W1-2: English consonants

JAPN398D: The Sounds and Dialects of Japanese

8/30/2023

Today's class

- International Phonetic Alphabet (IPA)
- Consonants vs. Vowels
- Consonants in English, (Korean, and Mandarin)
- 3 parameters for consonants
  - Voicing
  - Place of articulation
  - Manner of articulation

International Phonetic Alphabet (IPA)

- Phoneticians and phonologists use the International Phonetic Alphabet (IPA) to transcribe speech sounds.

- The IPA was invented by the International Phonetic Association.
  - https://www.internationalphoneticassociation.org/

- The IPA symbols are universally recognized.
  - Most symbols are from the Latin script (e.g. e) and Greek letters (e.g. ɛ).

International Phonetic Alphabet (IPA)

- Why do we need the IPA?

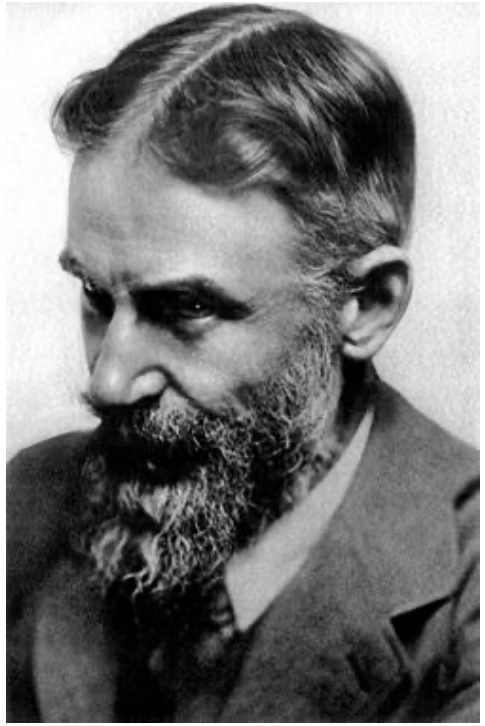
1. There is no one-to-one mapping between writing symbols and sounds.

- This is an alternate spelling of a common English word <ghoti>.
  a. goat
  b. gory
  c. forty
  d. fish
  e. goatee

International Phonetic Alphabet (IPA)

- <fish> could be spelled <ghoti>!

George Barnard Shaw



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- fish /fɪʃ/

- tough /f/
- women /ɪ/
- nation /ʃ/

International Phonetic Alphabet (IPA)

- Why do we need the IPA?

2. One word can be pronounced in different ways.

- Examples
  - Grammatical differences: *read* /ɹid/ (non-past) vs. /ɹɛd/ (past)
  - Dialectal differences: *tube* /tub/ (American) vs. /tʃub/ (British)
  - Idiolectal differences: The language variety of an individual speaker (*Language Files*, p. 699).

International Phonetic Alphabet (IPA)

- Why do we need the IPA?

3. The Latin alphabet letters can be pronounced in different ways in different languages.

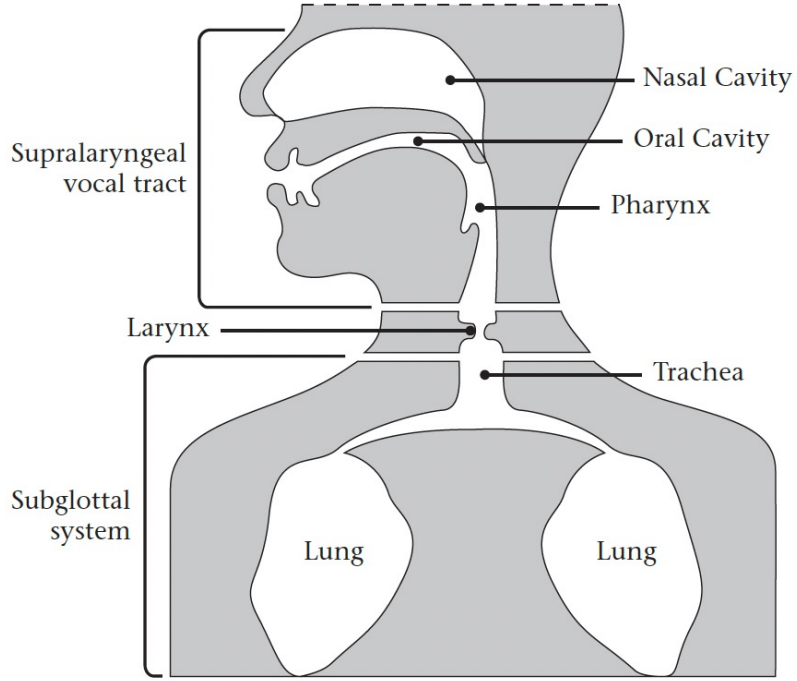
- Examples
  - *yes* /jɛs/ in English vs. *ja* /ja:/ in German
  - ラリルレロ in Japanese → ra, ri, ru, re, ro in ローマ字

Consonants vs. Vowels

- How do they differ?

Consonants vs. Vowels

- English and Japanese speakers produce sounds by manipulating exhaled air.
- Consonants involve a greater or lesser degree of obstruction of the airstream.
- Vowels involve no obstruction of air passage—just a change in its shape.



From Lieberman and Blumstein, *Speech physiology, speech perception, and acoustic phonetics* (1988), p. 4.

Consonants vs. Vowels

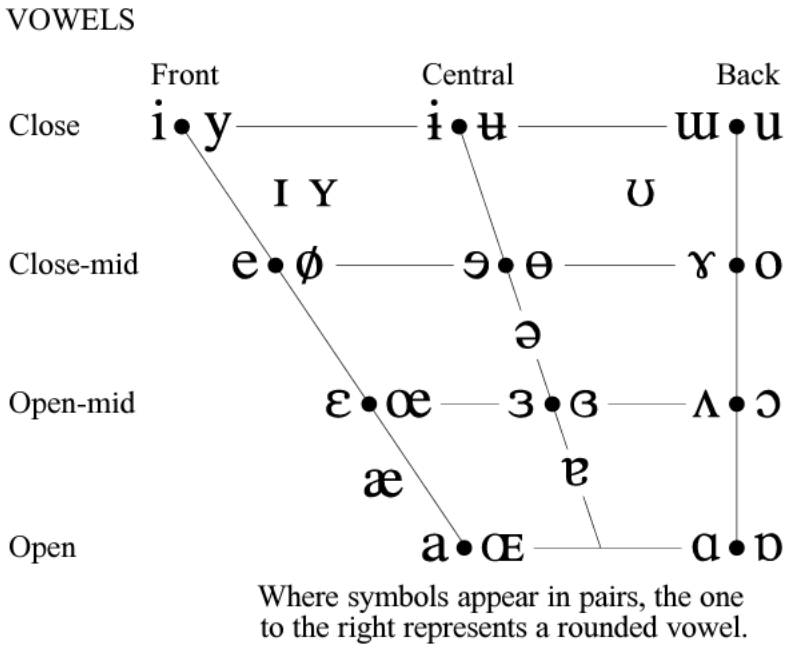
Consonants

CONSONANTS (PULMONIC) © 2015 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			

Symbols to the right in a cell are voiced, to the left are voiceless. Shaded areas denote articulations judged impossible.

Vowels



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

https://www.internationalphoneticassociation.org/content/full-ipa-chart

English consonants

	Bilabial		Labio-dental		Dental		Alveolar		Post-alveolar		Palatal		Velar		Glottal	
Stop	p	b					t	d					k	g	ʔ	
Fricative			f	v	θ	ð	s	z	ʃ	ʒ					h	
Affricate									tʃ	dʒ						
Nasal		m						n						ŋ		
Lateral Liquid								l								
Retroflex Liquid								ɹ								
Glide		w										j				

English consonants

Zsiga (2013): Table 2.1

IPA	Initial	Final	Medial
p	pat	whip	upper
b	bat	bib	rubber
m	mat	whim	summer
f	fat	whiff	suffer
v	vat	wave	ever
θ (theta)	thigh	with	Ethel
ð (eth)	that	bathe	weather
t	tat	wit	retool
d	data	mid	redo
n	Nat	win	renew
s	sat	miss	presser
z	zap	wiz	buzzer

IPA	Initial	Final	Medial
l	lateral	will	filler
ɹ	rat	where	terror
ʃ (esh)	shack	wish	pressure
ʒ (ezh)		beige	measure
tʃ	chat	witch	etcher
dʒ	jack	wedge	edger
k	cat	wick	wrecker
g	gap	wig	mugger
ŋ (engma)		wing	singer
h	hat		ahead
w	whack		away
j	yak		

Korean consonants

		Labial		Alveolar		Alveo-palatal		Palatal		Velar		Glottal	
Stop, Affricate	**Plain**	p ㅂ		t ㄷ		t͡ɕ ㅈ				k ㄱ			
	Tense	p͈ ㅃ		t͈ ㄸ		t͡ɕ͈ ㅉ				k͈ ㄲ			
	Aspirated	pʰ ㅍ		tʰ ㅌ		t͡ɕʰ ㅊ				kʰ ㅋ			
Fricative	**Plain**			s ㅅ								h ㅎ	
	Tense			s͈ ㅆ									
Nasal			m ㅁ		n ㄴ						ŋ ㅇ		
Liquid					ɾ ㄹ								
Glide			w						j				

Based on Cho & Whitman (2020)

Mandarin consonants

		Bilabial		Labio-dental		Alveolar		Retroflex		Alveolo-palatal		Velar	
Stop	**Unaspirated**	p (b)				t (d)						k (g)	
	Aspirated	p^h (p)				t^h (t)						k^h (k)	
Affricate	**Unaspirated**					ts (z)		tʂ (zh)		tɕ (j)			
	Aspirated					c (ts^h)		$tʂ^h$ (ch)		$tɕ^h$ (q)			
Fricative				f (f)		s (s)		ʂ (sh)	ɻ (r)	ɕ (x)		x (h)	
Nasal			m (m)				n (n)						ŋ (ng)
Lateral							l (l)						
Glide			w (w)								j (y)		

https://corpus.eduhk.hk/mandarin_pronunciation/?page_id=33

(Pinyin is in the parentheses.)

3 parameters for consonants

1. Voicing
   - Vocal fold vibration (voiced) or No vocal fold vibration (voiceless)

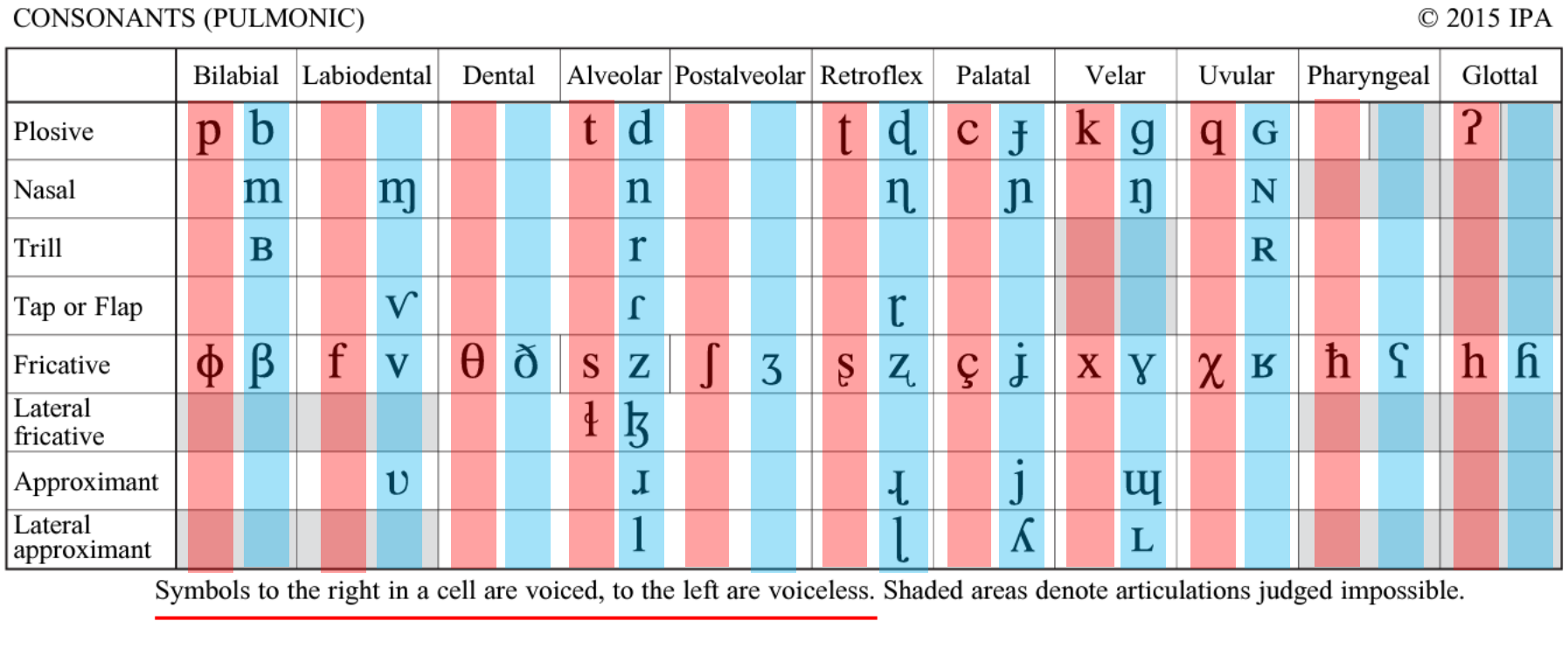
2. Place of articulation
   - The place in the vocal tract where the constriction for the production of a consonant is made (*Language Files*, p. 706).

3. Manner of articulation
   - How the airstream is modified by the articulators in the vocal tract to produce a consonant (*Language Files*, p. 702).
   - e.g. how narrow it is, whether the velum is open, etc.

3 parameters for consonants

← front PLACE of articulation → back

MANNER of articulation



CONSONANTS (PULMONIC)

© 2015 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						

Symbols to the right in a cell are voiced, to the left are voiceless. Shaded areas denote articulations judged impossible.

Consonants are organized in two dimensions.
Voicing is a third dimension.

Voicing

- Voiced sounds are produced when the vocal folds (cords) vibrate.
- Voiceless sounds are produced when the vocal folds do not vibrate.

- English voiced consonants
  - b, m, v, ð, d, n, z, l, ɹ, ʒ, dʒ, g, ŋ, w, j
- English voiceless consonants
  - p, f, θ, t, s, ʃ, tʃ, k, h, ʔ

- Test for voicing: Larynx touching test

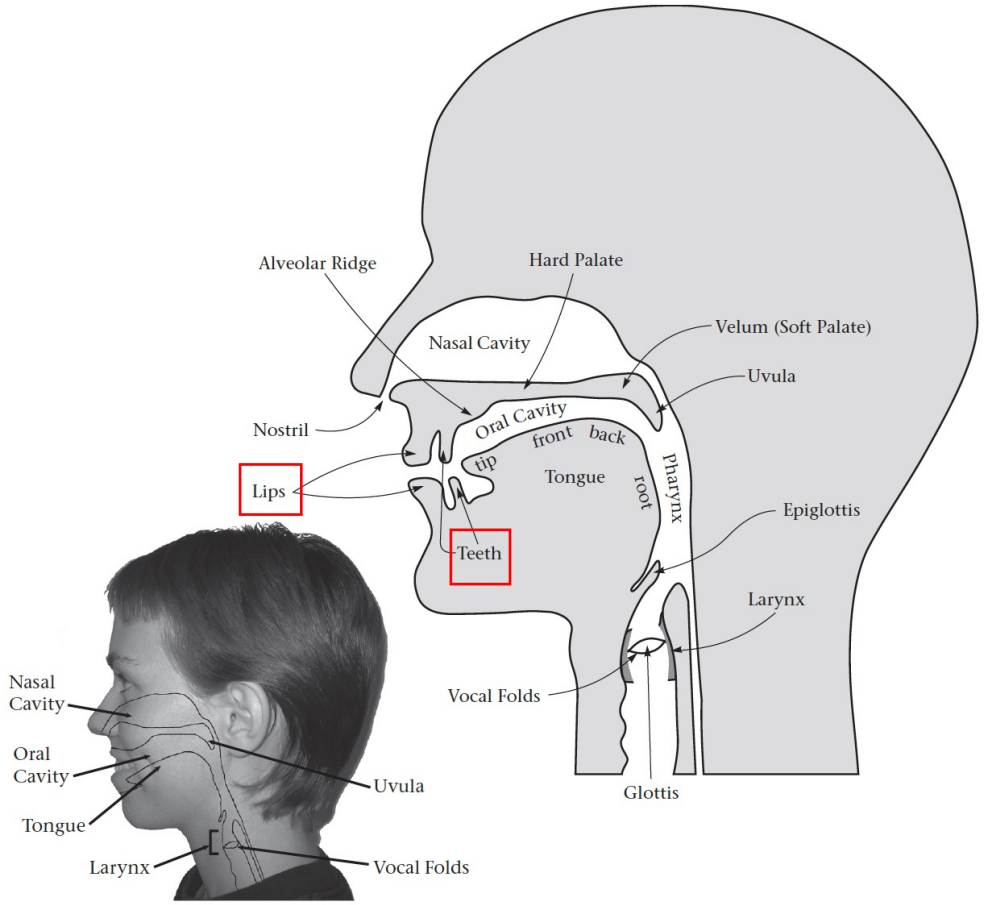
Voicing

https://www.youtube.com/watch?v=9Tlpkdq8a8c

Place of articulation

- Bilabial consonants are made with both lips.
  - p, b, m, w

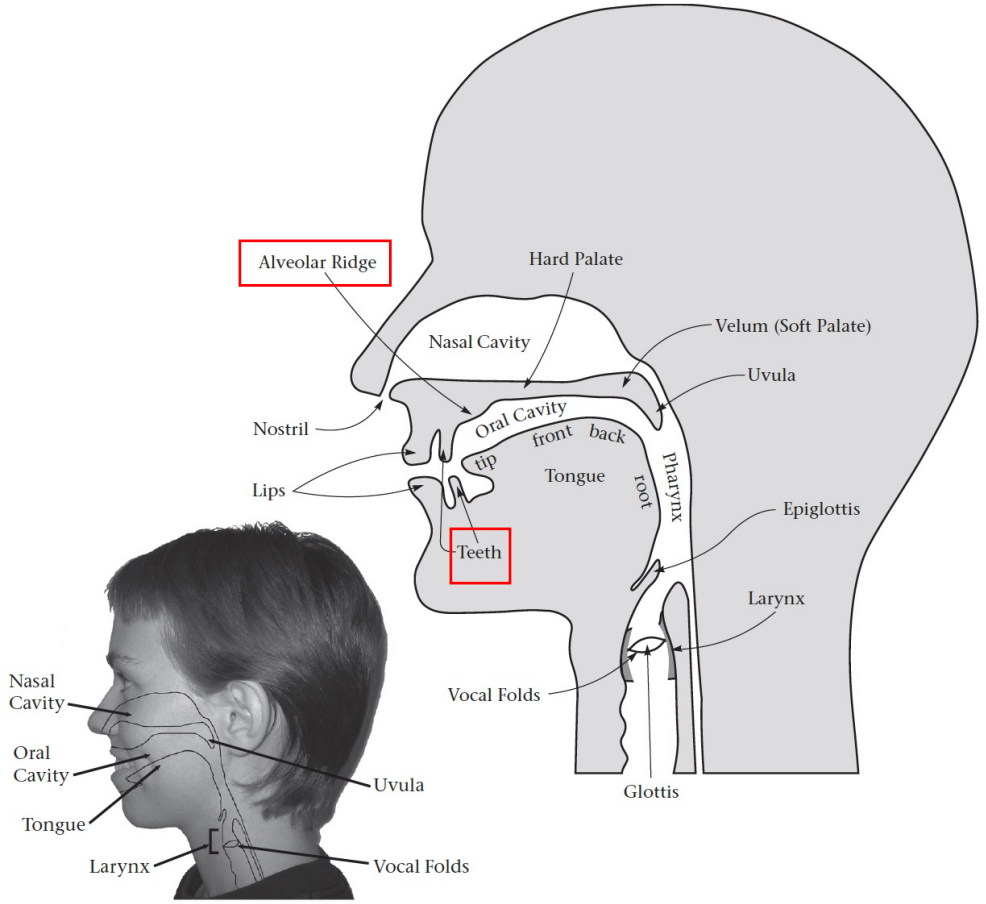
- Labio-dental consonants are made with the lower lip and the upper teeth.
  - f, v



Language Files, p. 52

Place of articulation

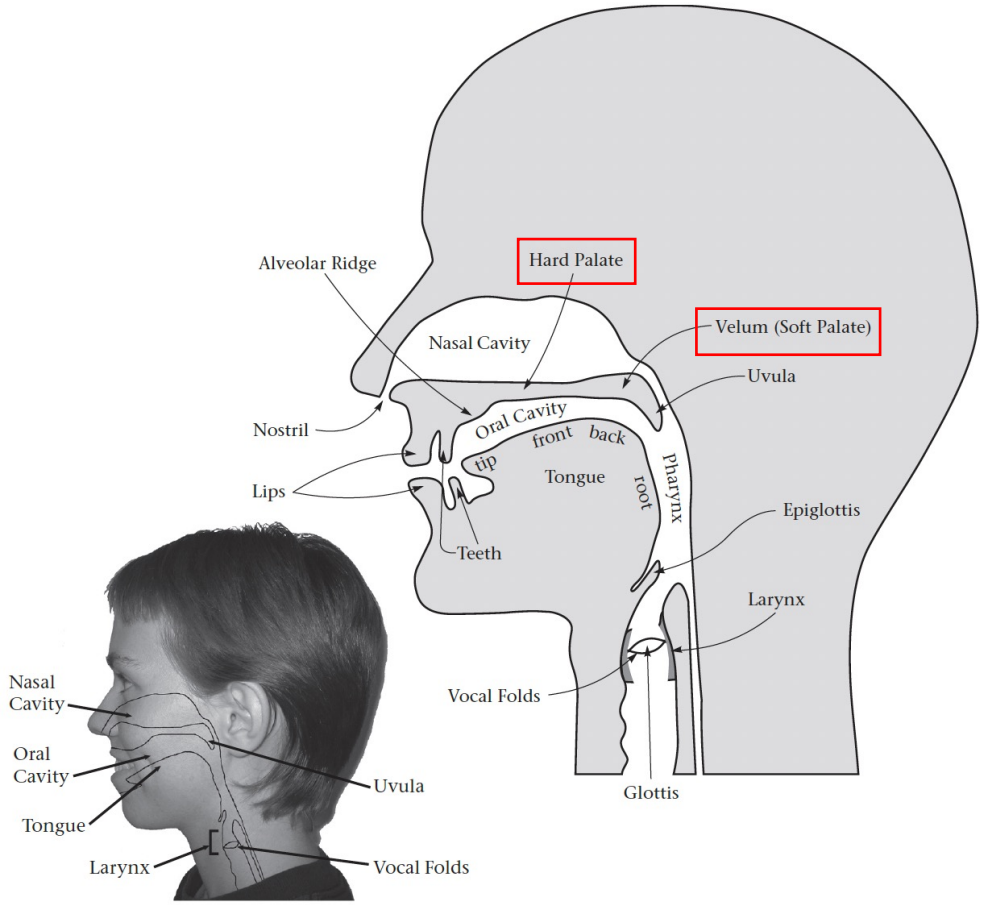
- Dental consonants are made with the tongue against the upper teeth.
  - θ, ð
- (Post-)alveolar consonants are made with the tongue against the alveolar ridge.
  - t, d, s, z, n, l, ɹ
  - ʃ, ʒ, tʃ, dʒ



Language Files, p. 52

Place of articulation

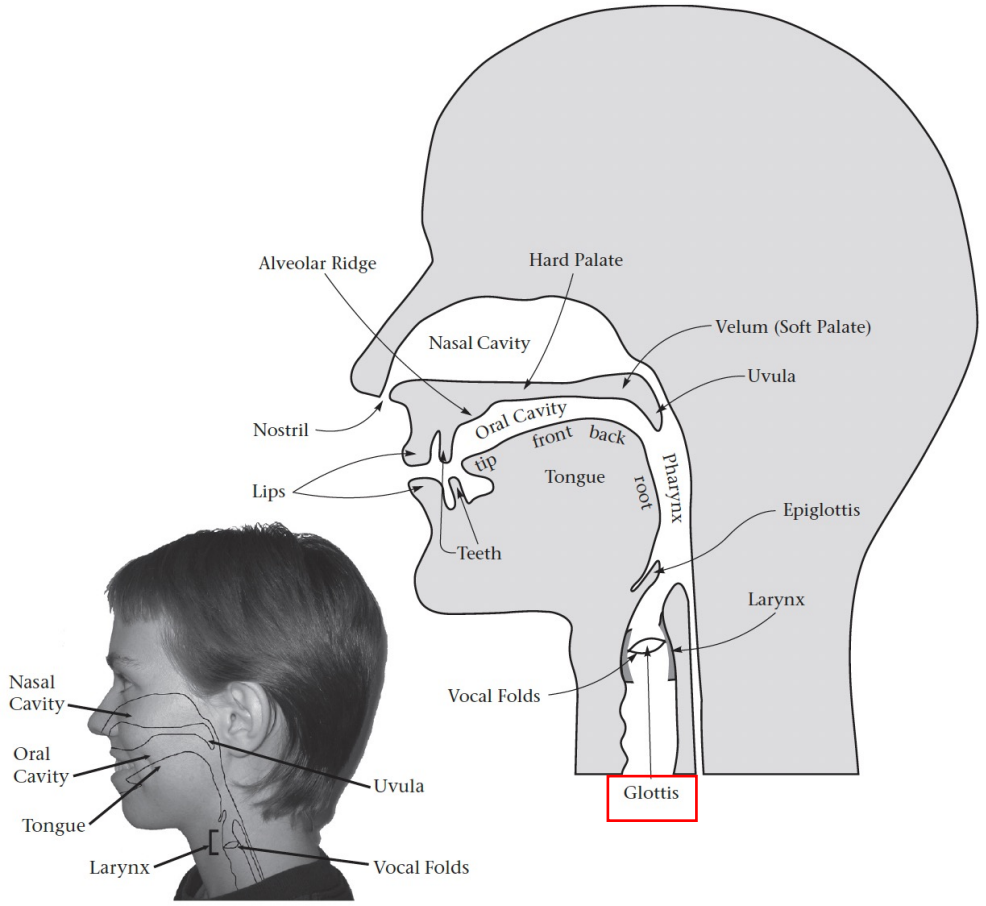
- Palatal consonants are made with the tongue and the hard palate.
  - j
- Velar consonants are made with the tongue and the soft palate.
  - k, g, ŋ



Language Files, p. 52

Place of articulation

- Glottal consonants are made with the glottis.
  - h, ʔ
- A glottal stop ʔ appears before each vowel in *uh-oh*.



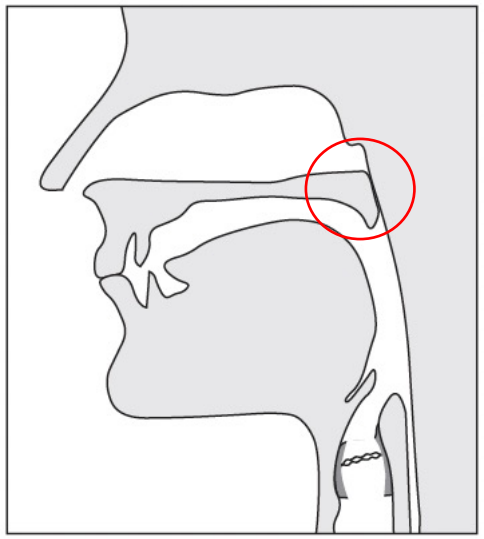
Language Files, p. 52

Manner of articulation

- (Oral) stops/plosives are produced with a full closure of the oral cavity.
  - p, b, t, d, k, g, ʔ
- Nasal (stops) are also produced by the same mechanism.
  - m, n, ŋ

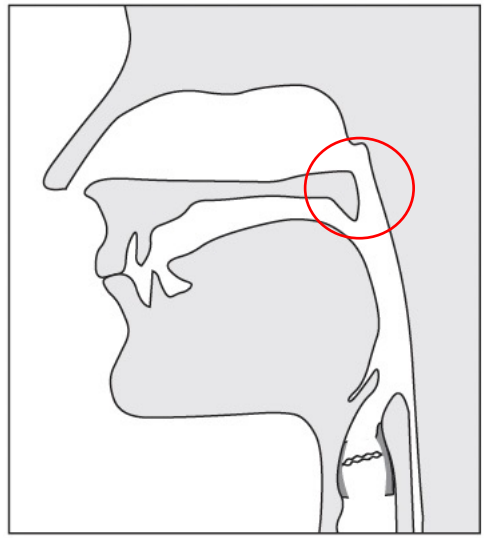
Manner of articulation

Stops and the other oral sounds



The velum is closed (raised).

Nasals



The velum is open (lowered).

Manner of articulation

- Stops and nasals are minimally different.

- Denasalization (nasal → oral)
  - e.g. m → b, n → d

Manner of articulation

- *Go-on* (呉音): *on'yomi* based on the Nanjing (南京) pronunciation
  - 美 (mi): e.g. 仁美（ひとみ）
- *Kan-on* (漢音): *on'yomi* based on the Chang'an (長安) pronunciation
  - 美 (bi): e.g. 美人（びじん）

- Word-initial denasalization in Modern Korean
  - 美 (미) mi → bi
  - e.g. 美人 (미인) miin → biin

Manner of articulation

- Fricatives are produced with a narrow constriction in the oral cavity, generating turbulent airflow.
  - f, v, θ, ð, s, z, ʃ, ʒ, h

- Affricates are a sequence of stop and fricative manners.
  - tʃ, dʒ

Manner of articulation

- Approximants are produced with a narrow constriction, but the constriction is not narrow enough to generate turbulent airflow.

- Approximants are divided into liquids and glides.
  - Liquids: l, ɹ
  - Glides: w, j

Manner of articulation

- Liquids have a narrower constriction than glides.
  - /l/ in English is called lateral because air passes around both sides of the tongue. = lateral liquid
  - Vance describes /ɹ/ in American English as a retroflex, which is pronounced with the tongue tip curled up and back. = retroflex liquid

Note: I follow the descriptions of /l/ and /ɹ/ in *Language Files* (p. 57).

- Glides are produced with a slight closure of the oral cavity.
  - Glides are sometimes called semi-vowels.

Manner of articulation

- The conventional order of the three-part articulatory descriptions is Voicing-Place-Manner.

- Examples
  - p: voiceless bilabial stop
  - ŋ: voiced velar nasal
  - l: voiced alveolar lateral liquid

Exercise 1

- Provide the IPA symbol whose definition is given.

1. Voiced alveolar stop
2. Voiceless velar stop
3. Voiced labio-dental fricative
4. Voiced alveolar nasal
5. Voiced alveolar retroflex liquid

Exercise 1

- Provide the IPA symbol whose definition is given.

1. Voiced alveolar stop: /d/
2. Voiceless velar stop: /k/
3. Voiced labio-dental fricative: /v/
4. Voiced alveolar nasal: /n/
5. Voiced alveolar retroflex liquid: /ɹ/

Exercise 2

- Provide the three-part articulatory descriptions for the consonants.

1. /m/
2. /f/
3. /tʃ/
4. /g/
5. /θ/

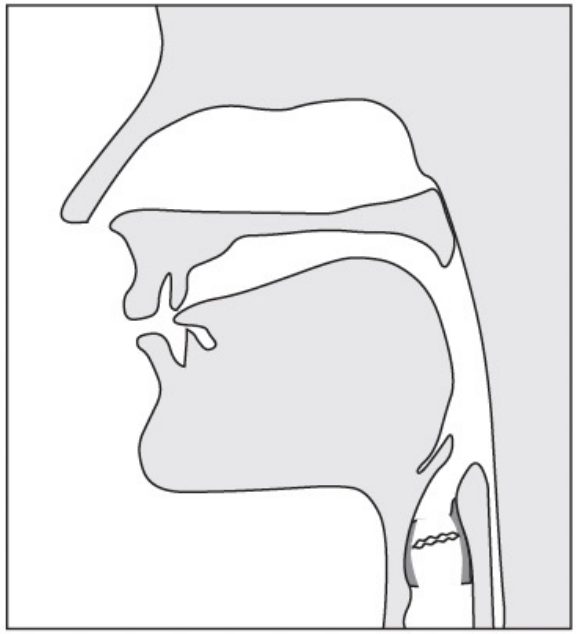
Exercise 2

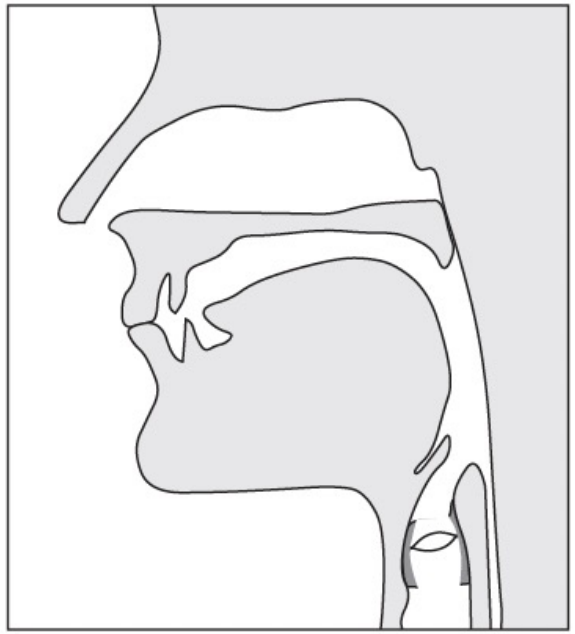
- Provide the three-part articulatory descriptions for the consonants.

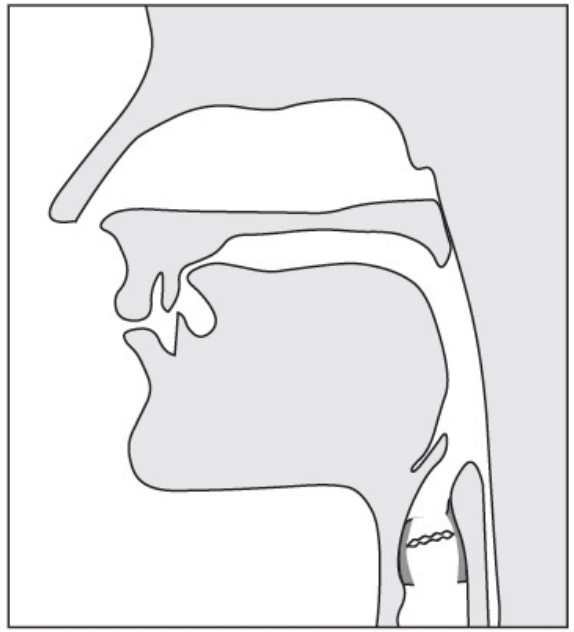
1. /m/: Voiced bilabial nasal
2. /f/: Voiceless labio-dental fricative
3. /tʃ/: Voiceless post-alveolar affricate
4. /g/: Voiced velar stop
5. /θ/: Voiceless dental fricative

Exercise 3

- Each of the diagrams illustrates the articulation of a consonant of English. Specify each of the consonants.
  - Voicing, Place of articulation, Manner of articulation

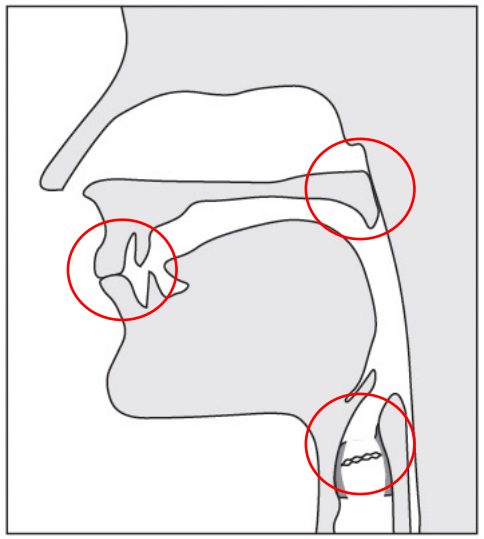






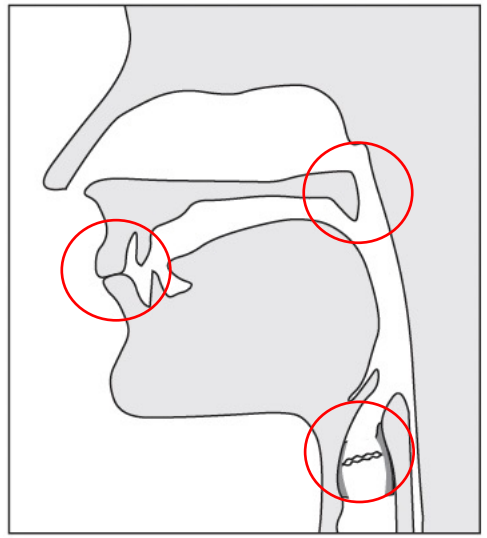
Hint

Voiced bilabial stop /b/



The vocal folds vibrate.
The velum is closed (raised).

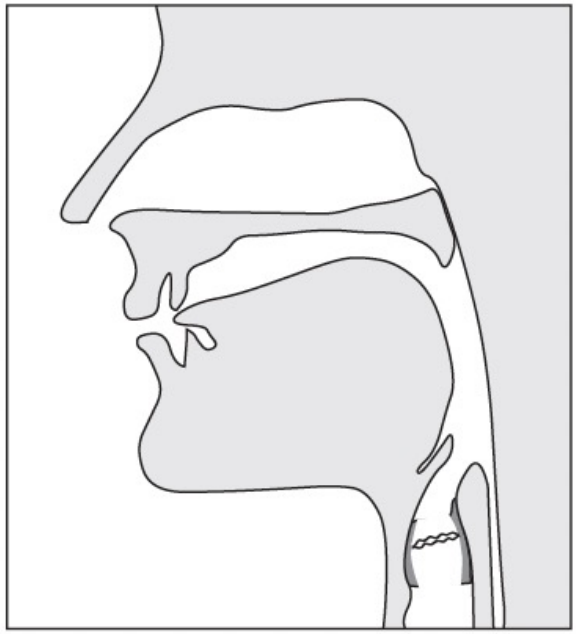
Voiced bilabial nasal /m/



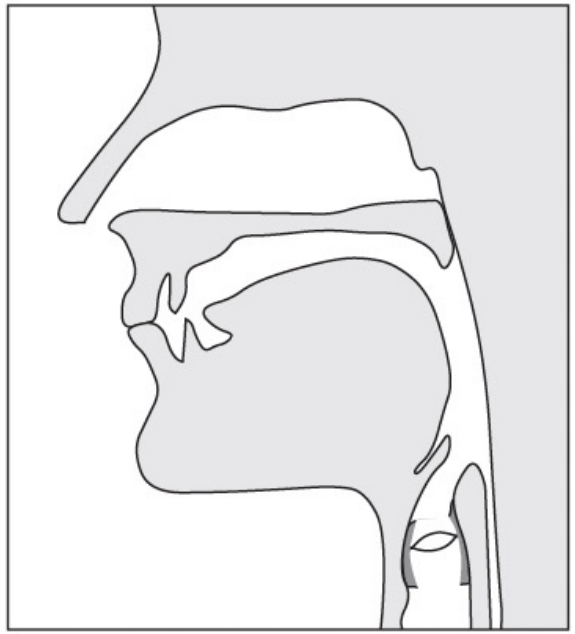
The vocal folds vibrate.
The velum is open (lowered).

Exercise 3

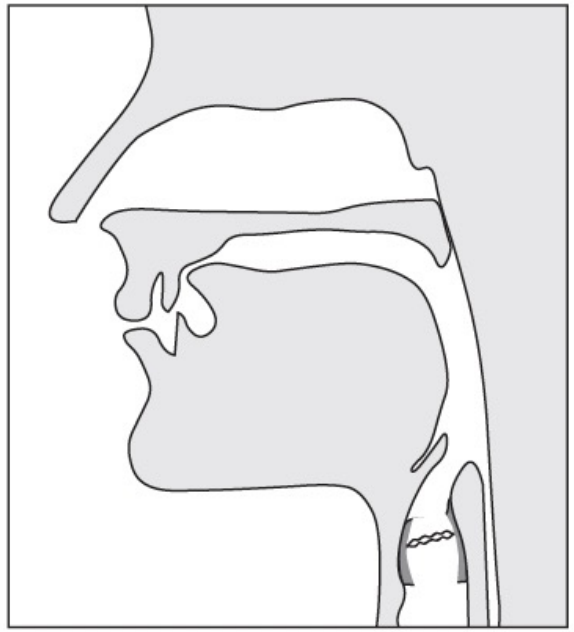
- Each of the diagrams illustrates the articulation of a consonant of English. Specify each of the consonants.
  - Voicing, Place of articulation, Manner of articulation



Voiced dental fricative /ð/



Voiceless bilabial stop /p/



Voiced alveolar fricative /v/

References (1/2)

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- IPA Chart, http://www.internationalphoneticassociation.org/content/ipa-chart, available under a Creative Commons Attribution-Sharealike 3.0 Unported License. Copyright © 2015 International Phonetic Association.
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Praat

Praat: doing phonetics by computer

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* Extensive manuals and tutorials: in Praat's **Help** menus.
* Beginner's manuals by others.
* Paul Boersma's publications on algorithms and tutorials.

Paul

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David

Questions, problems, solutions:

1. Many problems can be solved by upgrading to version 6.3.16 of Praat.
2. Make sure you have read the Intro from Praat's **Help** menu.
3. If that does not help, use the **Search** button in Praat's manual window.
4. Or consult the Frequently Asked Questions directly.
5. There is a user group on the Internet: the Praat User List.
6. If none of the above helps, you can send email to paul.boersma@uva.nl.

https://www.fon.hum.uva.nl/praat/