

# “Exploring different speech sources”

SPAU 3343 (Chapter 15)

A. Airstream mechanisms

B. Tone, Voice, VOT

# Airstream mechanisms

- The manner in which an airstream is set in motion for the purposes of speech.
- May produce **egressive** (outward) or **ingressive** (inward) airflow.

# Airstream Mechanism

(pg. 239)

	Pulmonic	Glottalic	Velaric
Egressive	Plosives /p, t, k, b, d, g/	Ejectives /p', t', k'/	NONE
Ingressive	NONE	Implosives /ɓ, ɗ, ɠ/	Clicks /ǀ, ǁ, ǃ, ǂ, Ǆ/

# Plosive production in initial position: Time course:

1. **Closure** (air pressure builds.....)
2. **Release** (articulators blow apart, “burst” of air typically occurs)
3. **Aspiration** (glottal noise w/ release)
4. **Voicing** (start of vocal fold vibration)

(e.g. /p<sup>h</sup>a/)

# Pulmonic Airstream Mechanism

## Plosives

- Stops that use only an outward-moving pulmonic airstream = plosives.
- GAE uses only an egressive pulmonic airstream.
- All oral stops in English are plosives

This is not true for all languages

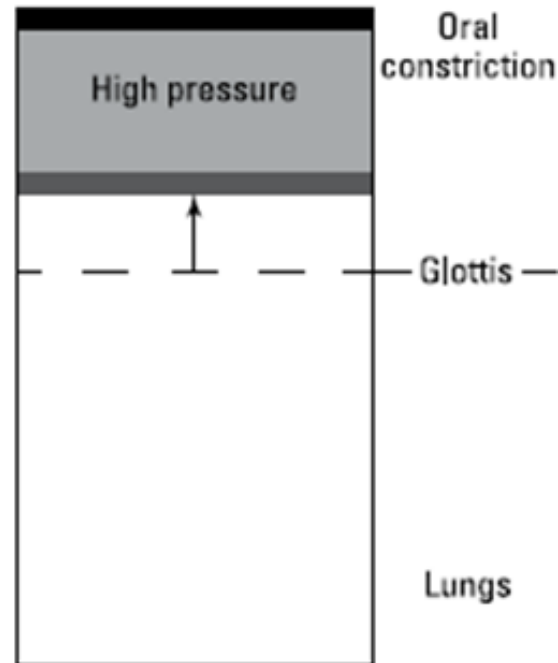
# Airstream Mechanisms

	Pulmonic	Glottalic	Velaric
Egressive	<p>Plosives</p> <p>/p, t, k, b, d, g/</p>	<p>Ejectives</p> <p>/p', t', k'/</p>	NONE
Ingressive	NONE	<p>Implosives</p> <p>/ɓ, ɗ, ɠ/</p>	<p>Clicks</p> <p>/◉,  , !, †,   /</p>

# Glottalic Airstream Mechanism

## Ejectives



- Hausa
- Quechua
- Lakhota
- Navajo
- K'ekchi



# Glottalic Airstream Mechanism

## Ejectives

- **Ejective** → A stop made with an egressive glottalic airstream, such as in Quechuan:



Aspirated velar stop	[k <sup>h</sup> ujui]	‘to whistle’	
Ejective	[k’ujui]	‘to twist’	



# Glottalic Airstream Mechanism

## Ejectives (cont'd)

Lakhota

Ejective	[ t'uʃɛ ]	'at all costs'	
Unaspirated dental stop	[ tuwa ]	'who'	

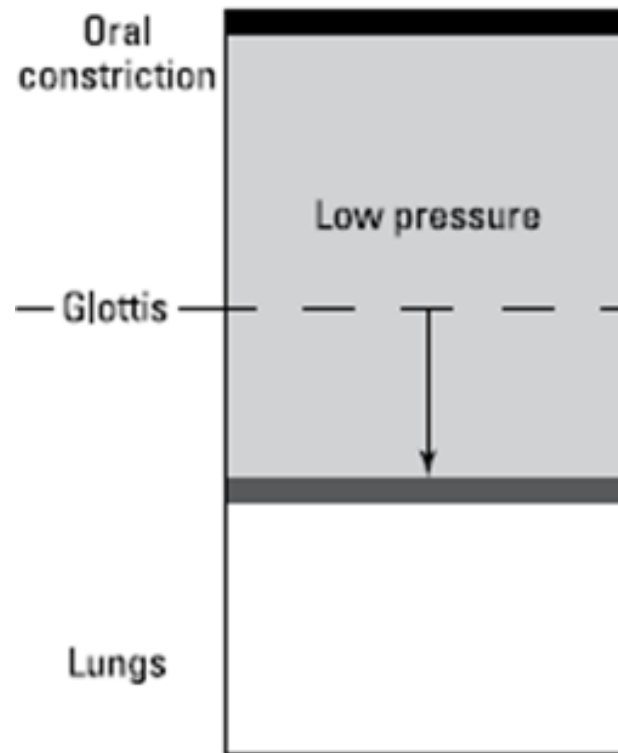
# Airstream Mechanisms

	Pulmonic	Glottalic	Velaric
Egressive	<p>Plosives*</p> <p>/p, t, k, b, d, g/</p>	<p>Ejectives</p> <p>/p', t', k'/</p>	<p>NONE</p>
Ingressive	<p>NONE</p>	<p>Implosives</p> <p>/ɓ, ɗ, ɠ/</p>	<p>Clicks</p> <p>/◌,  , !, †,   /</p>

# Glottalic Airstream Mechanism

## Implosives



- Sindhi
- Igbo



# Glottalic Airstream Mechanism

## Implosives



- **Implosive** → A stop made with an ingressive glottalic airstream, such as Sindhi /ɓ/.

Implosive	[ɓani]	‘field’	
Voiced bilabial stop	[banu]	‘forest’	

# Glottalic Airstream Mechanism

## Implosives

Another Sindhi Example

Implosive	[ɠanu]	‘handle’	
Voiced velar stop	[ɡuŋu]	‘quality’	

“Billions and billions...”



Image from *John Tebeau*. "Mark Roth: 'Joan of Arc Riding My Little Pony' (with Carl Sagan sing backup)". November 15, 2012. Accessed May 25, 2016. <http://tebeau.com/mark-roth-joan-of-arc-riding-my-little-pony-with-carl-sagan-singing-backup>

[www.utdallas.edu/~wkatz/PFD/carl\\_sagan\\_billions.mov](http://www.utdallas.edu/~wkatz/PFD/carl_sagan_billions.mov)

Text, pg. 242

# Airstream Mechanisms

	Pulmonic	Glottalic	Velaric
Egressive	<p>Plosives</p> <p>/p, t, k, b, d, g/</p>	<p>Ejectives</p> <p>/p', t', k'/</p>	NONE
Ingressive	NONE	<p>Implosives</p> <p>/ɓ, ɗ, ɠ/</p>	<p>Clicks</p> <p>/◉,  , !, †,   /</p>

# Velaric Airstream Mechanism

## Clicks

- Nama
- !Xhosa
- Zulu

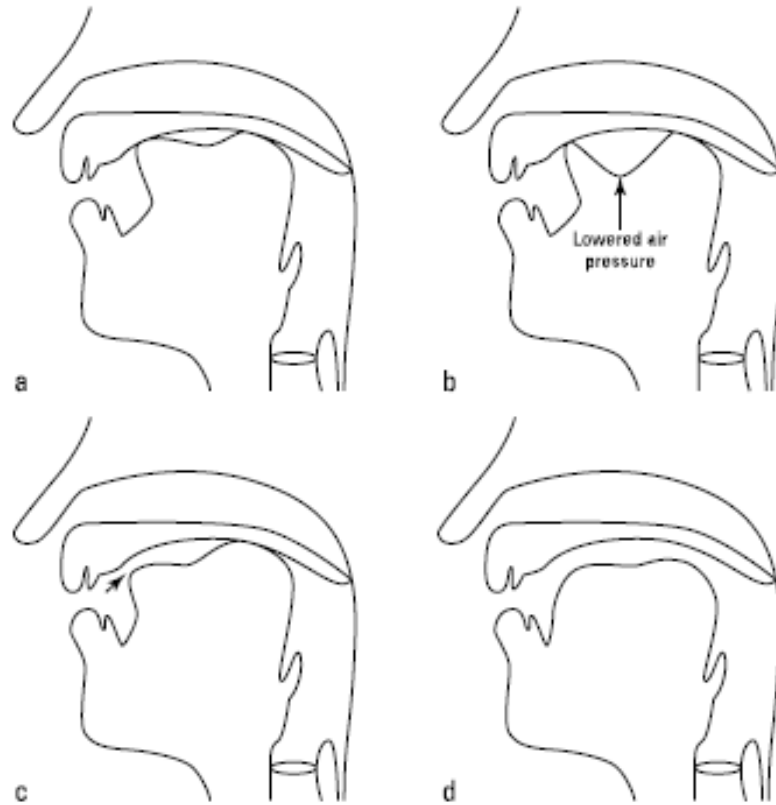


Illustration by Wiley, Composition Services Graphics. Image from *Phonetics for Dummies*. William Katz. "Going Global with Phonetics." 2013.





Producing alveolar clicks (pg. 244)



# Velaric Airstream Mechanism

## Clicks




- **Click** → A stop made with an ingressive velaric airstream, such as in Nama:

Dental	Alveolar	Palatal	Alveolar Lateral
[k oa] ‘put into’ 	[k!oas] ‘hollow’ 	[k≠ais] ‘calling’ 	[k  aros] ‘writing’ 

# Velaric Airstream Mechanism

## Clicks (cont'd)

!Xhosa

Dental	Alveolopalatal	Alveolar lateral
<p>[ukúk ola] 'to grind fine'</p> 	<p>[ukúk!oɓa] 'to break stones'</p> 	<p>[úk  olo] 'peace'</p> 

# Airstream Mechanism - Review

	Pulmonic	Glottalic	Velaric
Egressive	Plosives /p, t, k, b, d, g/ <b>English</b>	Ejectives /p', t', k'/ <b>Lakhota, Hauusa</b>	NONE
Ingressive	NONE	Implosives /ɓ, ɗ, ɠ/ <b>Sindhi</b>	Clicks /ǀ, ǁ, ǃ, ǂ, ǁ/ <b>!Xhosa, Zulu</b>

# Tone Languages

- Languages in which the meaning of a word is affected by the pitch.

## Two kinds:

1. **Register tone:** e.g., high/mid/low
2. **Contour tone:** include *rising*, *falling*, *dipping* (with slopes)

# Register tone

Found in many African languages:

- Ewe
- Yoruba
- Hausa

*FUN FACT:* Most of the tone languages in the world are register tone languages

# An example

## Ewe (West Africa)








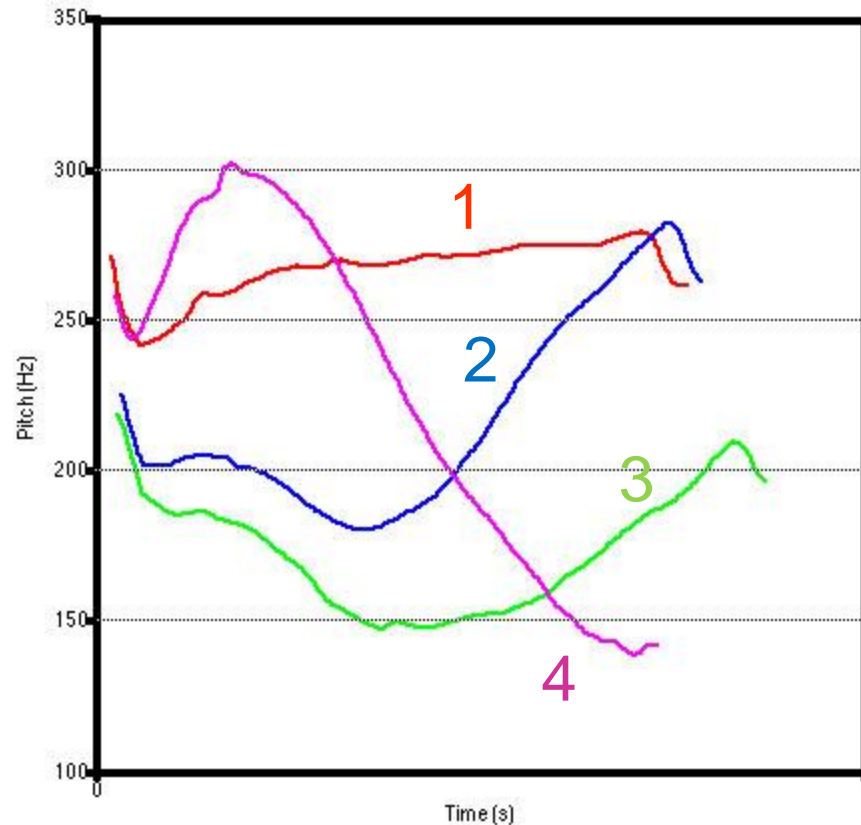
<b>Voiced bilabial</b>	éɸá 'he polished'		éɸlè 'he bought'	
<b>Voiced labiodental</b>	éfá 'he was cold'		éflè 'he split off'	
<b>Voiced bilabial</b>	èβè 'Ewe' (the language)		èβló 'mushroom'	
<b>Voiced labiodental</b>	èvè 'two'		évló 'he is evil'	

Table from *A Course in Phonetics*, 6th ed. Peter Ladefoged and Keith Johnson. "Articulatory Targets."

# Contour tone

For instance:

- Mandarin
- Cantonese
- Vietnamese





# Mandarin Chinese

STANDARD CHINESE <b>ma</b>			
Chinese Character	Tone symbol	Tone description	English gloss
媽	ㄇ	high level	'mother'
麻	ㄇˊ	high rising	'hemp'
馬	ㄇˋ	low falling	'horse'
罵	ㄇˋˊ	high falling	'scold'

Image from *A Course in Phonetics*. Peter Ladefoged. "Chinese (Standard) Tones." Accessed 5/25/16. <http://www.phonetics.ucla.edu/course/chapter10/chinese/chinese.html>



# A Mandarin tongue twister



*Does mother scold the horse's hemp?*

("mā mā mà mǎ de má ma?")

- mā mā - mother (*high level*)
- mà - scold (*high falling*)
- mǎ - horse (*low falling*)
- má - hemp (*rising*)





# Cantonese Chinese

CANTONESE si			
Chinese Character	Tone symbol	Tone description	English gloss
詩	˥	high level	'poem'
試	˨˨˨	mid level	'to try'
事	˨˨˨	low level	'matter'
時	˨˨˨˨	low falling	'time'
史	˥˥˥	high rising	'history'
市	˥˥˥˥	mid rising	'city'

Image from *Wiley-Blackwell: Vowels and Consonants*. "Pitch and Loudness." 2012. Accessed 5/25/16.  
[http://www.vowelsandconsonants3e.com/chapter\\_2.html](http://www.vowelsandconsonants3e.com/chapter_2.html)

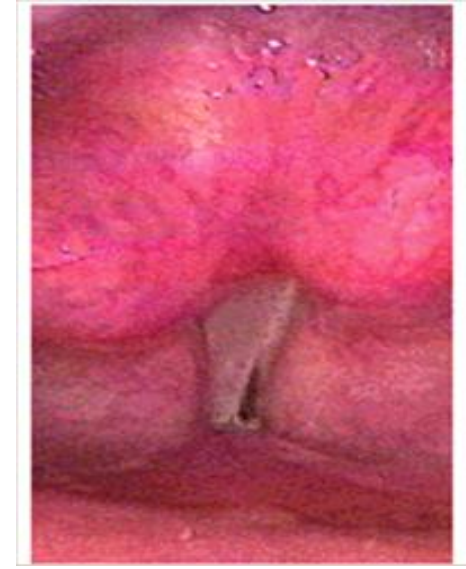
# States of the glottis

- Breathy voice  
(murmur)
- Creaky voice  
(laryngealized)

# Larynx: breathy vs. creaky voice



<https://www.youtube.com/watch?v=BYSZS1LaABQ>







<https://www.youtube.com/watch?v=9cKnUFZjs8k>

- Images: Vocal folds at one moment in the cycle  
(*click links above to see videos*)

# Breathy Voice Examples

- **Gujarati**

Diacritics: [b<sup>h</sup>], [d<sup>h</sup>],[m<sup>h</sup>], [a ]



[bar]	‘outside’	
[bar]	‘twelve’	
[mɐ̃l]	‘palace’	
[mɐ̃l]	‘dirt’	

# Creaky/Laryngealized Voice

- Hausa

[a̰]

Diacritic ↑

[ja:]	‘he’	
[ja:]	‘daughter’	

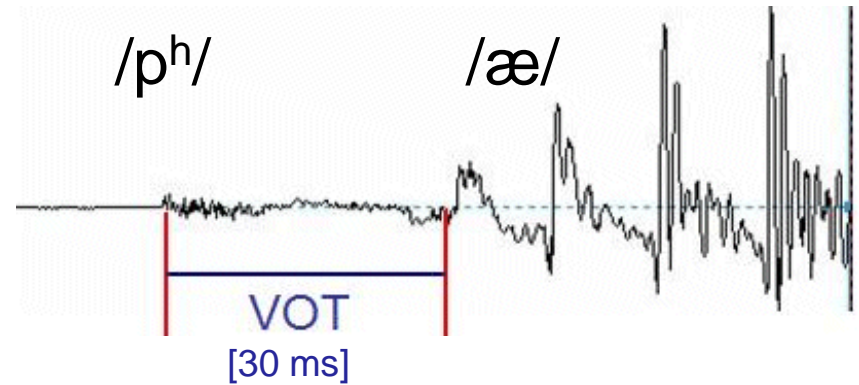
# Voice Onset Time (VOT)

- Important cue for voicing
- For stop consonants at the beginning of syllables
- For example: “**pat**” vs. “**bat**”



Much of what you hear in this contrast has to do with precise timing!

# VOT- cont'd



- Time interval (measured in milliseconds)
- ..between the release of air closure and the beginning of vocal cord vibration (voicing)
- In English, stop consonants with a VOT >25 milliseconds = voiceless (such as /p/),
- VOTs < 25 milliseconds = voiced (such as /b/)



# Try it!

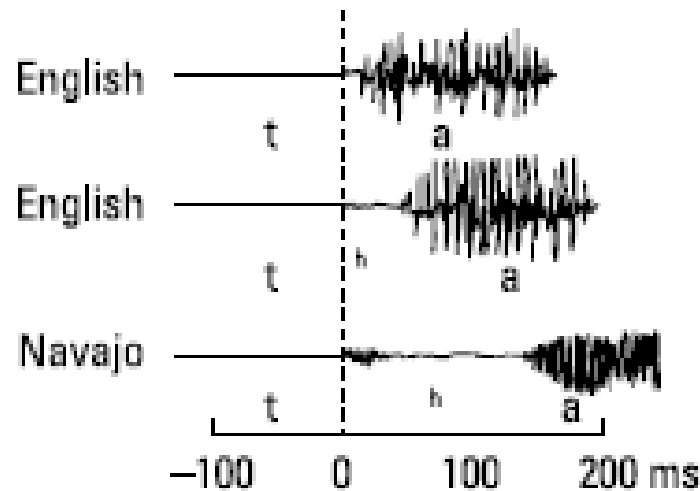
← Short VOT (voiced) /b/, /d/, /g/

Long VOT → (voiceless) /p/, /t/, /k/



# English vs. Navajo

(as in “stop”)



**VOT:**

Short

Longer

Longest

Listen to:

[http://www.utdallas.edu/~wkatz/PFD/Navajo\\_Keshmish.wav](http://www.utdallas.edu/~wkatz/PFD/Navajo_Keshmish.wav)

for very long lag VOT of [k<sup>h</sup>] in Navajo