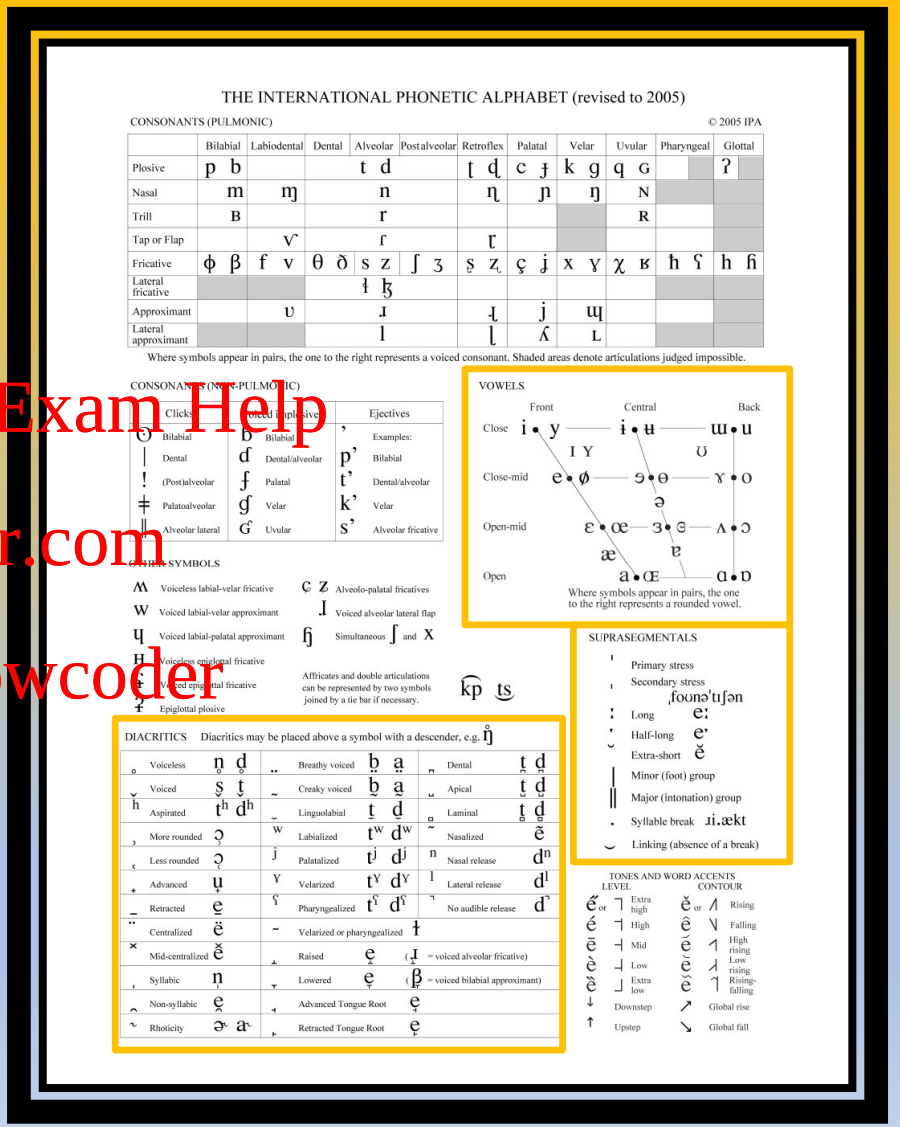
LINB09
LECTURE 6

Instructor: Joanna Chociej



THE INTERNATIONAL PHONETIC ALPHABET (revised to 2005)

CONSONANTS (PULMONIC) © 2005 IPA

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

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

CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
ʘ Bilabial	ɓ Bilabial	’ Examples:
ǀ Dental	ɗ Dental/alveolar	pʼ Bilabial
ǃ (Post)alveolar	ʄ Palatal	tʼ Dental/alveolar
ǂ Palatoalveolar	ɠ Velar	kʼ Velar
ǁ Alveolar lateral	ʛ Uvular	sʼ Alveolar fricative

OTHER SYMBOLS

ʍ Voiceless labial-velar fricative	ɕ ʑ Alveolo-palatal fricatives
w Voiced labial-velar approximant	ɺ Voiced alveolar lateral flap
ɥ Voiced labial-palatal approximant	ʢ Simultaneous ʃ and x
ʜ Voiceless epiglottal fricative	
ʡ Voiced epiglottal fricative	Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary.
ʡ Epiglottal plosive	k͡p t͡s

DIACRITICS Diacritics may be placed above a symbol with a descender, e.g. ŋ̊

◌̥	Voiceless	n̥ d̥	◌̤	Breathy voiced	b̤ a̤	◌̪	Dental	t̪ d̪
◌̬	Voiced	s̬ t̬	◌̰	Creaky voiced	b̰ a̰	◌̺	Apical	t̺ d̺
◌ʰ	Aspirated	tʰ dʰ	◌̼	Linguolabial	t̼ d̼	◌̻	Laminal	t̻ d̻
◌̹	More rounded	ɔ̹	◌ʷ	Labialized	tʷ dʷ	◌̃	Nasalized	ẽ
◌̜	Less rounded	ɔ̜	◌ʲ	Palatalized	tʲ dʲ	◌ⁿ	Nasal release	dⁿ
◌̟	Advanced	u̟	◌ˠ	Velarized	tˠ dˠ	◌ˡ	Lateral release	dˡ
◌̠	Retracted	e̠	◌ˤ	Pharyngealized	tˤ dˤ	◌̚	No audible release	d̚
◌̈	Centralized	ë	◌̴	Velarized or pharyngealized	ɫ			
◌̽	Mid-centralized	e̽	◌̝	Raised	e̝	(ɹ̝ = voiced alveolar fricative)		
◌̩	Syllabic	n̩	◌̞	Lowered	e̞	(β̞ = voiced bilabial approximant)		
◌̯	Non-syllabic	e̯	◌̘	Advanced Tongue Root	e̘			
◌˞	Rhoticity	ɚ a˞	◌̙	Retracted Tongue Root	e̙			

VOWELS

SUPRASEGMENTALS

ˈ	Primary stress
ˌ	Secondary stress ˌfoʊnəˈtɪʃən
ː	Long eː
ˑ	Half-long eˑ
◌̆	Extra-short ĕ
|	Minor (foot) group
‖	Major (intonation) group
.	Syllable break ɹi.ækt
‿	Linking (absence of a break)

TONES AND WORD ACCENTS

LEVEL		CONTOUR	
é͡ or ˥	Extra high	ě͡ or ˩˥	Rising
é ˦	High	ê ˥˩	Falling
ē ˧	Mid	e͡ ˧˥	High rising
è ˨	Low	e͡ ˩˧	Low rising
ȅ ˩	Extra low	e͡ ˥˧˩	Rising-falling
↓	Downstep	↗	Global rise
↑	Upstep	↘	Global fall

Lecture 6 Part 1

Vowel articulation & the IPA cardinal vowel chart

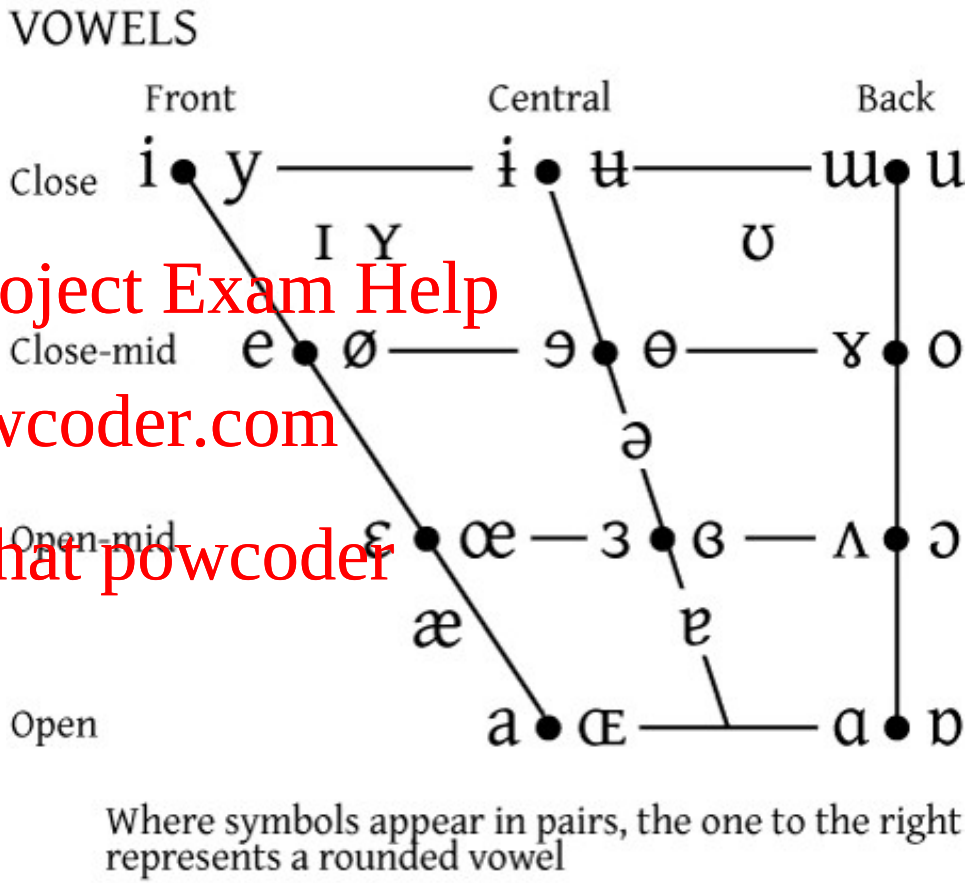
Review……

- Vowels symbols we learned about in Lecture 3 →
  - This way of organizing matches the way these sounds pattern in English.

	front	central	back
high	i ɪ		u ʊ
mid	ej ɛ	ə ʌ	ow ɔj ɔ
low	æ	aj aw	ɑ (ɒ)

Preview

The official IPA chart has a slightly different way of organizing the symbols for vowel sounds.



Articulatory vs Acoustic properties of vowels

- Articulatory descriptions of vowels use the parameters of:
  - **Height; Backness; Rounding**

  - These descriptions are meant to correlate with the highest point of the tongue in the mouth. However, they are based on the intuitions of traditional phoneticians who did not have access to x-ray technology or other methods of accurately investigating tongue placement.

- Acoustic descriptions of vowels are based on the frequencies of the **1st**, **2nd** and **3rd** formants.

Articulatory vs Acoustic properties of vowels

- The illustrations show the highest point of the tongue in American English vowels.
- Notice that the relative position of the vowels does not actually match the traditional vowel descriptions.

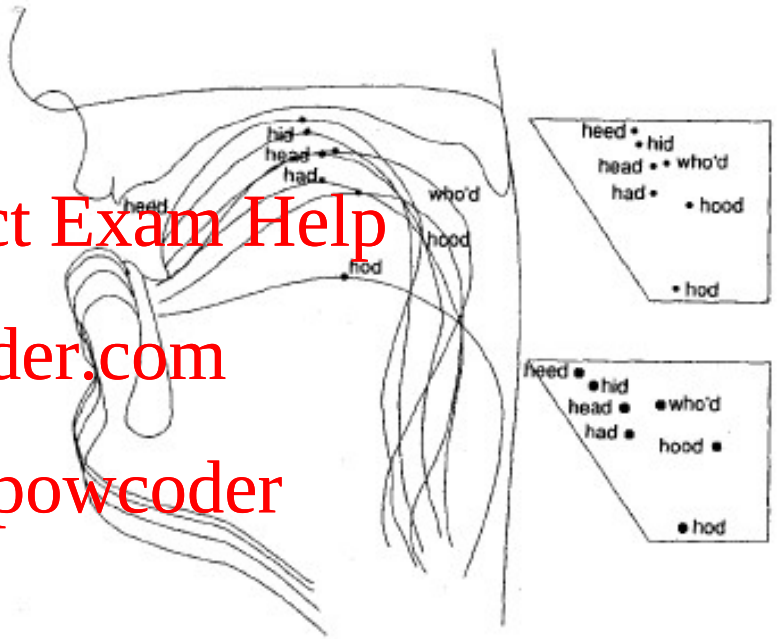


Figure 11.8 The position of the highest point of the tongue in General American English vowels. The lip positions are those for the vowels in figure 11.1. The lower quadrilateral on the right has the horizontal scale expanded.

From: Ladefoged (2001) *Vowels and Consonants*, pages 115-116

Articulatory and Acoustic properties of vowels

- Traditional descriptions more accurately reflect acoustic properties of vowels than articulatory properties of vowels.
  - F1 and F2 for the same set of vowels are plotted with F2 on the horizontal axis going from right to left, and F1 on the vertical axis ascending from the top of the chart to the bottom.
  - The resulting pattern closely resembles the traditional vowel quadrilateral.

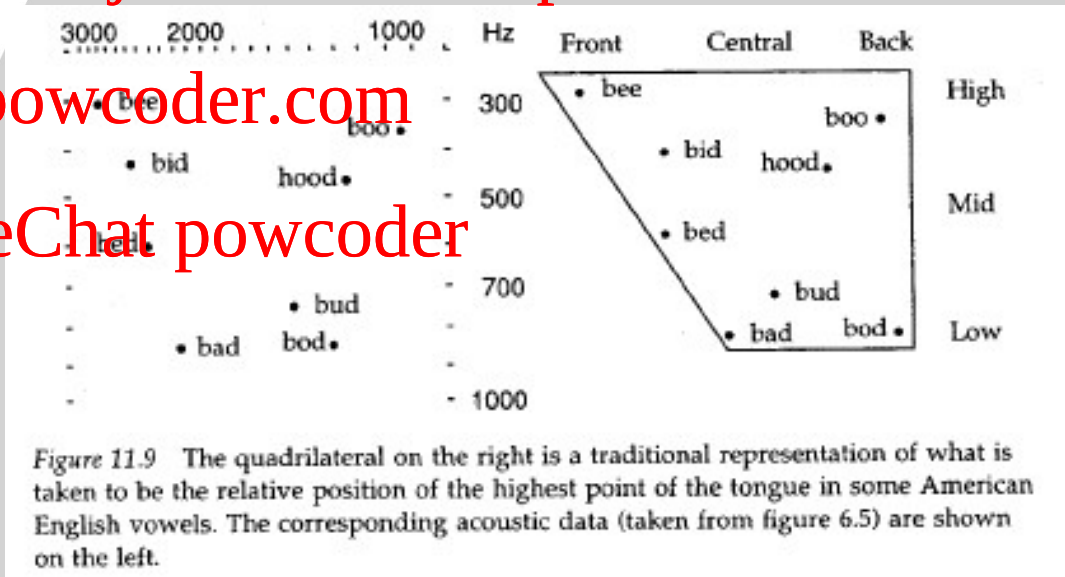


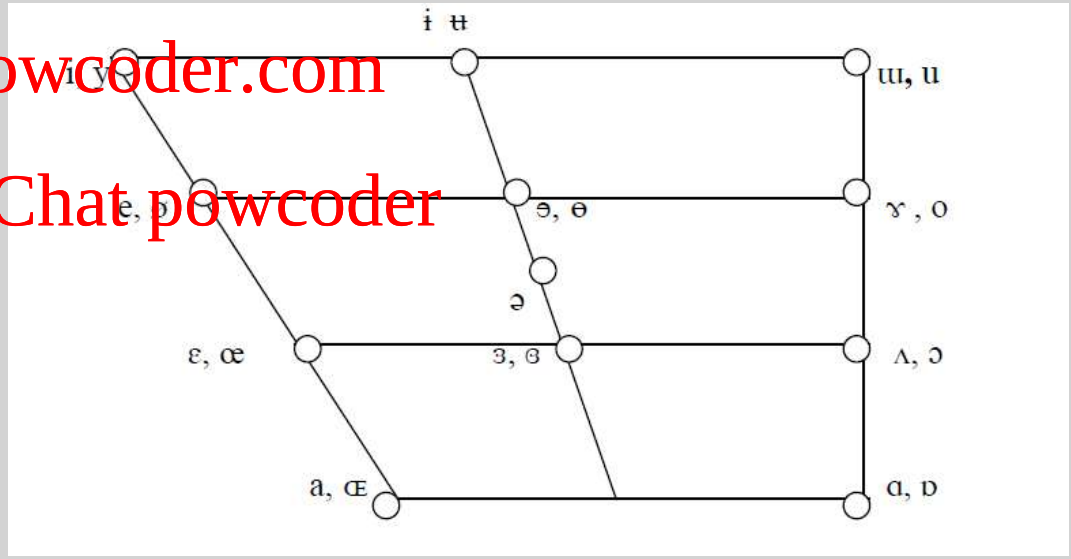
Figure 11.9 The quadrilateral on the right is a traditional representation of what is taken to be the relative position of the highest point of the tongue in some American English vowels. The corresponding acoustic data (taken from figure 6.5) are shown on the left.

From: Ladefoged (2001) *Vowels and Consonants*, pages 115-116

Cardinal vowels
& the IPA vowel quadrilateral

Where symbols appear in pairs,
the one on the right represents a rounded vowel.

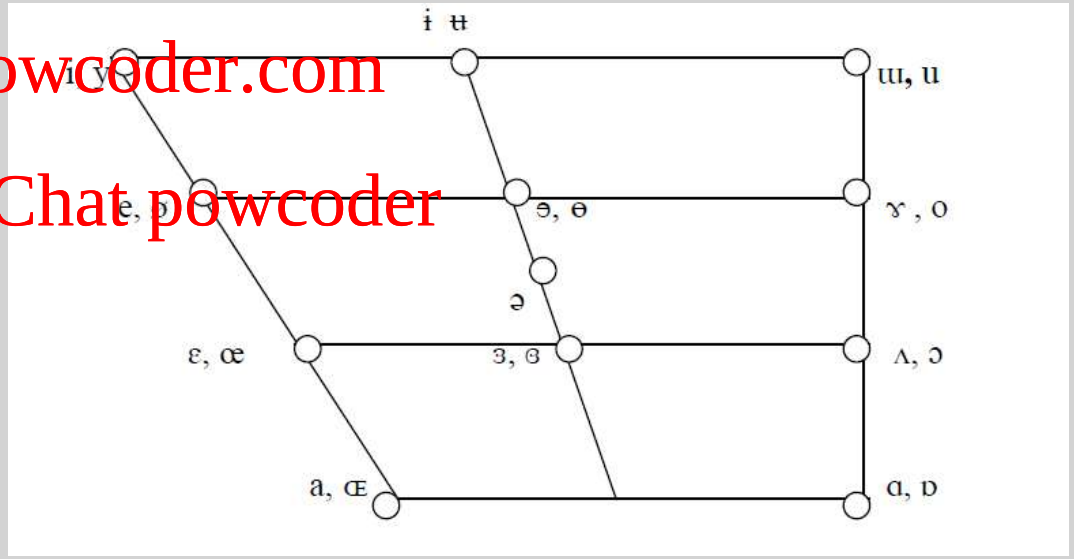
- The cardinal vowel system was designed to provide reference points in the description of vowels.
- Vowels in particular languages can be described in reference to the cardinal vowels.



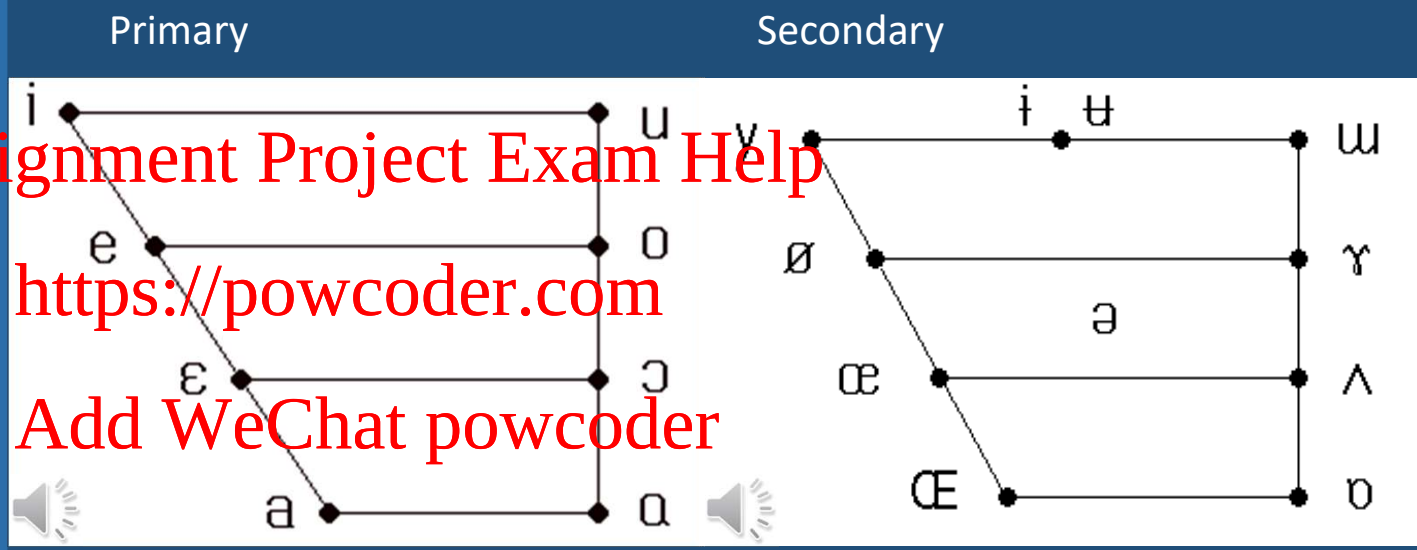
Cardinal vowels & the IPA vowel quadrilateral

Where symbols appear in pairs,
the one on the right represents a rounded vowel.

- In addition to the vowels produced at the 4 extreme corners of the vowel space, the vowel quadrilateral is further divided with a vertical line down the centre and 2 horizontal lines equidistant from one another.
- Each of the horizontal lines have cardinal vowels at the front and back extremes. The vowel schwa is in the very centre of the vowel space.

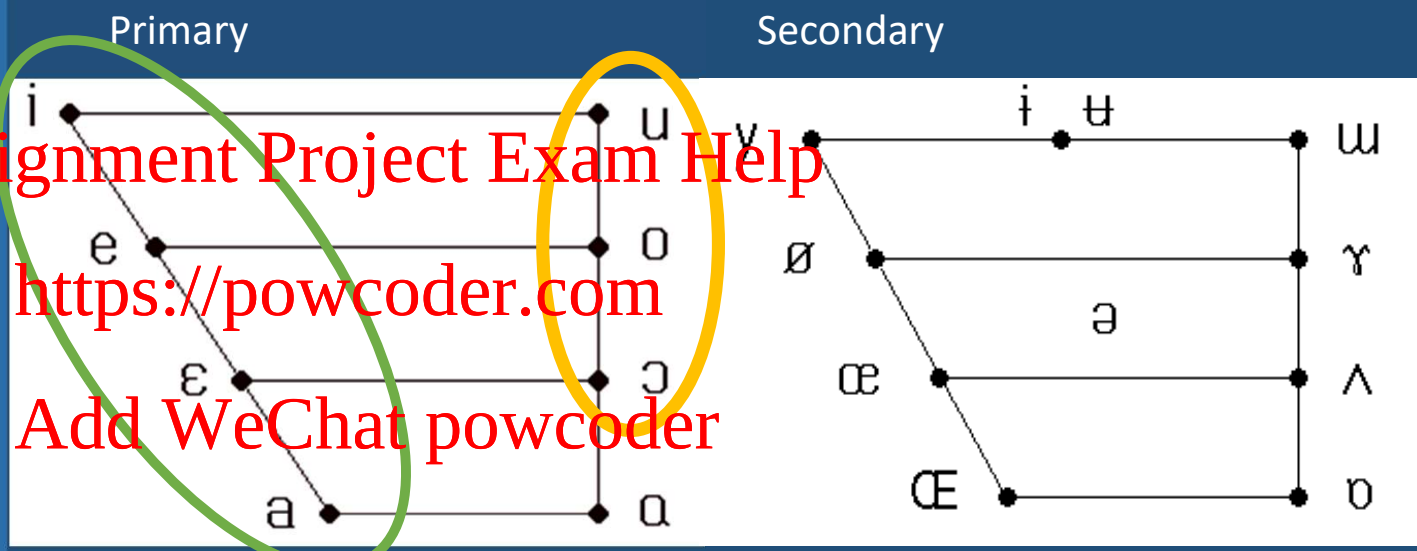


Cardinal vowels can also be grouped into primary and secondary sets of vowels.



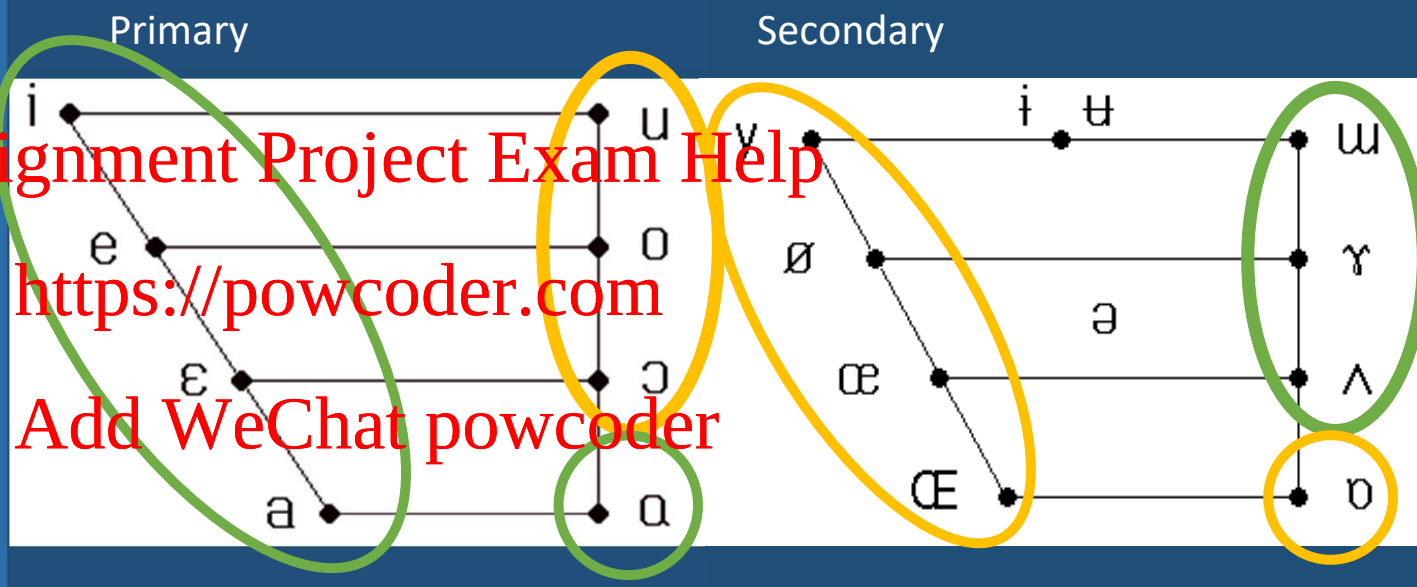
Primary vowels are more common than secondary vowels across the world's languages.

Primary front vowels are all unrounded; Most primary back vowels are rounded.



To go from a primary to its corresponding secondary vowel, you just have to change the rounding of your lips.

Green=unrounded
Yellow=rounded



Rounding

- Lip rounding for back vowels **tends** to be made by protruding the lips whereas lip rounding on front vowels **tends** to be made by narrowing the lips without pushing them forward.

- Adding lip rounding to front vowels lowers both formants, but particularly F2.

- Because a high F2 is characteristic of front vowels in general, the effect of rounding gives the impression that the high front rounded [y] is somewhere between [i] and [u].

Cardinal vowels

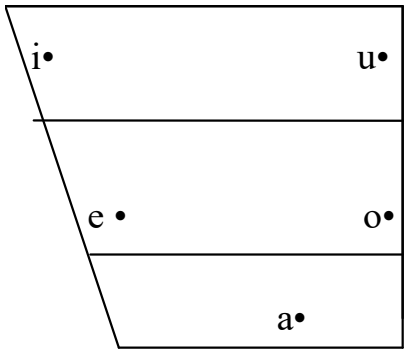
Average frequencies of F1 and F2 for the cardinal vowels (in Hz):

Primary			Secondary		
	F1	*F2*		*F1*	*F2*
i	240	2400	y	235	2100
e	390	2300	ø	370	1900
ɛ	610	1900	œ	585	1710
a	850	1610	ɶ	820	1530
ɑ	750	940	ɒ	700	760
ɔ	500	700	ʌ	600	1170
o	360	640	ɤ	460	1310
u	250	595	ɯ	300	1390

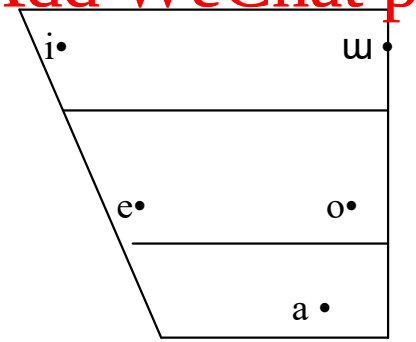
Vowel systems

- Vowel systems of particular languages are generally transcribed by using the cardinal vowel symbol that is closest to each vowel in a language (and that matches the rounding feature)
  - (…and given the choice, often the symbol that is easiest to type on a standard keyboard is preferred)

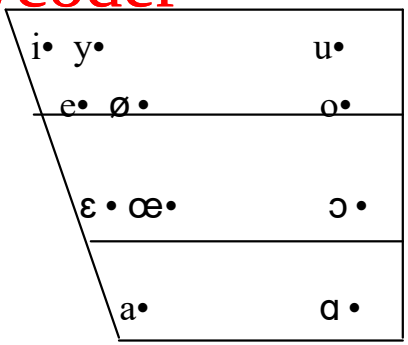
Spanish:



Japanese:



Danish:



E.g., the Spanish /i/ is lower and slightly more back than the cardinal vowel [i].

Vowel systems

- Note that, even when the vowel systems of two languages are the same, their average articulation may be slightly different.

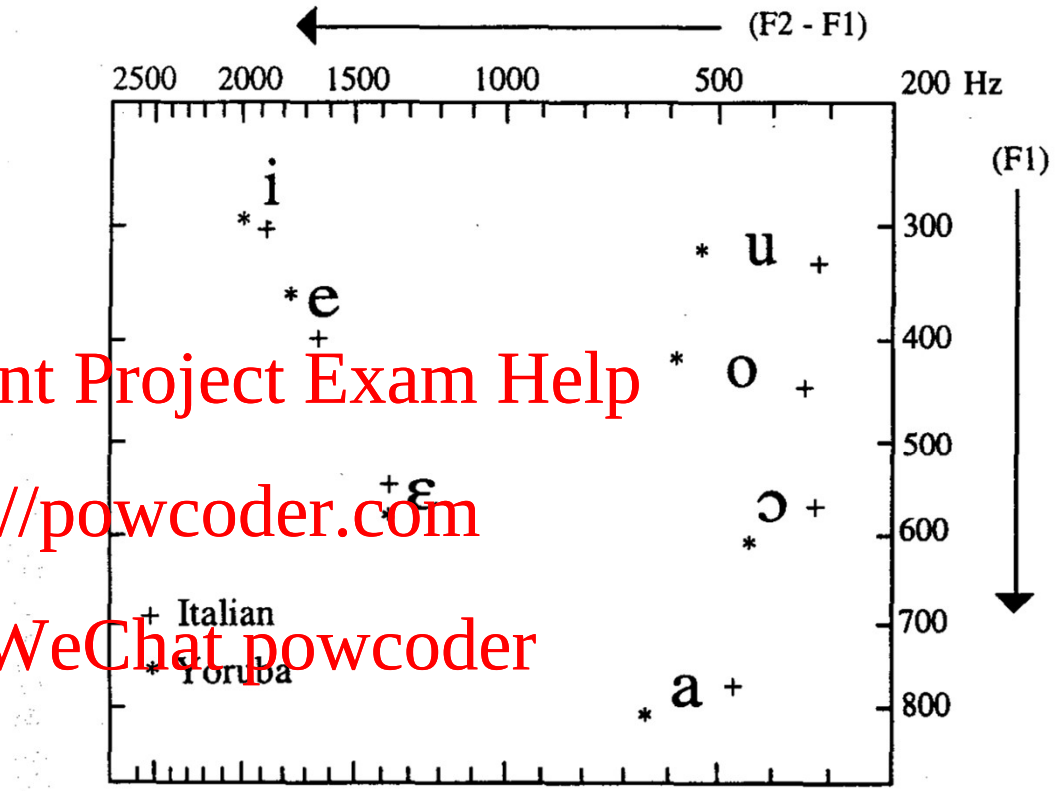


Figure 9.13 Mean formant frequencies of the vowels of Yoruba and Italian (based on data in Disner 1983).

From: Ladefoged & Maddieson 1996

Vowel systems

- Language specific transcription traditions also develop and differ from the cardinal vowel usage.
  - This is particularly true for phonology, where phonetic accuracy may not be the goal.
  - Historically, people were constrained by what they could type on a typewriter.
  - In phonology, using a particular symbol might make sense from the point of view of how vowels pattern in the language.

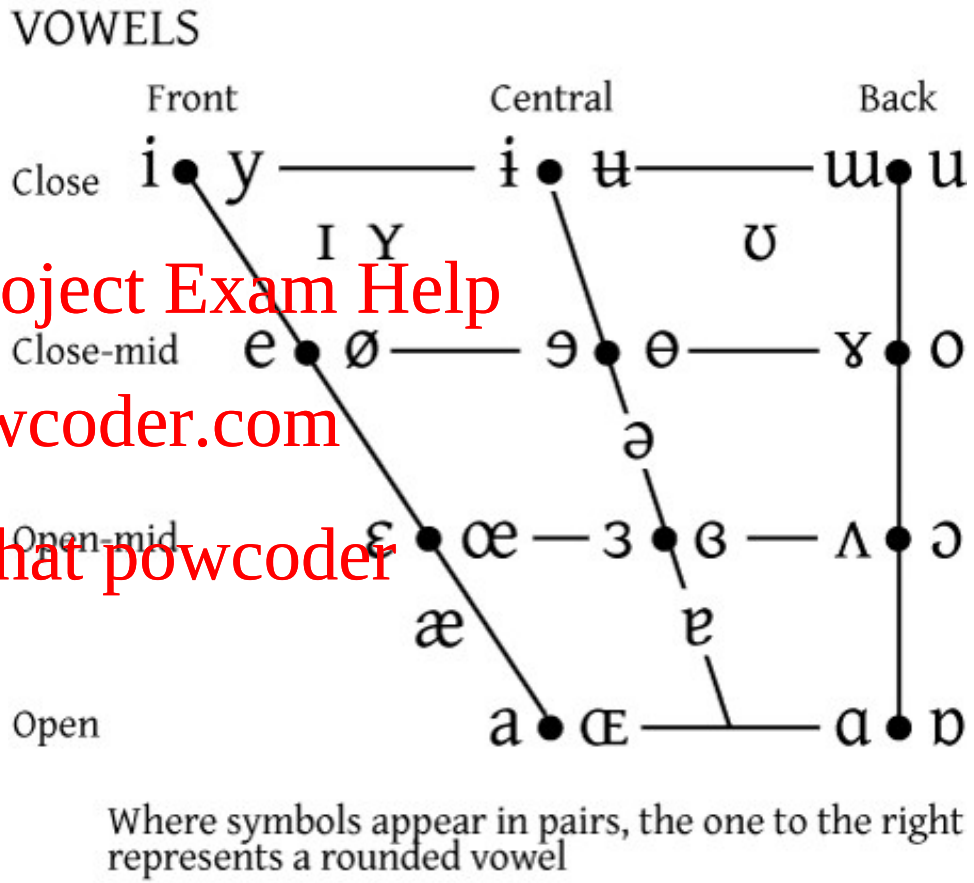
Additional Vowel Symbols

- Additional symbols are needed for some languages.
  - If a language has five, unrounded front vowels there will not be enough cardinal vowel symbols to represent every vowel in the language.
- The following additional symbols are needed for languages with larger vowel inventories:
  - [ɪ] – between [i] and [e]
  - [ʏ] – between [y] and [ø]
  - [ʊ] – between [u] and [o]
  - [æ] – between [ɛ] and [a]
  - [ɐ] – higher low central unrounded
- In English, for example, the low front vowel is transcribed with [æ] and not with the low, front cardinal vowel symbol [a], since there can be said to be 3 distinct low unrounded vowels.

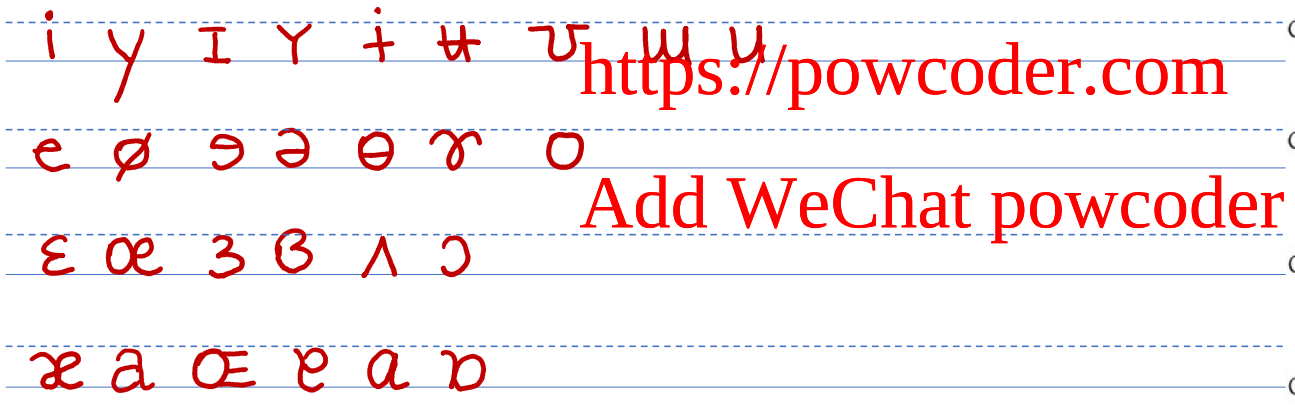
Summary

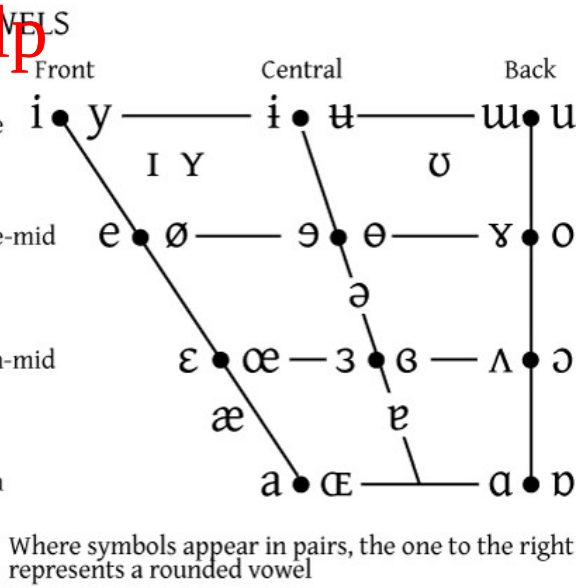
Full IPA vowel quadrilateral

Symbols used to transcribe vowel sounds in the world's languages →



Handwriting IPA symbols





Where symbols appear in pairs, the one to the right represents a rounded vowel

Lecture 6 Part 2

Vowel diacritics & additional vowel qualities

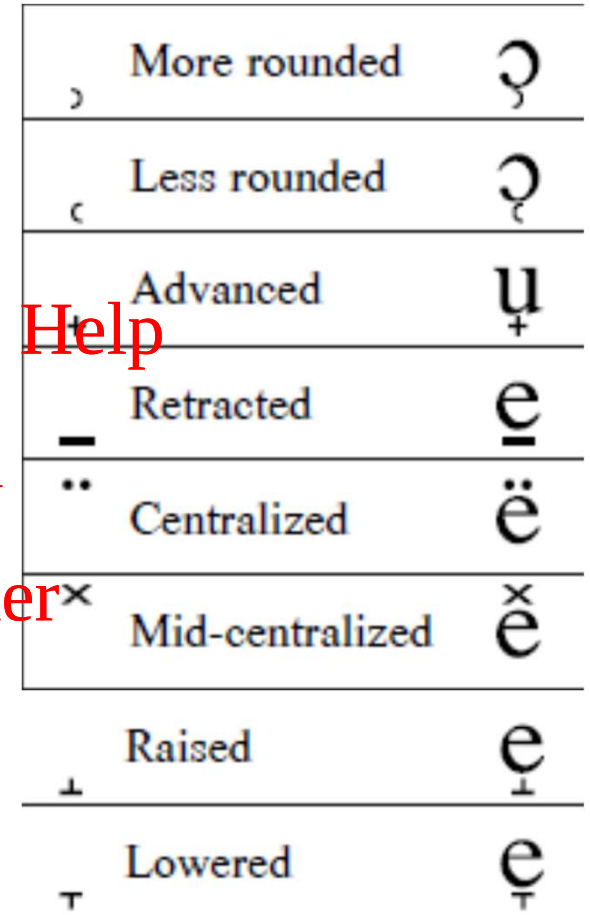
Roadmap

- Specifying height, backness, and rounding beyond what's possible with regular IPA vowel symbols
- Nasalization
- Rhotacization
- Length
- Expansion
  - Tense & Lax distinction

Vowel Diacritics for Height, Backness, and Rounding

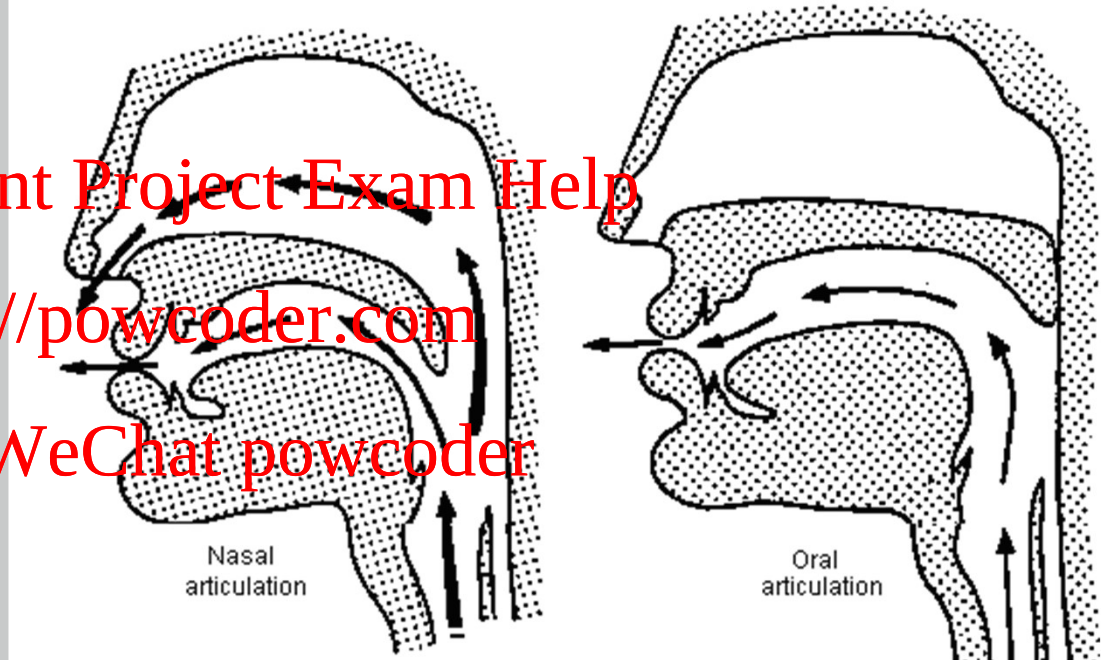
Sometimes additional precision is needed in a transcription that cannot be conveyed using symbols alone.

- E.g. If we want to convey detailed differences between languages, dialects, speakers, etc.
- In these cases, additional diacritics can be placed under the vowel symbol.



Nasalization

- Nasal vowels are produced with a lowered velum and air passing out through both the mouth and the nose.
  - English vowels are nasalized allophonically when they are adjacent to nasal consonants.



Nasalization

- Some languages use nasalization of vowels contrastively.
- Nasalization is indicated with a tilde above the vowel symbol.

  e.g. French:

  [sɛ] *sait* 'knows'

  [sɛ̃] *saint* 'saint'

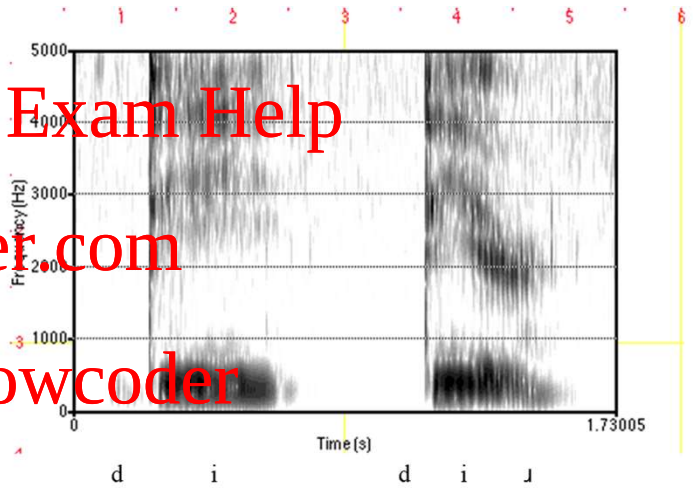
FRENCH

ORAL	NASAL	ORAL	NASAL
laid	lin	leur	lundi
lɛ	**lɛ̃**	**lœʀ**	**lœ̃di**
'ugly'	'flax'	'their'	'Monday'
las	lent	lot	long
la	**lɑ̃**	**lo**	**lõ**
'tired'	'slow'	'prize'	'long'

CHINANTEC

Rhotacization

- Vowels are rhotacized by curling back the tongue tip or by retracting the tongue tip into the body of the tongue.
- Rhotacized vowels generally have a hollowing of the tongue body.



The words *dee* and *deer*. Note the lowering of F3 in the articulation of the [ɹ]

Rhotacization causes lowering of F3.

Rhotacization

Examples of rhotacization in other languages:

- Badaga (Dravidian): plain, half-rhotacized, and fully-rhotacized vowels

  - be: ‘mouth’
  - be˞: ‘bangle’
  - be˞˞: ‘banana plant, crop’

- Mandarin: Erhua

Rhotacization is represented in IPA with a hook ˞ to the right of the affected vowel.

Length

Vowels can be produced with varying duration.

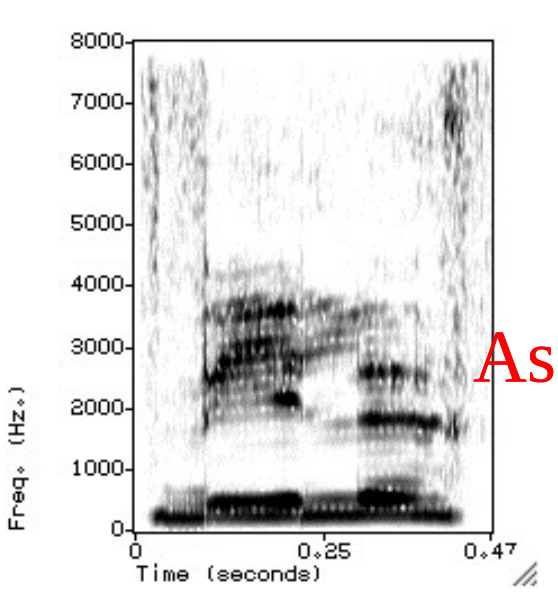
- In English, tense vowels are inherently longer than lax vowels.
- But in some languages, vowel length is contrastive

If there are two levels of length distinction:

Short: [a] vs. Long: [aː]

If there are more than two levels of length distinction, the following diacritics may be used:

half-long [aˑ] or extra-short [ă]



vilə ‘wild’ [def]

vi:lə ‘rest’

menə ‘remind’

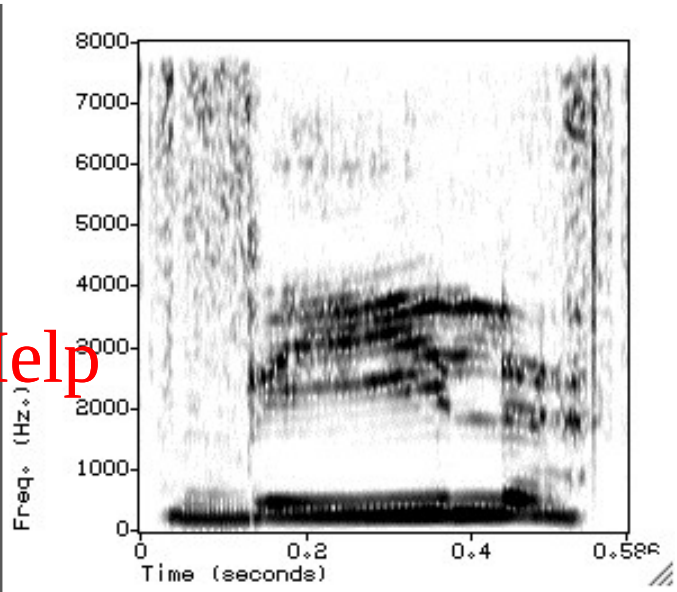
me:nə ‘mean’

lɛsə ‘load’

lɛ:sə ‘read’

mæsə ‘mass’

mæ:sə ‘mash’

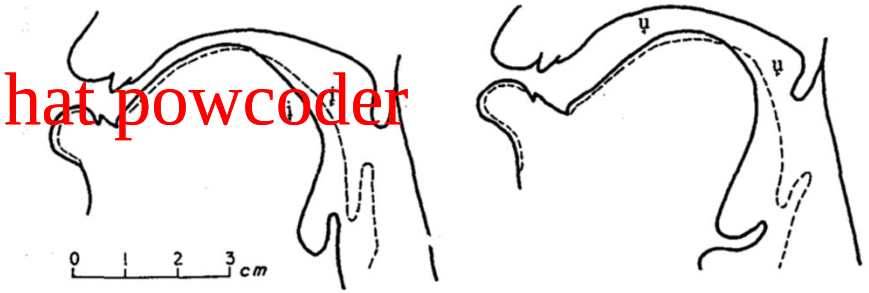


Length

Contrastive Length in Danish

Expansion

- Some languages make a contrast between vowels made with an expanded pharynx and vowels made without an expanded pharynx.
  - In the expanded set, the tongue root is pulled forward and the larynx is lowered.
  - The non-expanded set is produced with the tongue root back and without any lowering of the larynx.



Expansion

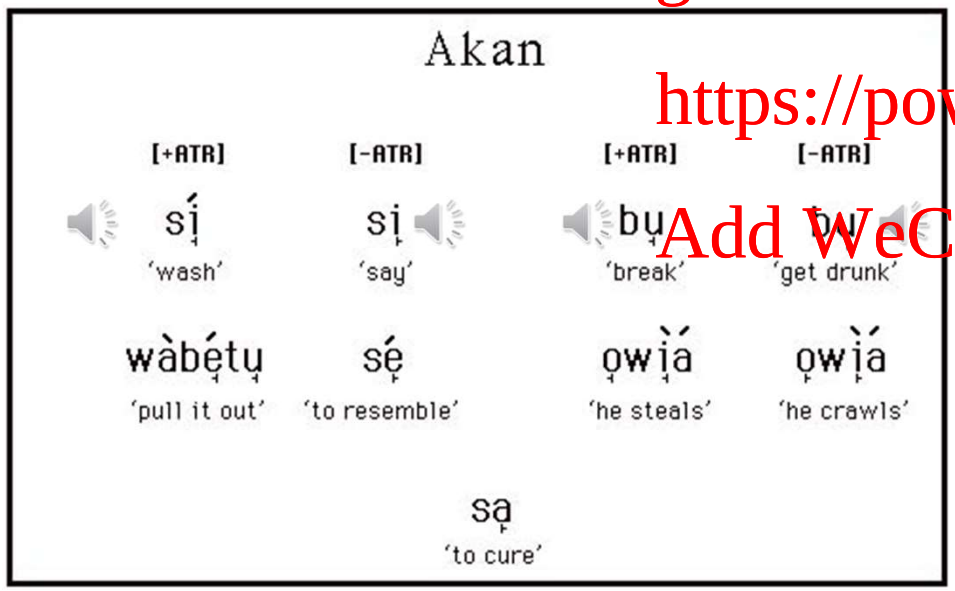
The terms *advanced tongue root* (ATR) and *retracted tongue root* (RTR) are also used for expanded and non-expanded vowels respectively.

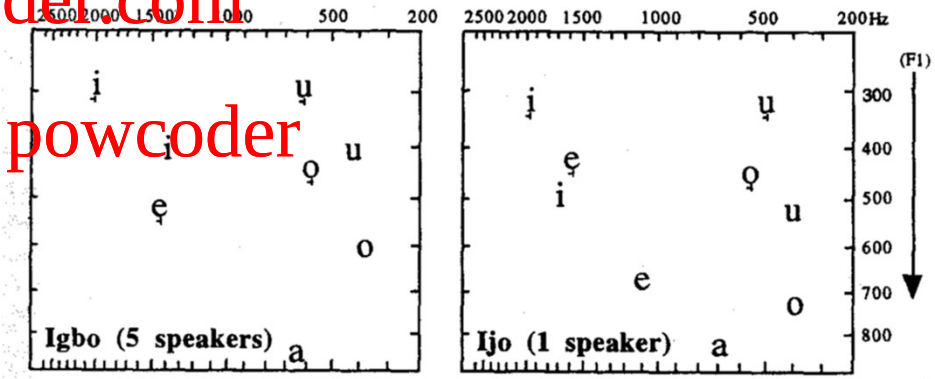
A diacritic below the vowel indicates:

a̘ Advanced Tongue Root	a̙ Retracted Tongue Root

Expansion

Expanded vowels have a lowered F1 due to the greater size of the pharyngeal cavity.





Expansion vs. Tense/Lax disctinction

- The tense-lax distinction is useful in describing phonological classes of English vowels and may be relevant for other languages as well.
  - Phonetically, however, there is no articulatory or acoustic trait which consistently distinguishes tense from lax vowels.

- Sometimes the terms or symbols are conventionally used interchangeably, but the tense-lax distinction is not the same as [ATR] or [RTR].
  - In descriptions of languages that have [ATR] distinctions, you might see [i u e o] representing vowels with advanced tongue root and [ɪ ʊ ɛ ɔ] representing vowels with retracted tongue root.

Expansion vs. Tense/Lax distinction

Note that there is little difference in the size of the pharyngeal cavity when it comes to English tense vs. lax vowels.

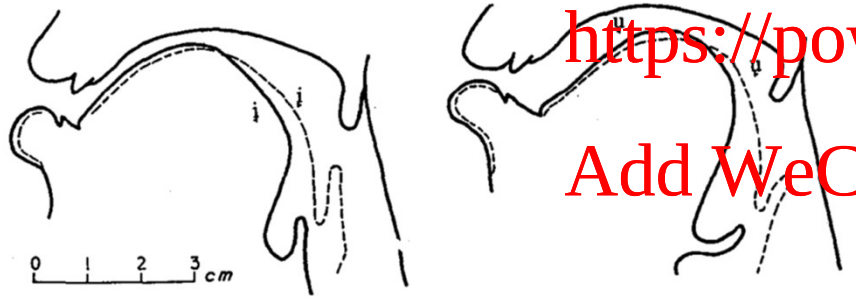


Figure 9.16 Tracings from x-ray cinematography films of Igbo vowels ị as in ọ́bị́ (*óbì* in the standard Igbo orthography) 'heart'; ị as in ụ̀bị̀ (*ùbì*)poverty of ability'; ụ as in ị́bụ́ (*ìbú*) 'weight'; and ụ as in ọbụ̀ (*ọbụ*) 'it is'. In accordance with current IPA usage ˛ and ˛ are used to indicate Advanced and Retracted Tongue Root, respectively.

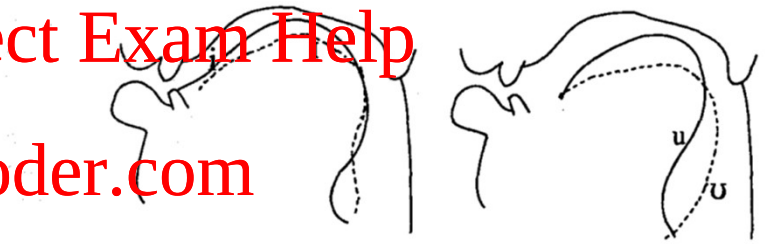


Figure 9.19 X-ray tracings of the articulatory positions in some so-called Tense/Lax pairs of vowels in English (redrawn from data in Perkell 1969).

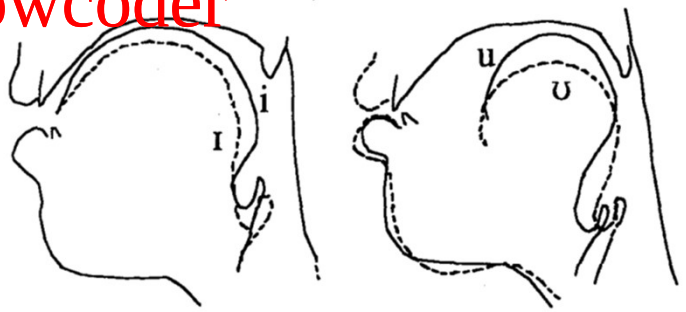
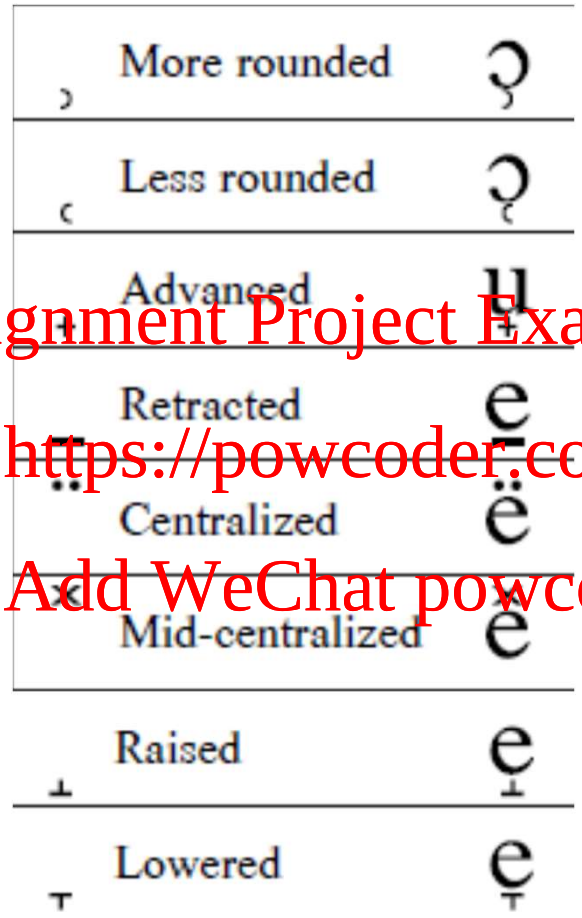
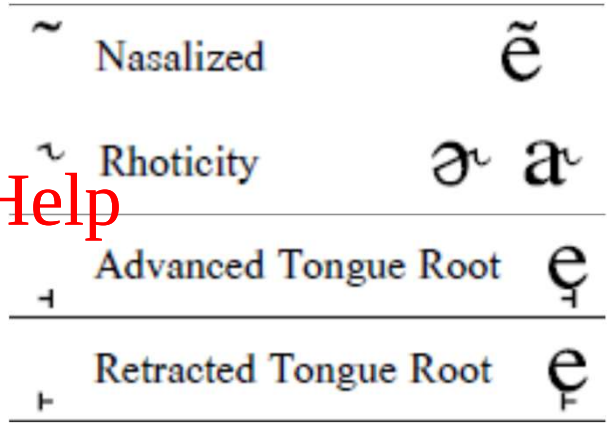


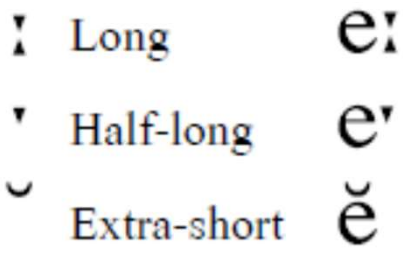
Figure 9.20 X-ray tracings of the articulatory positions in some so-called Tense/Lax pairs of vowels in German (after Bolla and Valaczkai 1986).

Recap

We learned about several additional characteristics of vowels and the IPA diacritics used to represent them.







Announcements/Reminders

- **Tutorial 6** is on Monday October 24th
- **Quiz 3** is from **Tuesday October 25th** to **Thursday October 27th**
- **Assignment 2** is due on **Friday November 4th**

Assignment 2 and academic integrity

- Each student should complete and write this assignment individually.
- However, I recognize that some students may benefit from working through the technical aspects of this assignment with others. In order to maintain Academic Integrity: if you discussed this assignment with anybody else, such as in a study group or group chat, you should credit them by writing their name(s) (or aliases) and briefly stating how they helped you with working through the assignment.
- Please consult this website for more information on Academic Integrity and sharing work: https://www.academicintegrity.utoronto.ca/smart-strategies/students-sharing-academic-work/

- This document was completed by: (give your full name)
- _____

- I received help on this assignment from the following people:
- _____