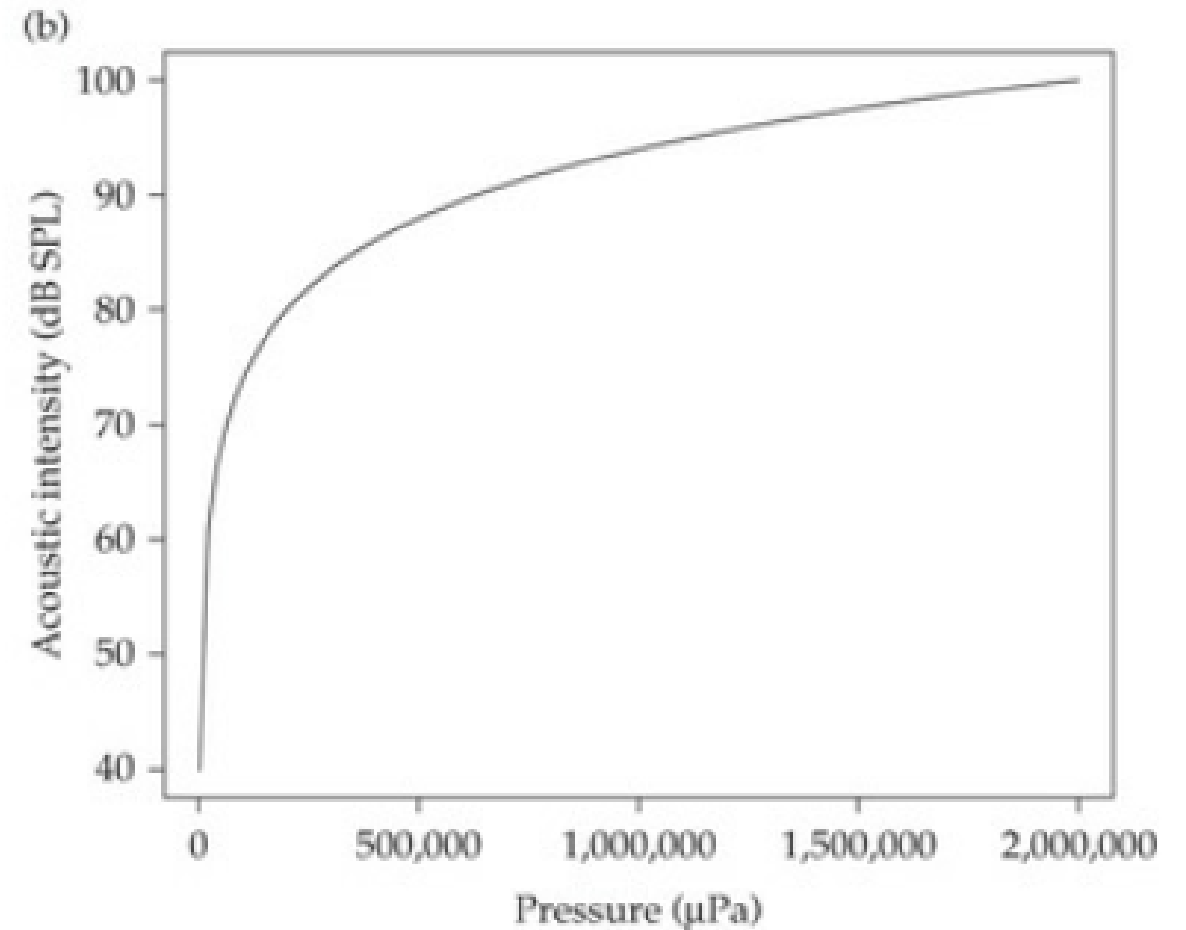
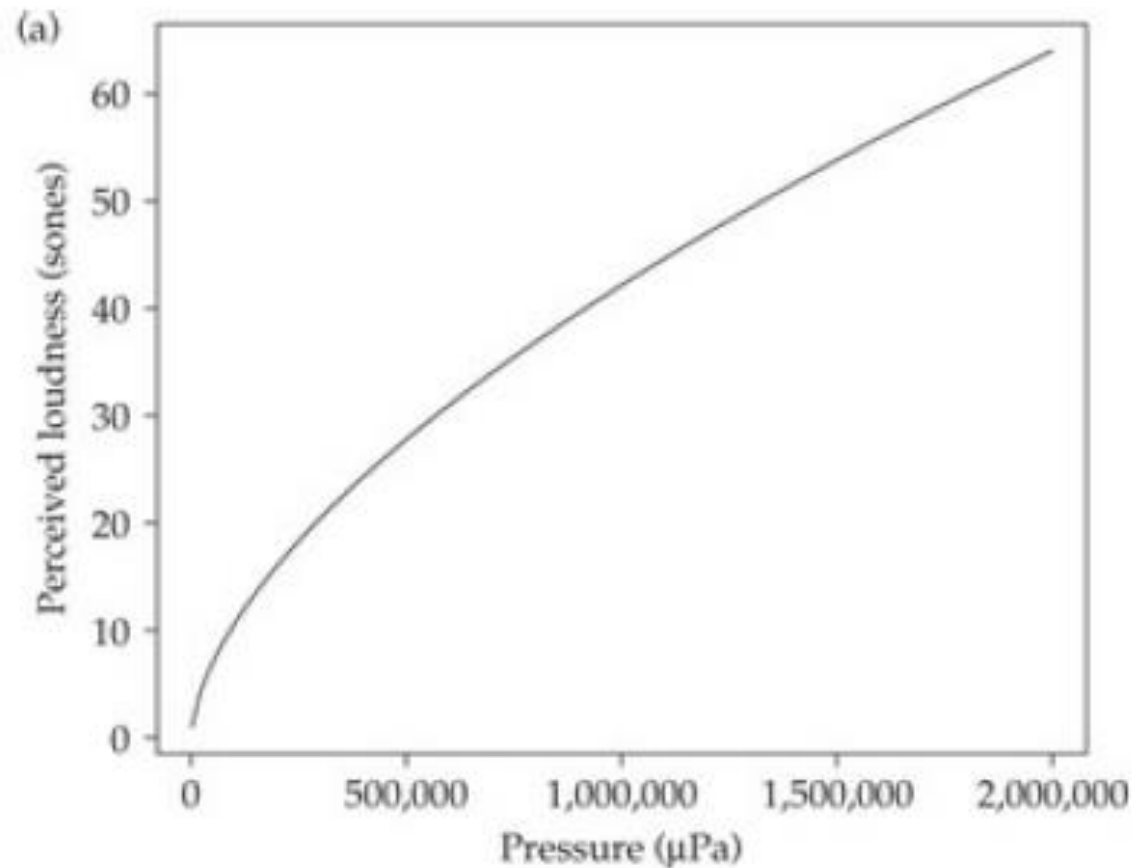
1. translates acoustic signals into neural signals
2. performs amplitude compression
3. performs a kind of Fourier analysis

Video!

# Acoustics vs. hearing

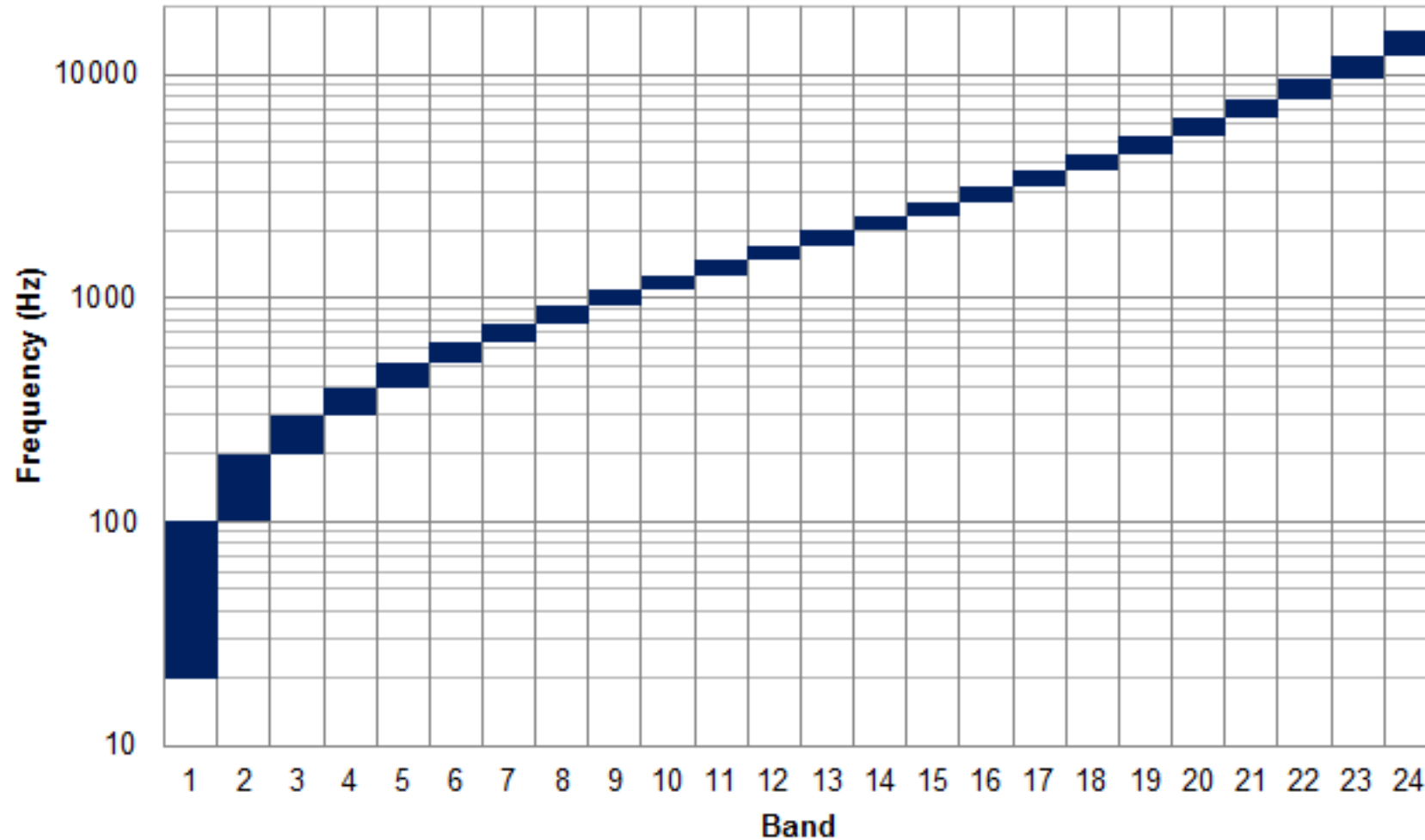
- Psychoacoustic scales

# Perceived loudness: the sone scale

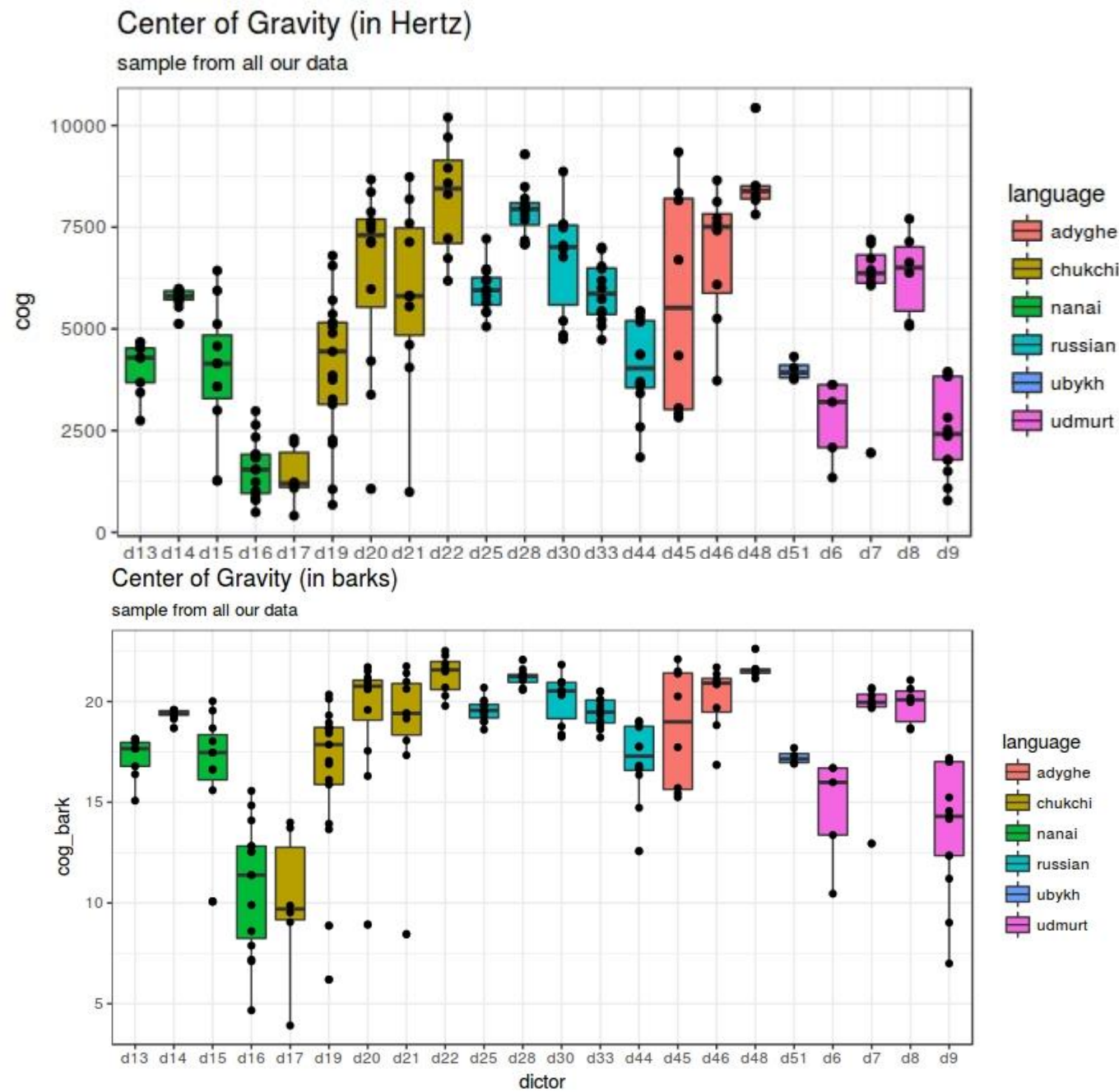




# Perceived frequency: Bark scale



# The spectrum of s in Hertz and Bark



# The main idea

Praat is not ears

# Perception and audition

- Phonetics influences perception
- Words influence perception
- What else?

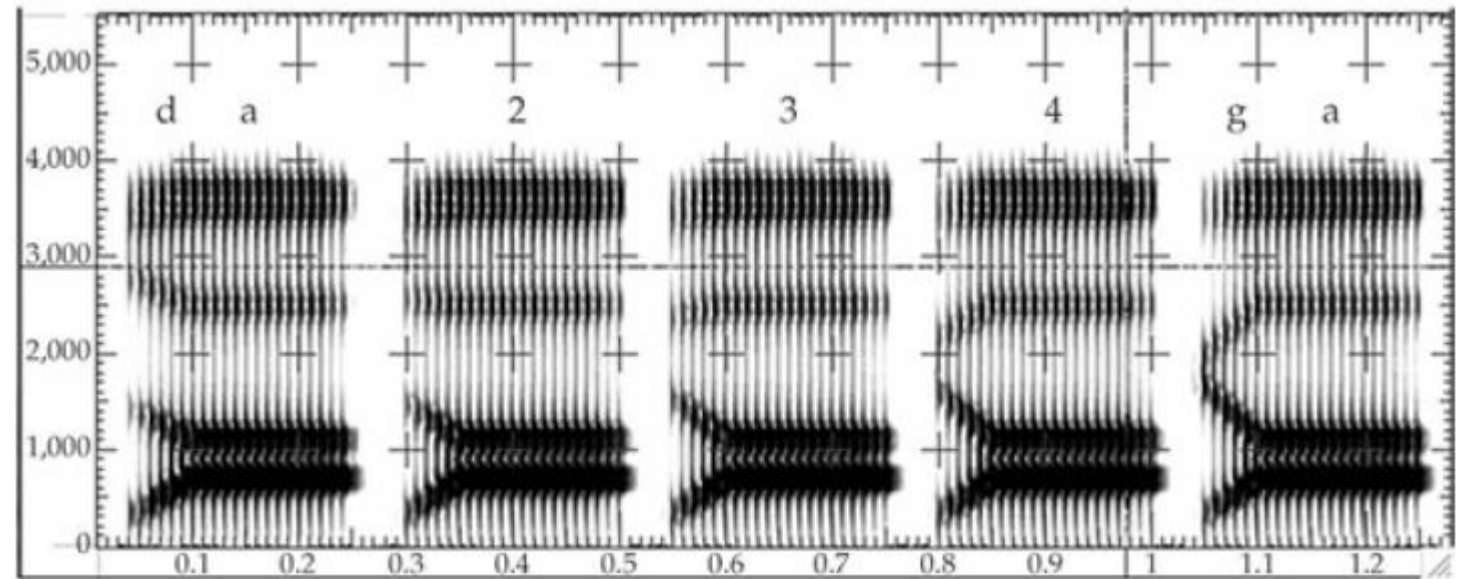
# Perception and phonetic knowledge

- Phonetic knowledge shapes perception?
  - categorical perception
  - phonetic coherence

# Categorical perception

A stimulus continuum: *da* to *ga*

- “Please write down what you hear”
- “Please guess are the who sounds equal or not”

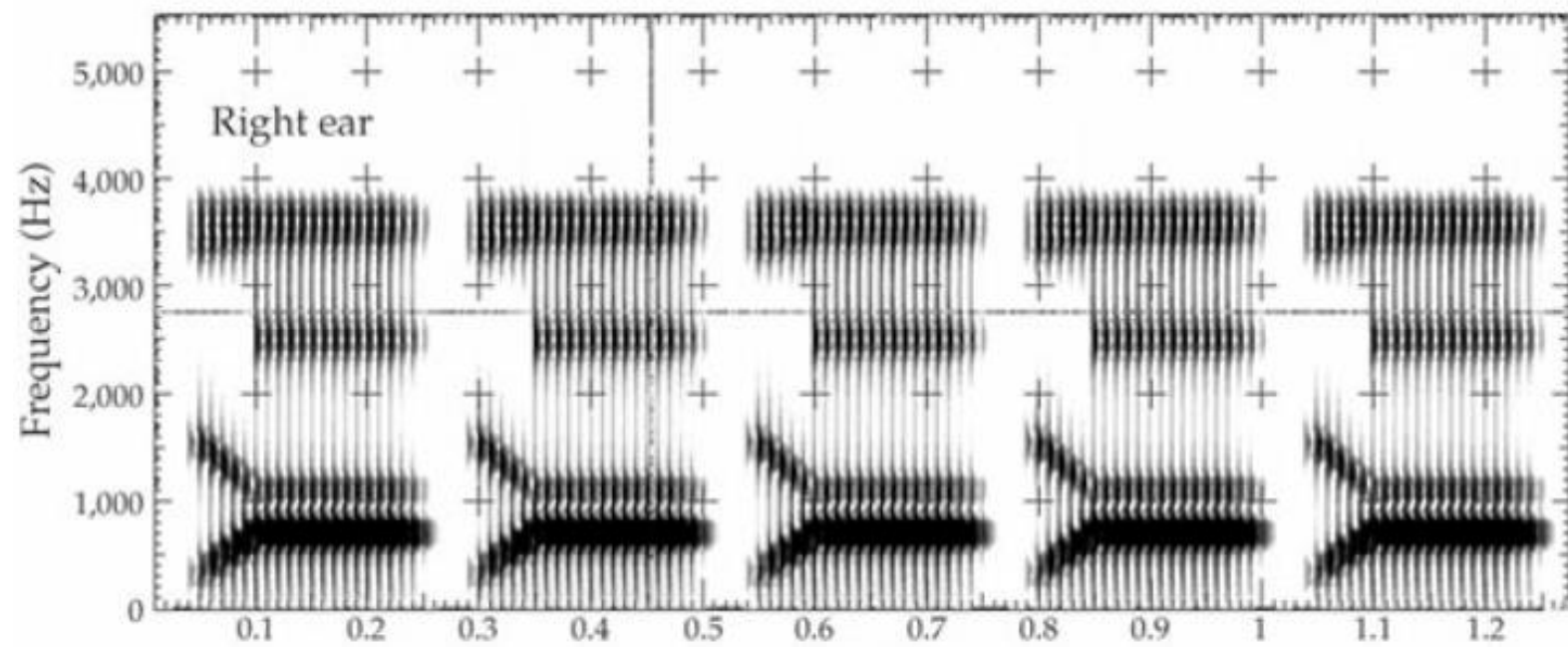
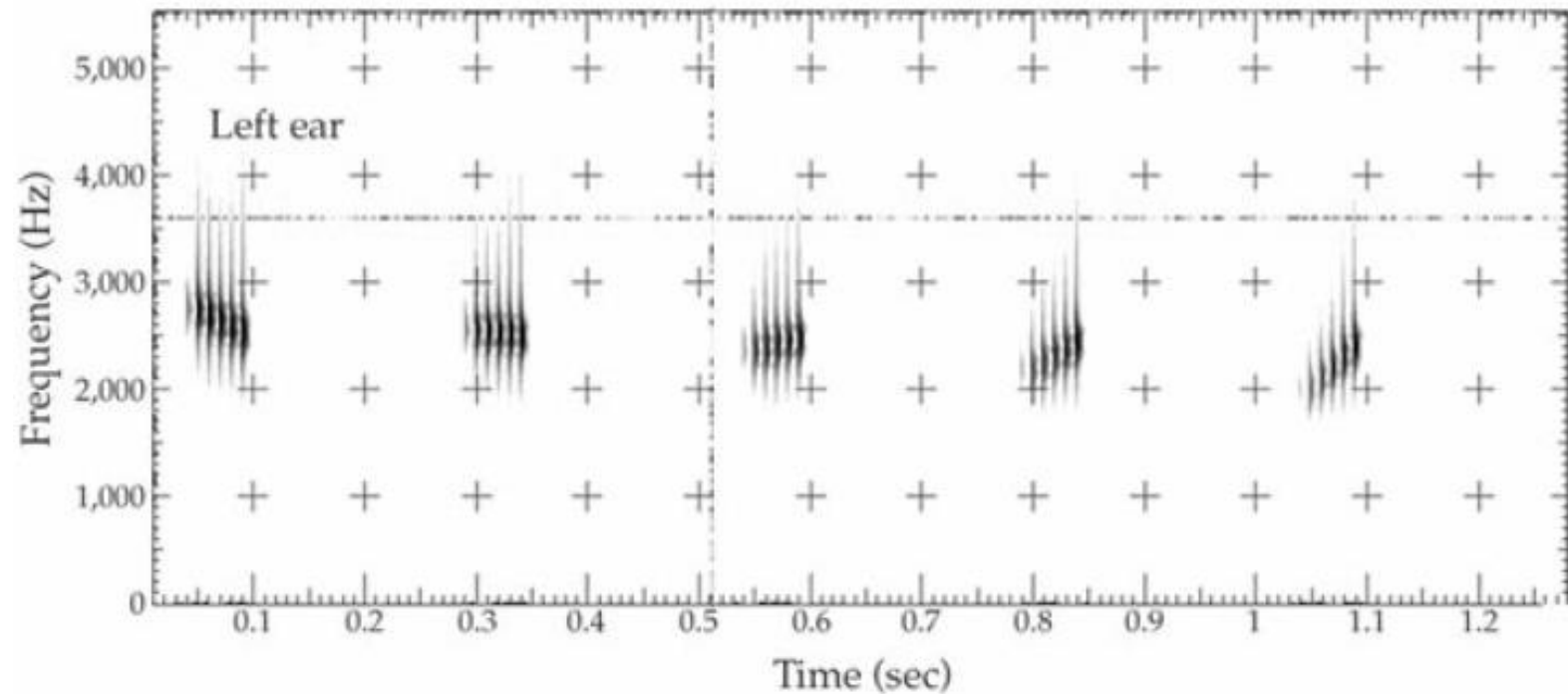


# Categorical perception

<i>Token number</i>	<i>F<sub>2</sub> onset</i>	<i>F<sub>3</sub> onset</i>	<i>Identified as</i>
1	1,480	2,750	"da"
2	1,522	2,562	"da"
3	1,565	2,375	"da"
4	1,607	2,187	"ga"
5	1,650	2,000	"ga"

# Phonetic coherence

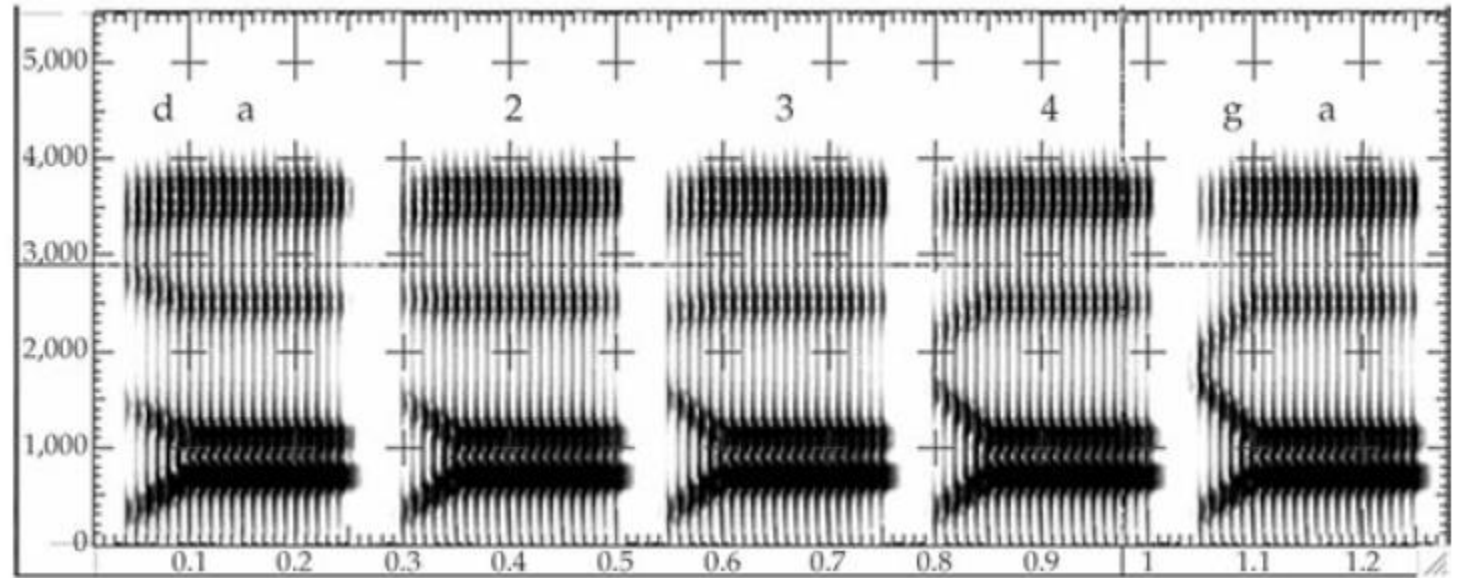
- Leading ear
- Matching channels





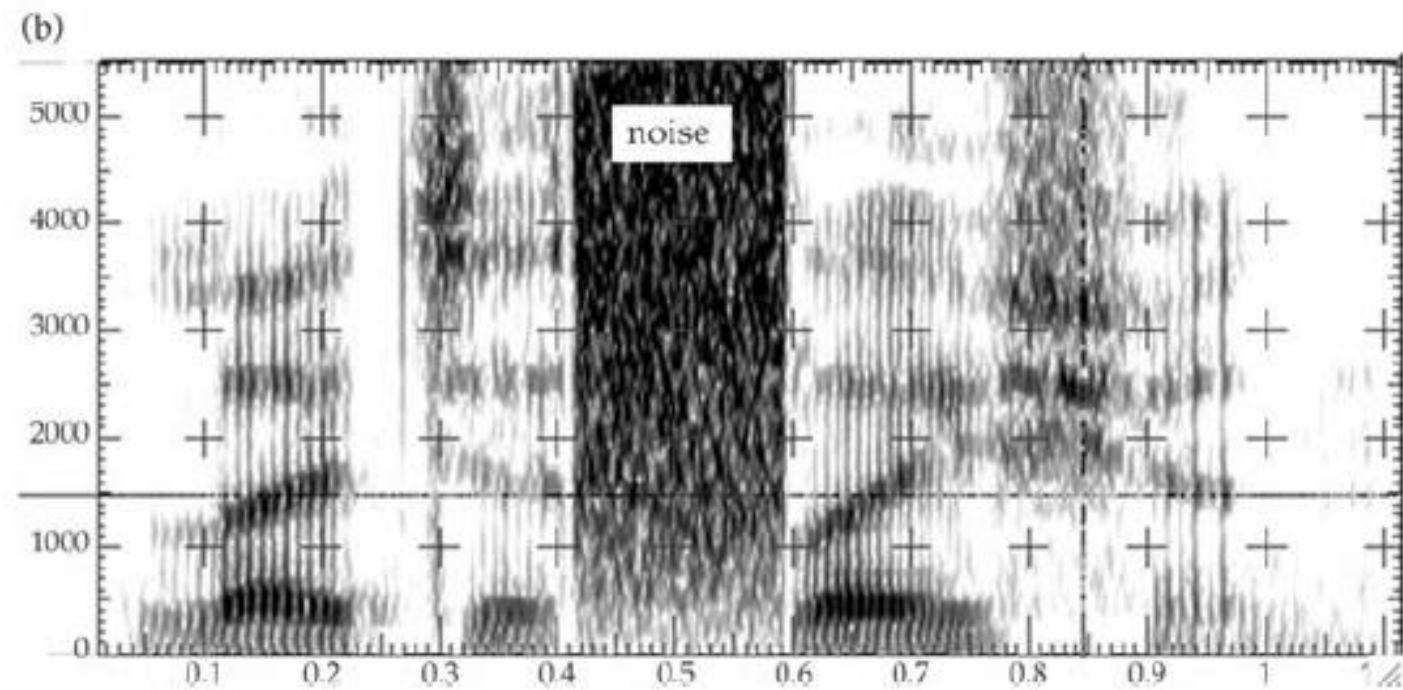
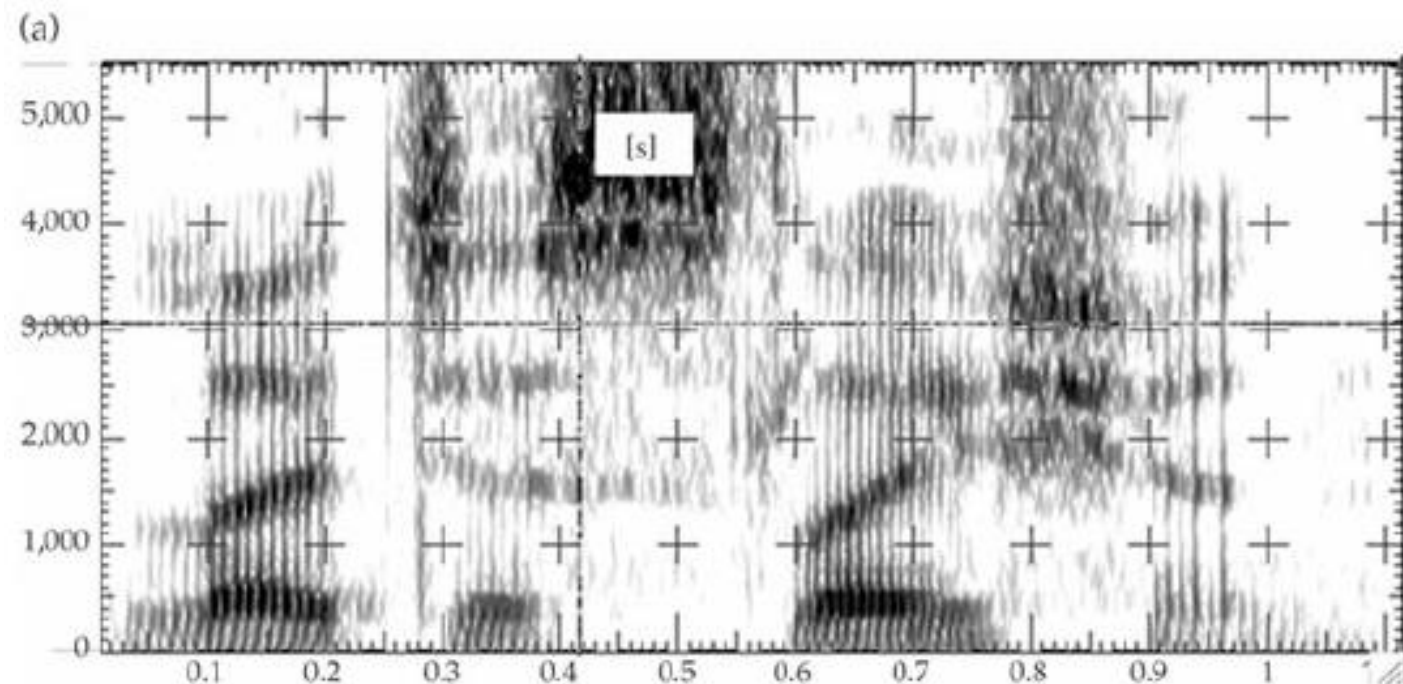
# Perception of sounds vs. that of words

- Ganong effect:  
more dogs!



# Perception of sounds vs. that of words

- “Phoneme restoration”



# Audition and perception

- Our perceptual systems are tuned by linguistic experience
- Children's speech, speech pathology: categories differ

# Multimodal phenomena

- Lips matter? McGurk effect

# Perception and audition

- Phonetics influences perception
  - Categorical perception
  - Non-linear perception
- Words influence perception
- Multimodal perception

# Reading

- Johnson K. Acoustic and Auditory Phonetics. Blackwell Publishing, 2003.
- The handbook of speech perception / edited by David B. Pisoni and Robert E. Remez. Blackwell Publishing, 2005.