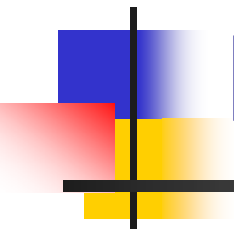


LING-001 Lecture 8: Phonetics

Hilary Prichard

10/4/10

What is phonetics?

- The study of speech sounds
  - From production to perception

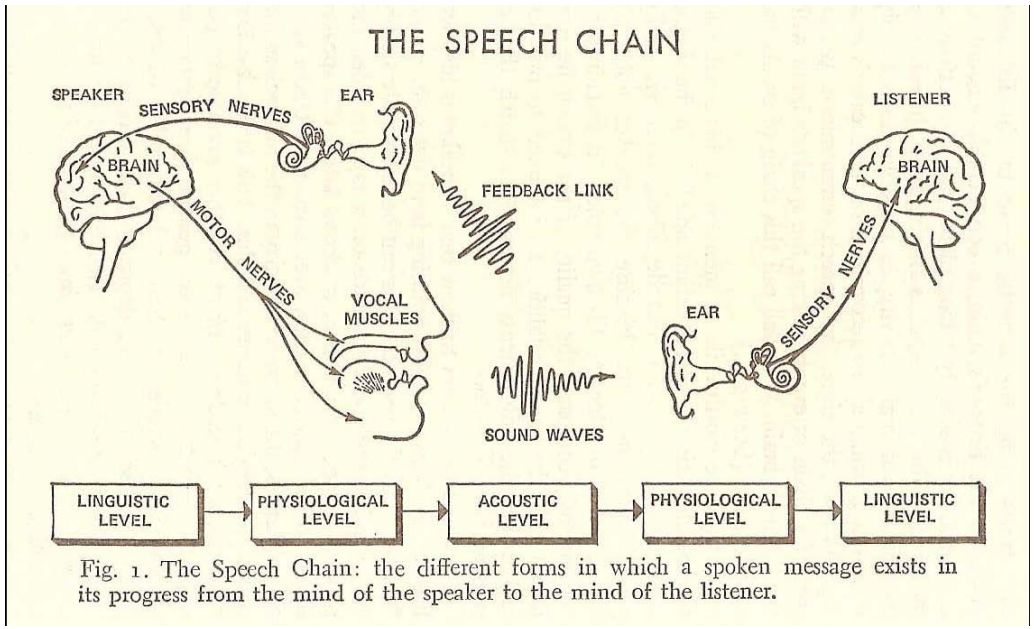
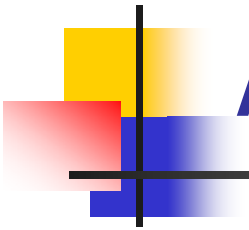


Fig. 1. The Speech Chain: the different forms in which a spoken message exists in its progress from the mind of the speaker to the mind of the listener.

From Denes & Pinson, 1993

Three branches of phonetics

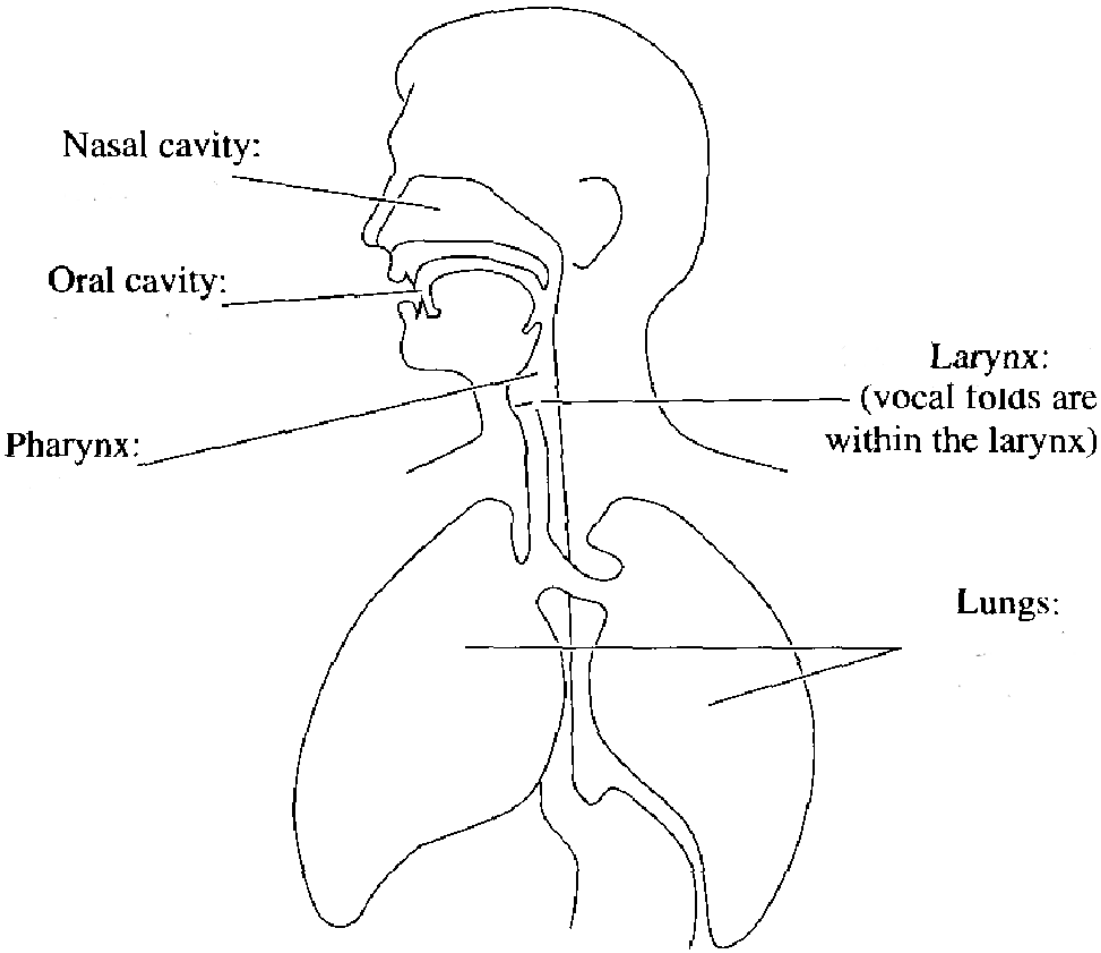
- Articulatory
  - *How speech is produced*
- Acoustic
  - *Acoustic properties of speech*
- Auditory
  - *How speech sounds are received and perceived*



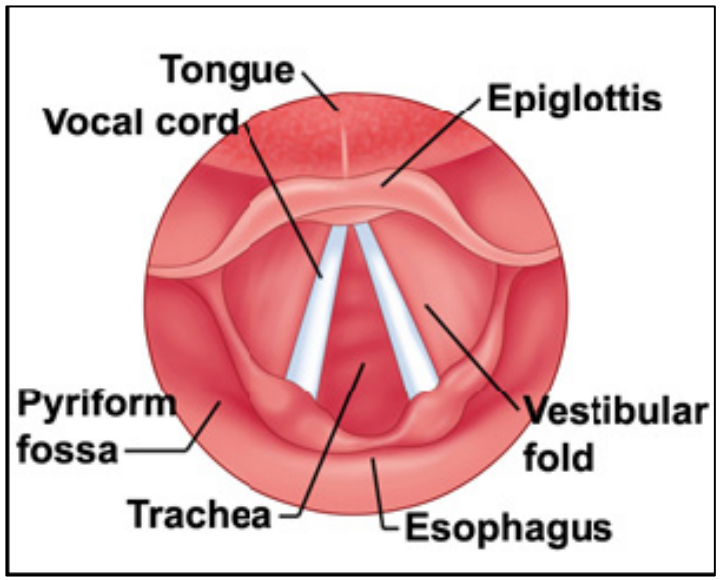
Articulatory Phonetics

- How are speech sounds produced?

The Vocal Tract



The Larynx



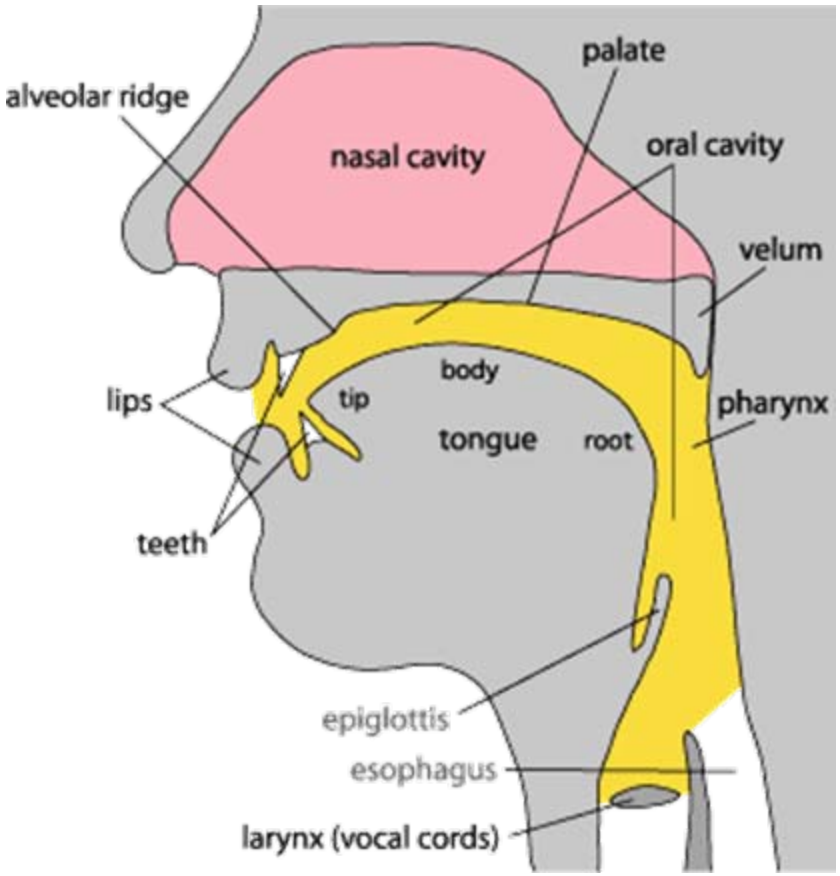
- Contains the vocal folds (or cords)
- Air from the lungs passes through these folds
- When they are closed, the airflow causes them to vibrate

The Vocal Folds in Action

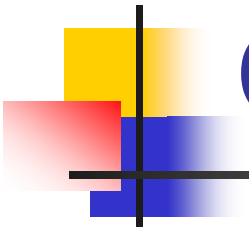
"Inside the Voice"
http://www.youtube.com/watch?v=Z_ZGqn1tZn8&feature=player_embedded

"High Speed Video of the Vocal Folds"
http://www.youtube.com/watch?v=9kHdhbEnhoA&feature=player_embedded

The Articulators



- The parts of the vocal tract which are used to shape the sound



Consonants

- Place of Articulation
  - Which parts of the vocal tract are involved?
- Manner of Articulation
  - What type of closure is created by the articulators?

Place of Articulation

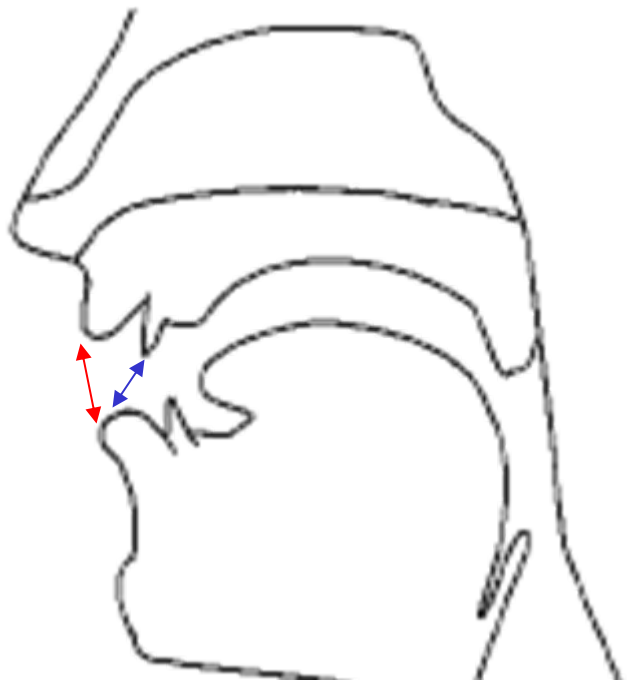
- Bilabial:

  made with both lips

  - [p b m]
- Labiodental:

  made with lower lip and upper teeth

  - [f v]



Place of Articulation

- Dental:

  Tongue & upper front teeth

  - [ð θ]

- Alveolar:

  Tongue & alveolar ridge

  - [t d n s z]

Place of Articulation

- Post-Alveolar: (palato-alveolar)

  Tongue & back of
  the alveolar ridge
  - [ʃ ʒ]
- Palatal:

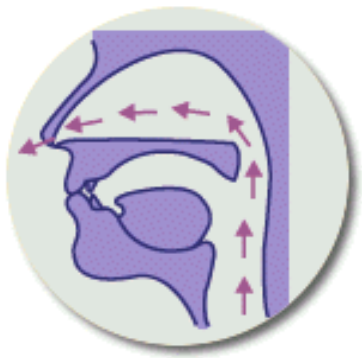
  Tongue & hard palate
  - [j]
- Velar:

  Tongue & soft palate (velum)
  - [k g ŋ]

Manner of Articulation

- **Stop:** (plosive) complete closure, no air escapes through the mouth

  - **Oral Stop**: Velum is raised; air cannot escape through the nose or mouth until released
    - [p b t d g k]



  - **Nasal Stop**: Velum is lowered; air can escape through the nose
    - [m n ŋ]

Manner of Articulation

- **Fricative:** articulators are close, but not touching
  - Creates a turbulent, hissing airflow
    - [f v θ ð s z ʃ ʒ]
- **Approximant:** articulators are close, but create less obstruction than in fricatives
    - [j w r l]

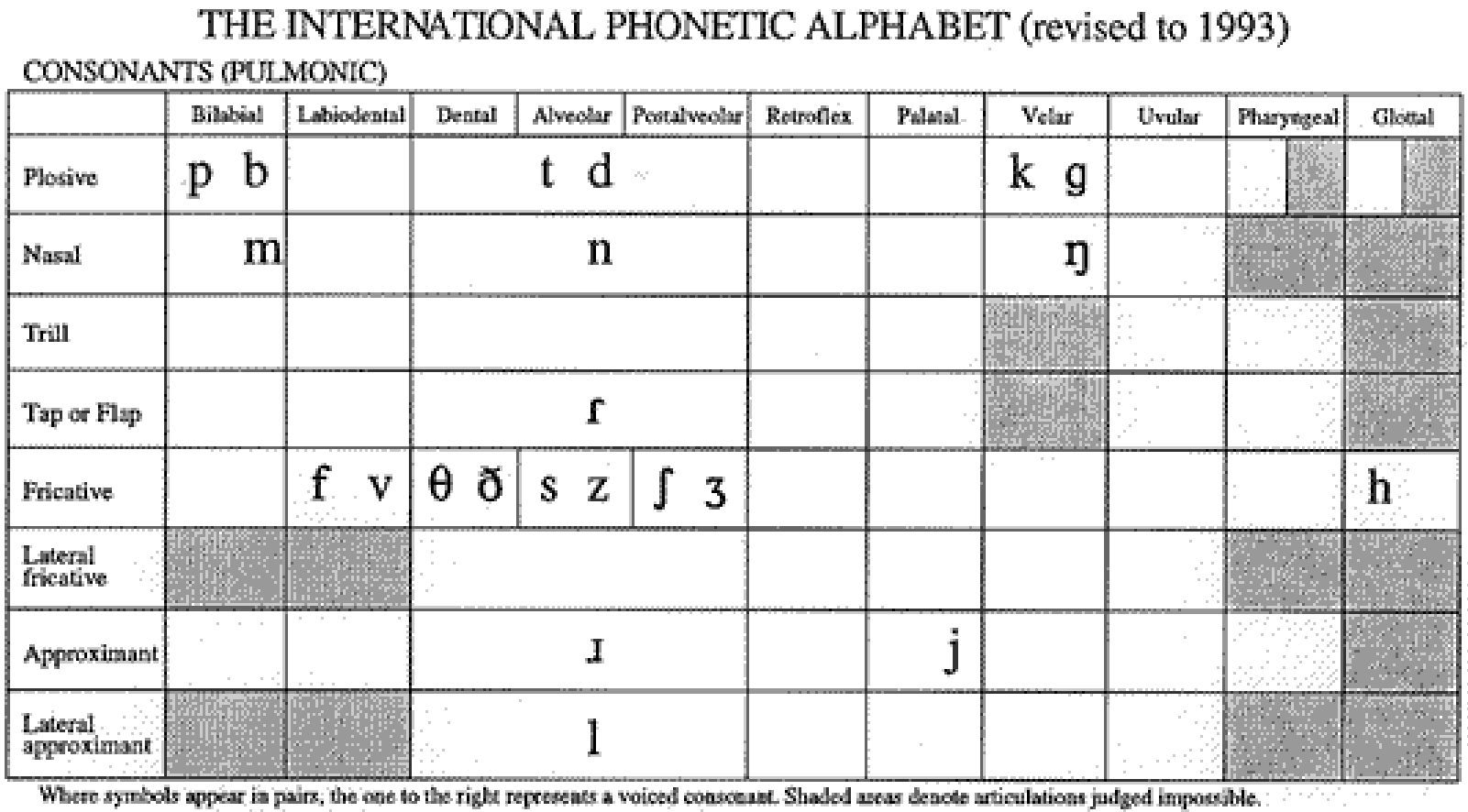
Manner of Articulation

- Special cases to remember:
  - Tap / flap: tongue makes a quick tap against the alveolar ridge
    - [ɾ]
  - Affricate: stop + fricative
    - [ʧ ʤ]

Putting it all together

- Now we can refer to specific consonant sounds by their voicing, place, and manner of articulation
  - [b] is the voiced bilabial stop
  - [f] is the voiceless labiodental fricative
  - [j] is the voiced palatal approximant
  - [k] is the voiceless velar stop

IPA recall



THE INTERNATIONAL PHONETIC ALPHABET (revised to 1993)

CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d				k g			
Nasal	m			n				ŋ			
Trill				r							
Tap or Flap				ɾ							
Fricative		f v	θ ð	s z	ʃ ʒ						h
Lateral fricative											
Approximant				ɹ			j				
Lateral approximant				l							

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

Vowels

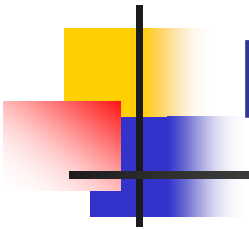
- Three dimensions
  - Position of the tongue:
    - Front vs. Back
    - High vs. Low (Close vs. Open)
  - Position of the lips:
    - Rounded vs. Unrounded

Vowels

- So according to this system…
  - [i] is the high front unrounded vowel
  - [u] is the high back rounded vowel
  - [a] is the low front unrounded vowel
  - Etc.

X-ray showing articulation

- Ken Stevens x-ray film
- http://www.youtube.com/watch?v=DcNMCB-Gsn8&feature=player_embedded

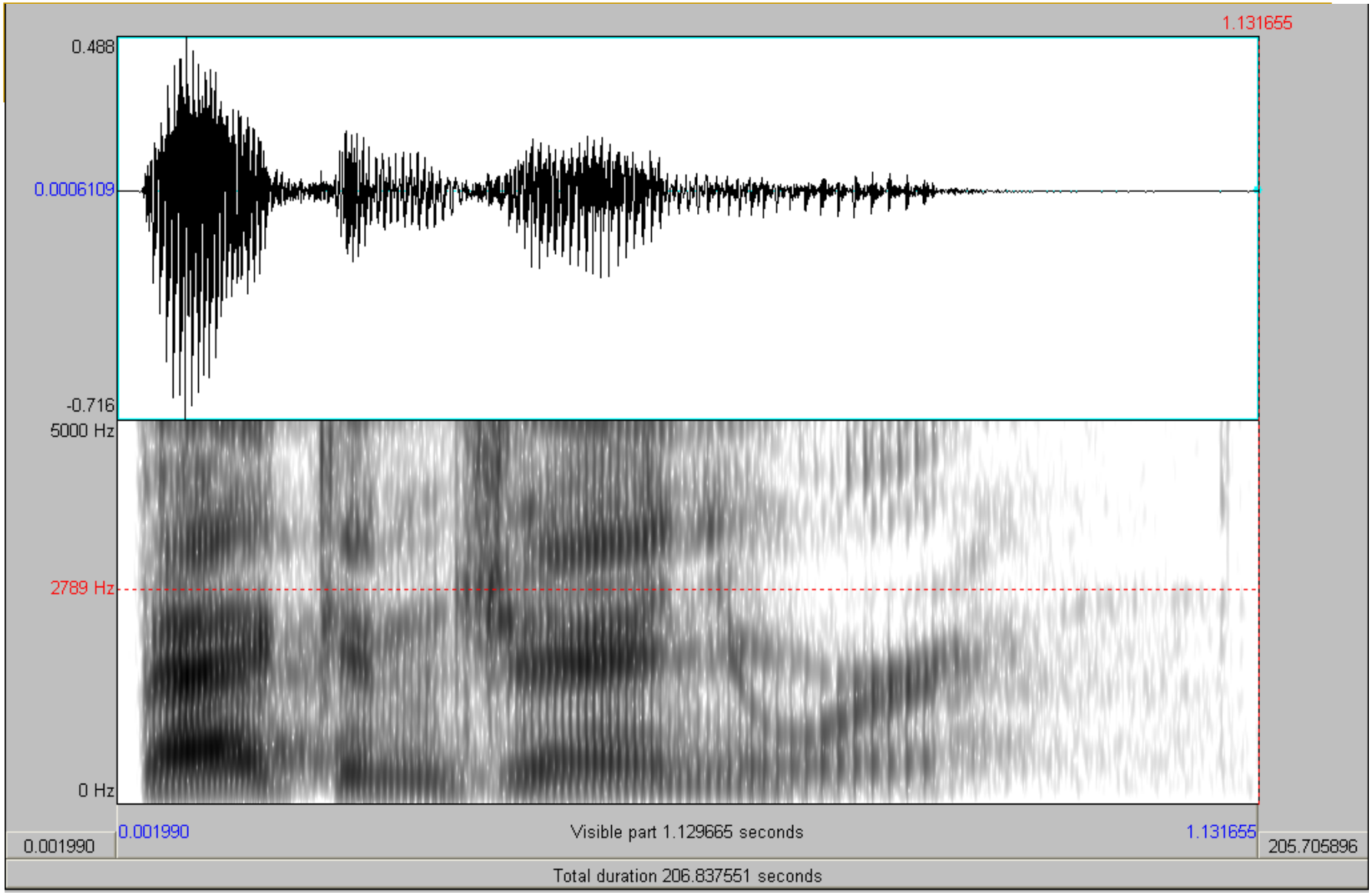


Brief intro to acoustic phonetics

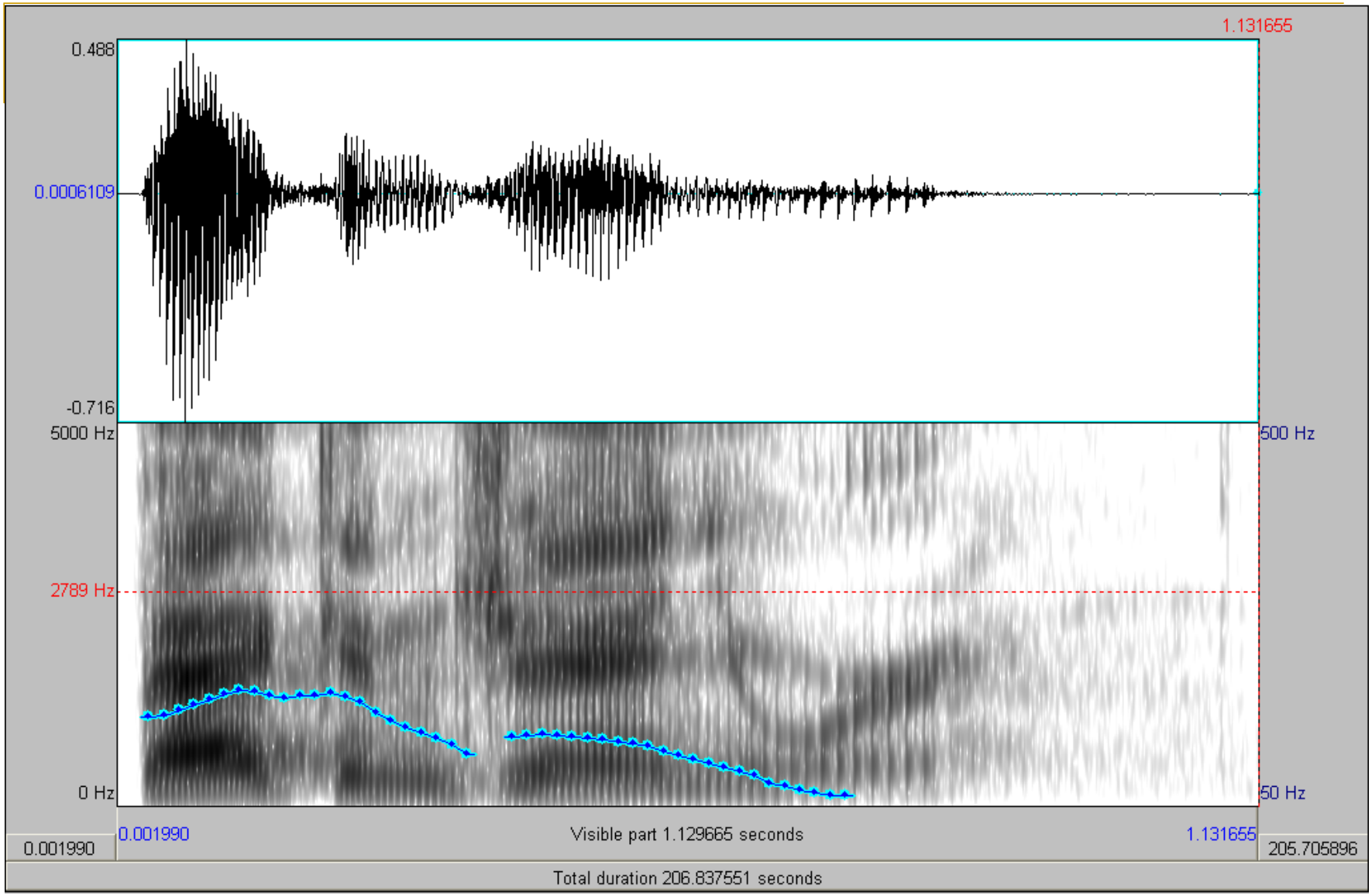
- Articulatory phonetics looks at how sounds are produced.
- Acoustic phonetics looks at the acoustic properties of those sounds.
  - How?

Acoustic Phonetics

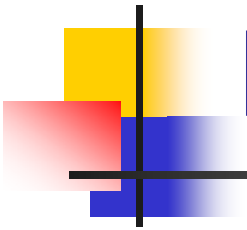
- Sounds travel in waves
  - Waveforms are a visual representation of those waves
- Vowels are made up of multiple pitches, or *overtones*, which give each vowel its unique quality
  - Spectrograms allow us to see the frequencies of a vowel's overtones, also called *formants*



"Back in January"



The same spectrogram, with pitch tracking.



Reminders

- Homework 3 is due Wednesday
- Professor Liberman will be back on Wednesday to give the phonology lecture