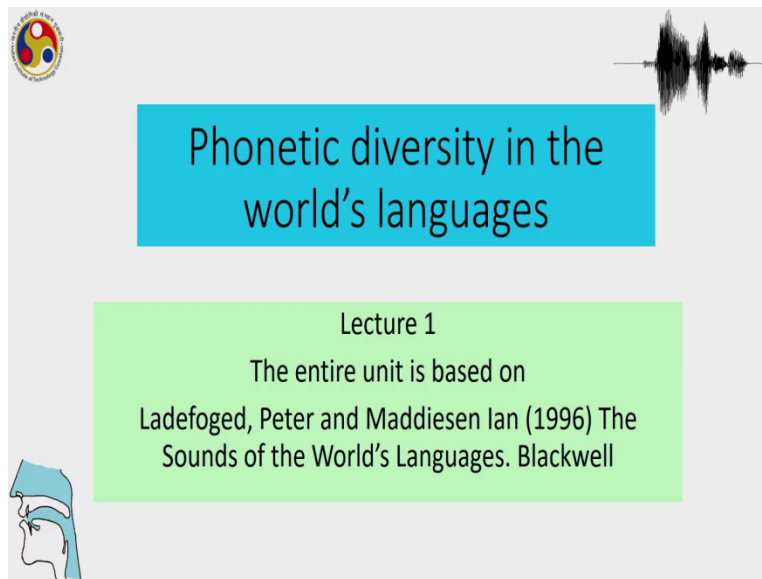


Phonetics and Phonology: A Broad Overview
Professor Shakuntala Mahanta
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Indian Institute of Technology Guwahati
Lecture 06

Linguistic Diversity – Consonants and Vowels in the Languages of the World

Welcome to the second lecture on Phonetics and Phonology: A Broad Overview, NPTEL MOOC Course.

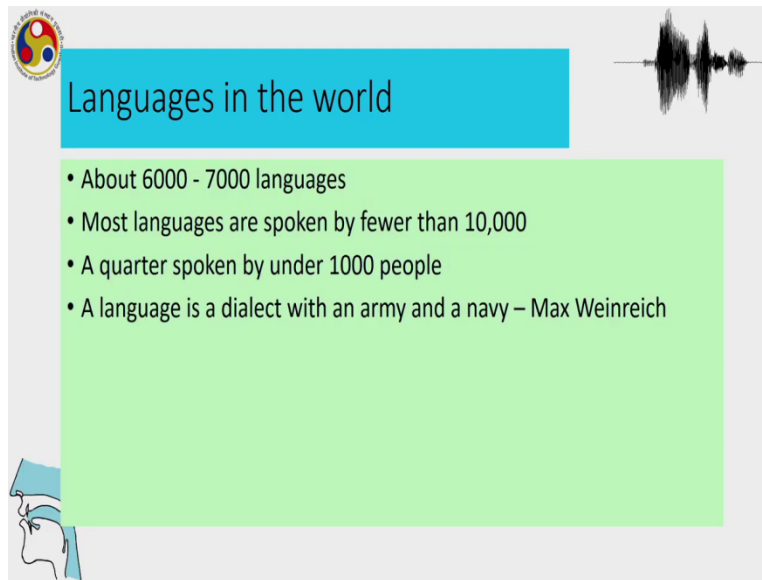
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The slide features a light gray background. In the top left corner is the NPTEL logo, a circular emblem with a stylized 'N' and 'P' in red and blue. In the top right corner is a black waveform representing sound. The main title 'Phonetic diversity in the world's languages' is centered in a blue rectangular box. Below it, 'Lecture 1' is centered in a light green rectangular box. Underneath that, a white rectangular box contains the text: 'The entire unit is based on Ladefoged, Peter and Maddiesen Ian (1996) The Sounds of the World's Languages. Blackwell'. In the bottom left corner, there is a profile illustration of a human head with a blue cap, showing the vocal tract.

So, in this unit, we will cover the Sound of the World's Languages. While doing so, we attempt to discuss the phonetic diversity in the world's languages.

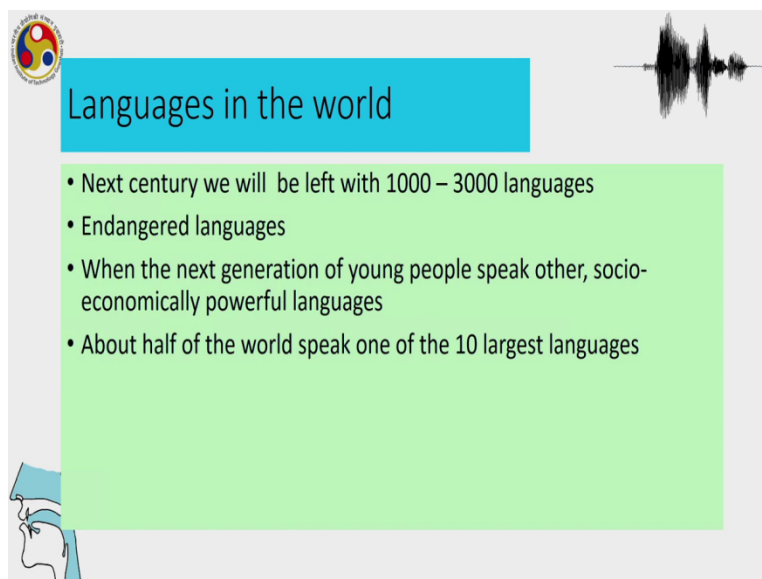
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Slide 1: Languages in the world

- About 6000 - 7000 languages
- Most languages are spoken by fewer than 10,000
- A quarter spoken by under 1000 people
- A language is a dialect with an army and a navy – Max Weinreich

The slide features a blue header with the title 'Languages in the world', a green content area with a bulleted list, and a waveform icon in the top right corner. A small profile icon of a person wearing a blue headscarf is visible in the bottom left corner.



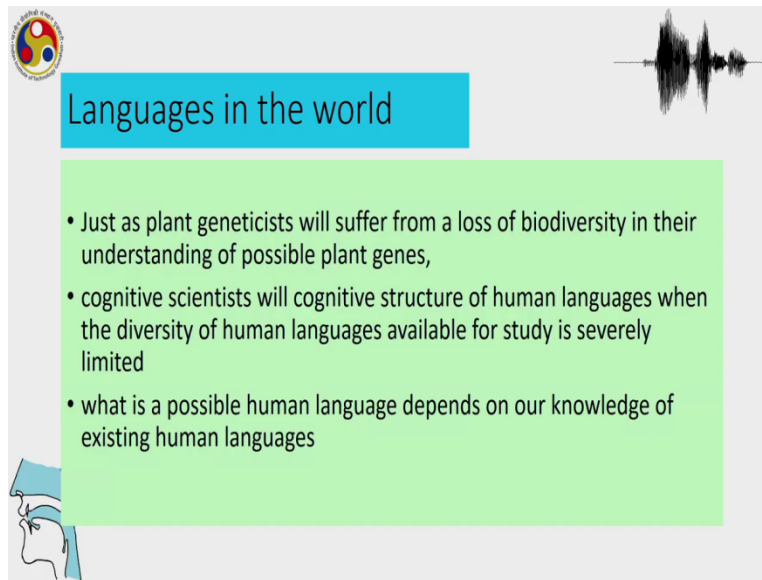
Slide 2: Languages in the world

- Next century we will be left with 1000 – 3000 languages
- Endangered languages
- When the next generation of young people speak other, socio-economically powerful languages
- About half of the world speak one of the 10 largest languages

The slide features a blue header with the title 'Languages in the world', a green content area with a bulleted list, and a waveform icon in the top right corner. A small profile icon of a person wearing a blue headscarf is visible in the bottom left corner.

And in lecture 1, we talked about how there are diverse languages in the world and where many languages are threatened because of various economic reasons and because of the pressure on land and people, more and more people are speaking the larger languages. So, as a result, about half of the world's people speak 1 of the 10 largest languages.

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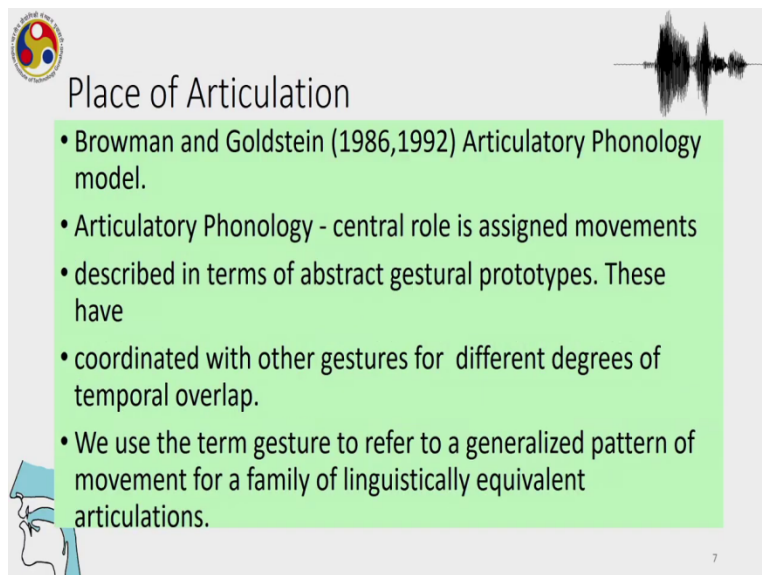
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Languages in the world

- Just as plant geneticists will suffer from a loss of biodiversity in their understanding of possible plant genes,
- cognitive scientists will cognitive structure of human languages when the diversity of human languages available for study is severely limited
- what is a possible human language depends on our knowledge of existing human languages

So, the fear is that as we fear loss of biodiversity in the world, the loss of languages will lead to similar crisis in understanding the cognitive structure of the human brain and the human languages are integral part of our cognitive structure and such loss will be a great loss to humanity.

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Place of Articulation

- Browman and Goldstein (1986,1992) Articulatory Phonology model.
- Articulatory Phonology - central role is assigned movements
- described in terms of abstract gestural prototypes. These have
- coordinated with other gestures for different degrees of temporal overlap.
- We use the term gesture to refer to a generalized pattern of movement for a family of linguistically equivalent articulations.

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Place of articulation



- Range of different locations of articulation
- Five major parts of the vocal tract
- Movable parts – active articulators
- Lips, tip and blade of the tongue
- Tip of the tongue – apical
- Centre part of the tongue – Laminal
- The body of the tongue is behind the blade
- Articulations made with this surface are called Dorsal



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Places of articulation

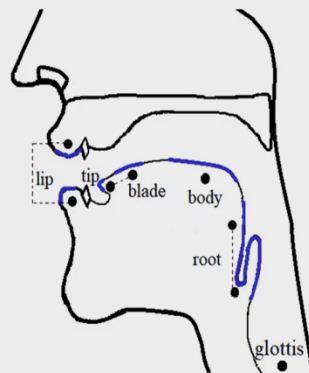


Fig. 1. The five groups of moveable structures forming the active articulators in the vocal tract.



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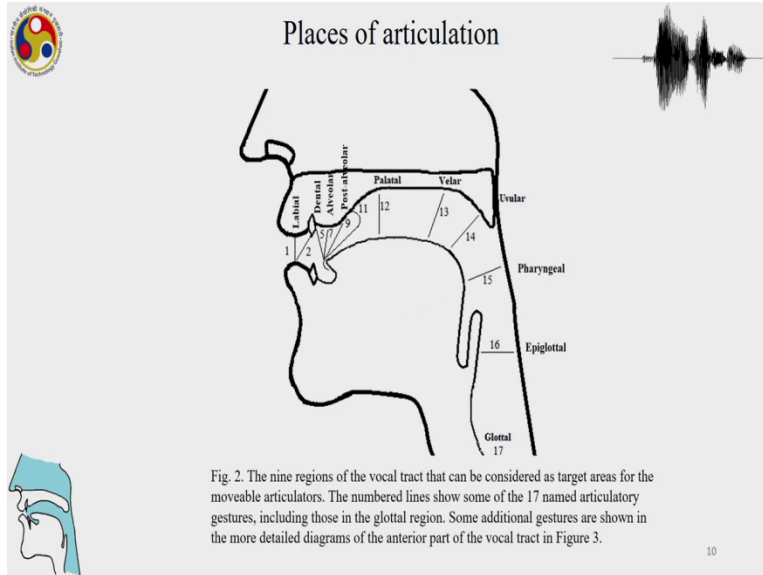


Fig. 2. The nine regions of the vocal tract that can be considered as target areas for the moveable articulators. The numbered lines show some of the 17 named articulatory gestures, including those in the glottal region. Some additional gestures are shown in the more detailed diagrams of the anterior part of the vocal tract in Figure 3.

And to study the phonetic diversity, we talked about place of articulation and different locations of articulation. The 5 major parts of the vocal tract, the moveable parts, and the 17 articulatory gestures that was shown in places of articulation and the 9 regions that are the target areas as shown in the diagram in figure 2.

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Palatals

- Palatal Stops
- 59 languages in UPSID database have palatal stops
- Palatals vs. Velars in Ngwo (spoken in Cameroon)

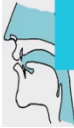
Ngwo			
Laminial dentalalveolar	Laminial palatalalveolar	Palatal	Velar
èdzè	ɖzè	éjè	ègè
(dance)	(fruit)	'postpone'	'grass' [pl.]



Place of Articulation



- Alveolar
- Pairings between active articulator and targets in figures 3 and 4
- Traditional descriptions imply both the active articulator and target
- Not always a complete specification



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Linguo-labial in Tonga



Table 2.3 Words illustrating bilabial, linguo-labial and alveolar places of articulation in Tonga (from Maddieson 1989, Camden 1979)

	BILABIAL	LINGUO-LABIAL	ALVEOLAR
PLOSIVE	peta 'taro'	teje 'butterfly'	taqa 'father'
NASAL	mata 'snake'	meta 'eye'	nunua 'messenger spirit'
FRICATIVE	βiliu 'dog'	ʔatu 'stone'	sasati 'bad'




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CORONAL

Part of Tongue Used

- Apical - Tongue Tip
- Laminal - Tongue Blade
- Dorsal - Back of Tongue



Apical	t	d
Laminal	t̪	d̪












So, we talked about place of articulation as targets and we talked about how the coronal region can be divided into the tip of the tongue, the blade of the tongue, targeting different regions and how we can have sounds that we see in very few languages like linguo-labials that we saw in Vao and linguo-labials in Tonga. And we also saw other differences in articulation like retroflexion, which are seen in some language groups, especially in South Asia, and also retroflexion is seen in Austronesian languages as well as a few other languages.


And we also saw that labials, dentals coronals, the entire coronal region from the dental till the retroflex region have specific ways in which the tongue is used. So, it could be either apical, laminal or dorsal. And then, we looked at the gestures that result in the movement of the tongue or the moveable articulators moving towards a particular target area. And we stopped at the palatal region in the last class, and we saw how languages can have denti-alveolar as in Ngwo, which can have laminal, denti-alveolar, palato-alveolar, palatal and velar 4 regions that stops can contrast.

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 **Other Places of Articulation** 

- One dialect of Hebrew has uvular and pharyngeal fricatives

Hebrew (Oriental dialect)					
	Uvular	Pharyngeal		Glottal	
Initial	 χ imia 'chemistry'	 ħor 'hole' ʕor 'skin'		 hem 'them' ʔor 'light'	
Medial	 ma χ ar 'he sold'	 naħar 'snored' naʕar 'made a donkey noise'		 nahar 'river' jaʔon 'noise'	
Final	 la χ 'for you' [fem.]	 laħ 'humid' naʕ 'moved'		 lah 'for her'	



Now, let us move on to other places of articulation. So after palatal so we can have languages can also have uvular and pharyngeal fricative. So Hebrew can contrast in terms of (pronouncing Hebrew) uvular, let us play a few Hebrew sounds to hear how different they sound; (pronouncing Hebrew) So initial (pronouncing Hebrew) uvular, pharyngeal and glottal (pronouncing Hebrew). Uvular (pronouncing Hebrew), pharyngeal (pronouncing Hebrew), glottal (pronouncing Hebrew). Final (pronouncing Hebrew), uvular (pronouncing Hebrew), pharyngeal (pronouncing Hebrew), and glottal (pronouncing Hebrew).

So, which means even in the dorsal region, we can have a three-way distinction as we saw that, even with regard to coronal languages we can have dental and alveolar and palato-alveolar in language and even in the dorsal region, there can be a few contrast as we see that there could be uvular, pharyngeal and glottal contrast in language such as Hebrew.

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Quechua Contrasts •
Quechua is spoken primarily in Bolivia and Peru.

tʃaka	kujuj	qaʎu
'bridge'	'to move'	'tongue'
tʃʰaka	kʰujuj	qʰaʎu
'large ant'	'to whistle'	'shewi'
tʃʰʰaka	kʰujuj	qʰaʎu
'hoarse'	'to twist'	'tomato sauce'

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So, in Quechua, another language which has pharyngeal sounds, so (pronouncing Quechua), we will come to the symbol which is used here, that is the apostrophe that is used to show these sounds.

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Epiglottals

- Epiglottis to back wall of pharynx
- Rare in Fricatives
- Phonemic contrast between pharyngeal & epiglottal place extremely rare.

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The epiglottis moves to the back wall of the pharynx. That is how epiglottal sounds are produced. They are very rarely seen in fricatives and a phonemic contrast between pharyngeal and epiglottal place is known to be extremely rare.

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Epiglottals in Agul • Agul is spoken in Dagestan, near the Caspian Sea, in Russia

Agul (Burkixan Dialect)		
Voiced pharyngeal fricative	muʕ ^o 'bridge'	muʕar 'bridges'
Voicedless pharyngeal fricative	muħ 'barn'	muħar 'barns'
Voicedless epiglottal fricative	mɛɬ 'whey'	mɛɬɛr 'wheys'
Voicedless epiglottal stop	jaʔ 'center'	jaʔar 'centers'
	sɛʔ 'measure'	sɛʔɛr 'measures'














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Labial-velar stops
Examples from Idoma (spoken in Nigeria):

Idoma			
Labial	àpà 'lizard'	àbà 'palm nut'	áma 'bell'
Labial-velar	àkɔ̀pà 'bridge'	àgbà 'jaw'	aŋmàa 'painted body marks'
Velar	àka 'wheel'	àga 'ax'	ɔ̀ŋáji 'Western rainbow'
Labialized	ɔ̀k ^w ɔ̀ (tree)	àg ^w a 'swimming'	àŋ ^w à 'fortune-telling instrument'

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And let us listen to a few epiglottal in Idoma, a language spoken in Nigeria (pronouncing Idoma).

(Refer Slide Time: 06:55)

Epiglottals in Agul • Agul is spoken in Dagestan, near the Caspian Sea, in Russia

Agul (Burkixan Dialect)		
Voiced pharyngeal fricative	muʕ ^o 'bridge'	muʕar 'bridges'
Voiceless pharyngeal fricative	muħ 'barn'	muħar 'barns'
Voiceless epiglottal fricative	mɛħ 'whey'	mɛħer 'wheys'
Voiceless epiglottal stop	jaʔ 'center'	jaʔar 'centers'
	sɛʔ 'measure'	sɛʔer 'measures'

52

These are the epiglottal in Agul. Agul is spoken in Dagestan near the Caspian Sea in Russia. (pronouncing Agul) This is a voiced pharyngeal fricative, (pronouncing Agul) voiceless pharyngeal fricative, (pronouncing Agul) voiceless epiglottal fricative (pronouncing Agul) and a voiceless epiglottal stop.

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Velar

Stops, nasals, fricatives, and approximants

Velar
k g
ŋ
x ɣ
ɰ
L

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So, now, let us look at a few other types of other places of articulation, we have not heard velar stops, but velars are possible in as stops, as nasals, as fricatives and as approximants.

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Linguolabials

- Linguolabials are formed by touching the blade of the tongue to the upper lip.
- Examples from V'enen Taut, a language spoken in Vanuatu (the South Pacific):

Bilabial	Linguo-labial	Alveolar
patak 'my head'	tatei 'breadfruit'	
namək 'my spirit'	nəŋək 'my tongue'	ʒanu 'island'
naβal 'songfest'	naʒət 'stone'	

55

And other sounds which we have talked about before is that linguolabials which are formed by touching the blade of the tongue to the upper lip, and here are some linguolabial examples from V'enen Taut.

(Refer Slide Time: 08:01)

Coronal

- Yanyuwa Coronal Contrast
- Yanyuwa is spoken in the Northern Territory of Australia
- Yanyuwa has 7 stop place contrasts

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Finally, going back to the coronal contrast, we want to see how many stop contrast can languages possibly have. So, the largest number of stop contrast that is seen in a language called Yanyuwa and we have Yanyuwa data from the Ladefoged and Maddiesen repository and we can see the 7 place stop place contrast in Yanyuwa.

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Yanyuwa
Oral stops

Bilabial	wubuwingu	'for a small female one'
Laminal dental	wuɖurumaya	'laught'
Apical alveolar	wuduru	'full of food'
Apical retroflex	wuɖuɭa	'in the stomach'
Palatoalveolar	wuɖuɭa	'into the grass'
Front velar	ɣuɣuɭu	'sacred'
Back velar	wuɣuɣu	'grandparent'

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And Yanyuwa has bilabial, laminal dental, apical alveolar, apical retroflex. So, all these coronal sounds and then palato alveolar and then a velar and a front velar as well as a back velar, (pronouncing Yanyuwa). So finally, that was the front velar and this is the (pronouncing Yanyuwa) back velar. So, now we can see that apart from glottals, pharyngeal, uvulars; velars there can be contrast in language like Yanyuwa, we can have a contrast between a front velar and back velar.

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**Sounds of the world's languages:
Consonants around the world**

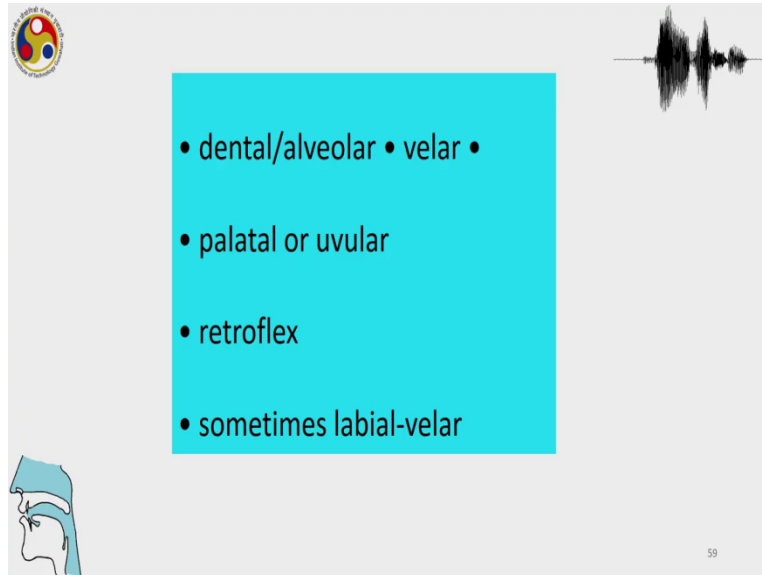
Dental t, Alveolar t, Retroflex ɭ, Palatoalveolar ɭʎ

Fig. 3. Positions of the tongue during the stop closures in the four Nunggubuyu words

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So, language can have 4 different ways in which coronals can contrast that is a dental t, tha, alveolar t, tha and t and a retroflex t and palato alveolar cha.

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- dental/alveolar • velar •
- palatal or uvular
- retroflex
- sometimes labial-velar

So for language, these are the common contrast that we see in languages. So languages can have dental alveolar so it is not very common to have both a dental and an alveolar contrast but that is also seen as we saw examples. But it's most commonly either the dental or alveolar place of articulation. And it is common to have dental alveolar and velar. And if there is a third contrast and it is most common to have a palatal or uvular contrast and if there are fourth or fifth contrast then we can have, language can have a retroflex as a fourth way and sometimes labial-velar.

So, these, this is the 5 way contrast that we can see stops contrasting in languages. However, we also saw Yunyuwa which had 7 way stop contrast. So, that was the place of articulation. And we saw that we can have coronals, we can have dorsals, we can have radicals, and we will summarize all the places of articulation towards the end of this lecture.

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This slide features a teal header with the text "Manner of articulation". To the right is a black waveform representing a sound signal. In the bottom left corner, there is a sagittal cross-section diagram of the human head and neck, highlighting the vocal tract in light blue. A small number "60" is visible in the bottom right corner.

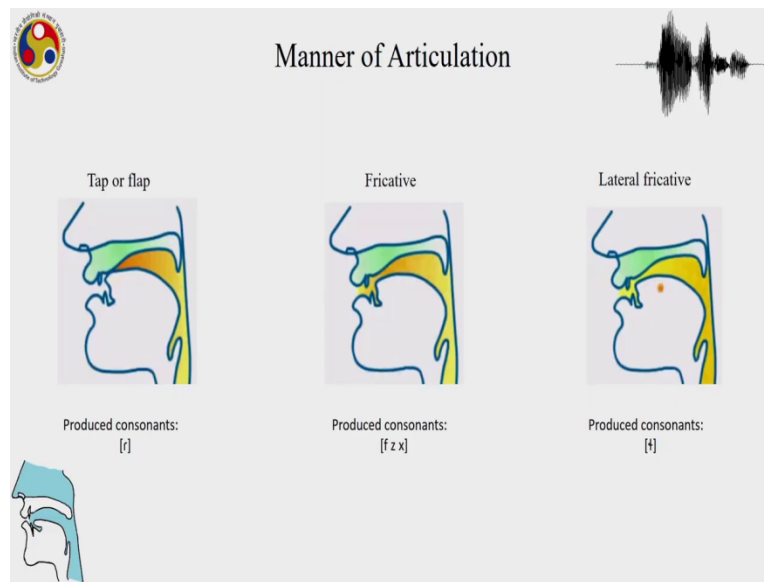
This slide is titled "Manner of Articulation" and displays three categories of articulation, each with a sagittal cross-section diagram and a list of produced consonants:

- Plosive:** The diagram shows the tongue making contact with the roof of the mouth. Produced consonants: [p t k].
- Nasal:** The diagram shows the tongue touching the roof of the mouth while the velum is lowered, allowing air to pass through the nasal cavity. Produced consonants: [m n].
- Trill:** The diagram shows the tongue vibrating against the roof of the mouth. Produced consonants: [r].

Each diagram is color-coded to show the vocal tract. A waveform is present in the top right corner, and a sagittal cross-section diagram is in the bottom left corner.

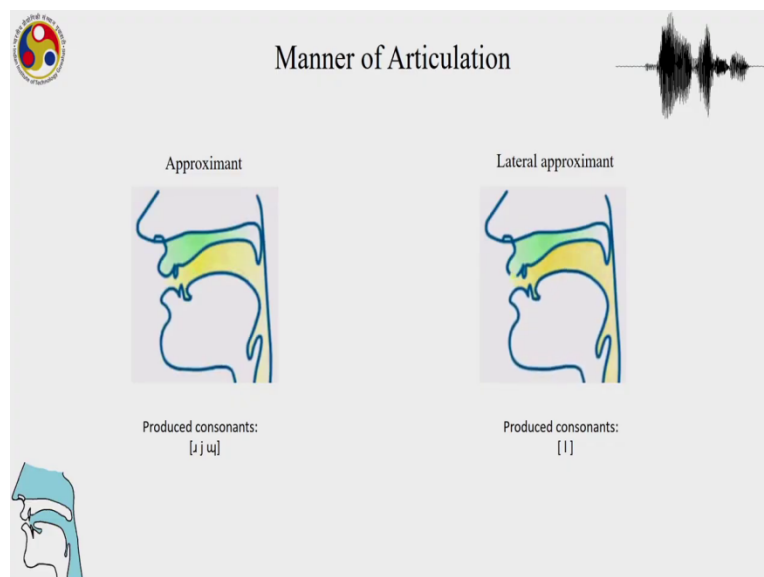
We have seen manner of articulation in the previous lecture on articulatory phonetics. Stops require complete closure, nasals also required to complete closure if they are stopped, nasal stops, but then the velum is lowered and air is released through the nose. And then we have rapid sort of vibrating meeting motion for the production of trills.

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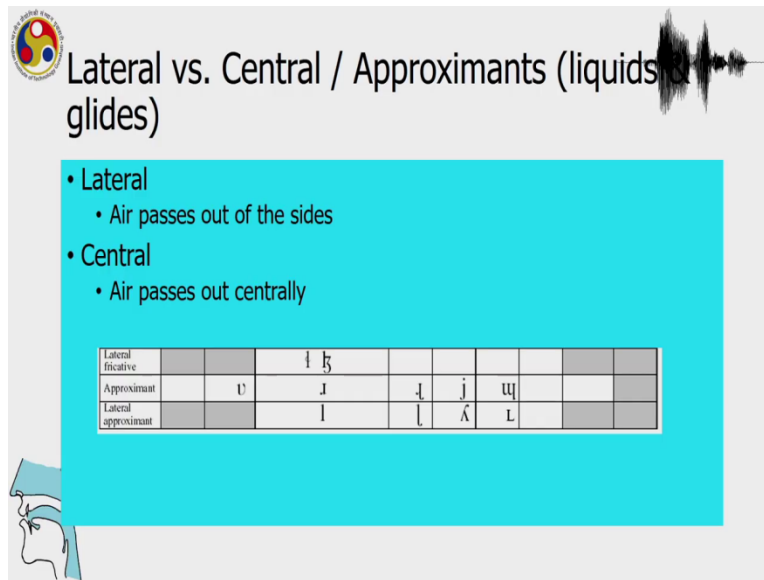
And then we have tap or flap and then we have fricative where the occlusion is not like that of the stop where it is not complete closure, but it is harsher and slower release. And we also saw that there could be a difference between centrality and laterality in languages. So we can also have lateral fricatives where the air is released from both sides of the articulator.

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Then we can have approximants where we do not have complete occlusion and we have the occlusion not as narrow as that of stops or fricatives and then we have lateral ones and we have central and lateral approximants.

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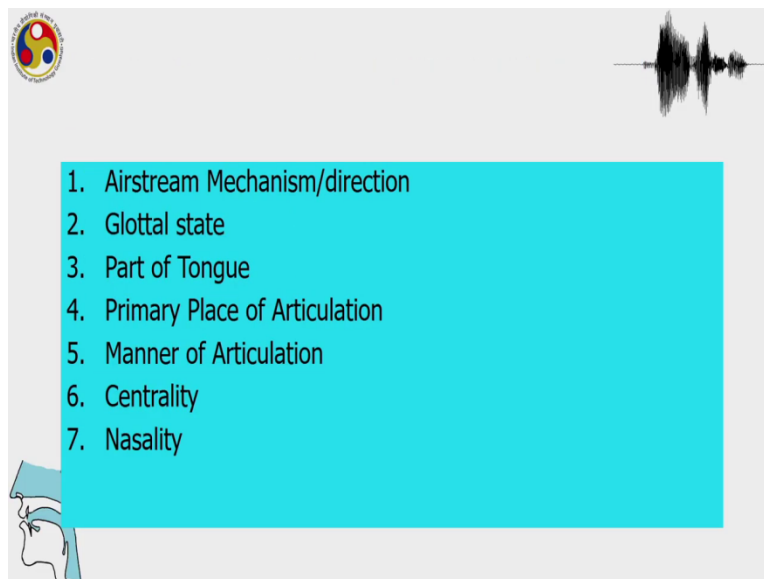
Lateral vs. Central / Approximants (liquids glides)

- Lateral
 - Air passes out of the sides
- Central
 - Air passes out centrally

Lateral fricative			ɬ	ɮ					
Approximant	ʋ		ɹ	ɻ	ɻ̥	ɻ̥̥	ɻ̥̥̥		
Lateral approximant			l	ɭ	ʎ	ʎ̥	ʎ̥̥		

So, there are 2 lateral fricatives and there are 4 lateral approximants in the languages of the world.

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1. Airstream Mechanism/direction
2. Glottal state
3. Part of Tongue
4. Primary Place of Articulation
5. Manner of Articulation
6. Centrality
7. Nasality

Now, what are the main things that we have, where we need to consider when we are studying sounds. We saw place of articulation which is number 4 here to a large extent with a manner of articulation, there are a couple of more things which gives the sounds their particular shape, and the color. So, the things that which are important apart from place of articulation, manner of


articulation is the airstream mechanism, the glottal state, the part of the tongue laminal or epical, or sub epical, etc.

And centrality and nasality are also, these 7 aspects give the consonant sounds that particular shape and flavor and color actually, and so, even though we have studied in our basic course, in phonetics the 3 things place of articulation, manner of articulation, glottis, are most important. But now, we see that there are additional factors, which have to be taken into account while studying consonants apart from the 3 major factors and all these 7 aspects play their role in the production of consonants. Let us see something that we have not seen so far.









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Voiceless Nasals



- Nasalization and fricatives are not compatible
- The existence of nasal fricatives is very often disputed
- voiceless nasals in **Burmese**

NASALS	BILABIAL	DENTAL	PALATAL	VELAR
VOICELESS	ŋá  om'	ŋá:  asal'	ɟá:  siderate'	ŋá  row'
VOICED	má  t up'	ná:  ain'	ɟá:  ight'	ŋá  sh'

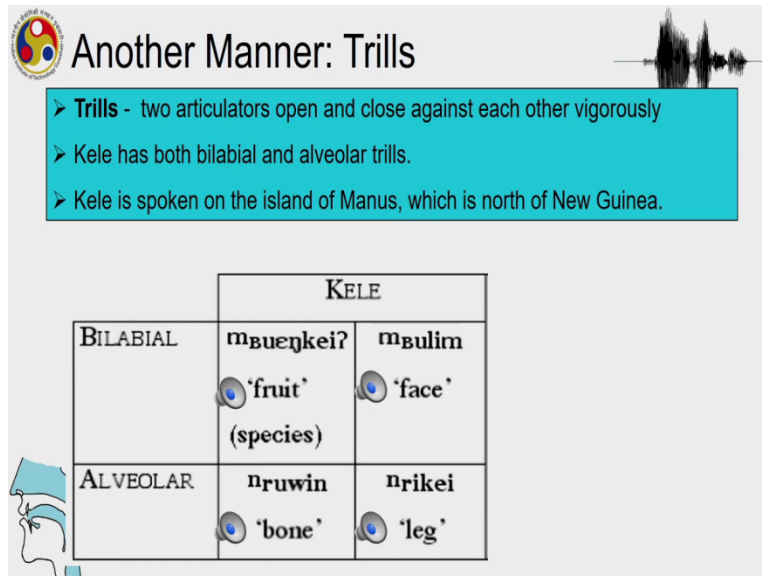


For instance, let us (pronouncing Burmese) see voiceless nasals. As we know nasals involve the release of air through nasal cavity because the lowering of the velum and there is already another closure in the vocal tract. So nasalization and fricatives, are not compatible. And the existence of a nasal fricative is very often disputed. However, it is possible to have nasals which are voiceless. (pronouncing Burmese)

These are voiceless nasals from Burmese, Burmese can have contrastive nasals which are along the place of articulation of bilabial, dental, palatal and velar. And in all these places of articulation, they can contrast based on the state of the glottis, that is, voiceless versus voiced. So Burmese has voiceless and voiced nasals in all the places of articulation possible for the nasals, that is, bilabial, dental, palatal and velar.

(pronouncing Burmese) that is a bilabial voiceless nasal, (pronouncing Burmese) bilabial dental nasal, (pronouncing Burmese) bilabial palatal nasal, (pronouncing Burmese) that is a bilabial velar nasal. So, (pronouncing Burmese) all these nasals that you heard were voiceless nasals. So, when you heard the voiceless nasal, you heard whispering sound along with the production of nasal and that is a characteristic of voiceless sonorants.

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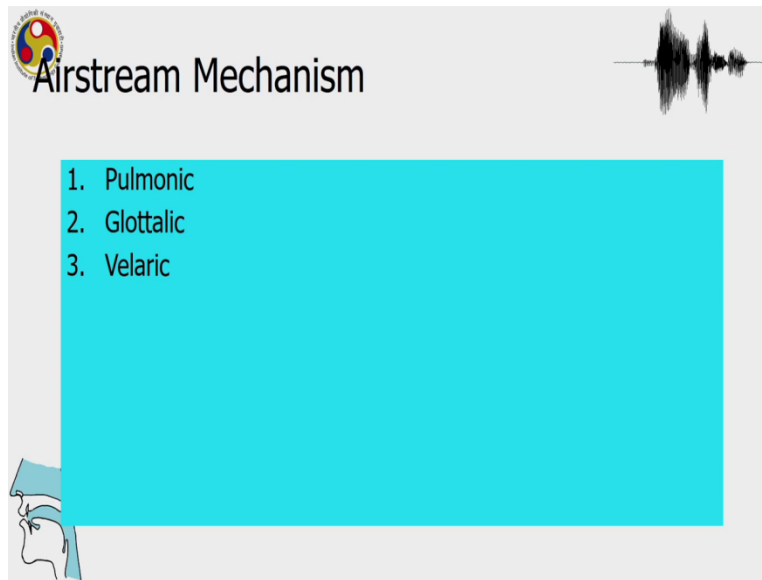
Another Manner: Trills

- **Trills** - two articulators open and close against each other vigorously
- Kele has both bilabial and alveolar trills.
- Kele is spoken on the island of Manus, which is north of New Guinea.

		KELE	
BILABIAL	mbueŋkeiʔ ‘fruit’ (species)	mbulim ‘face’	
ALVEOLAR	ɲruwin ‘bone’	ɲrikei ‘leg’	

So, another manner of articulation that we have not discussed at all so far is that of trills. So, trills involve 2 articulators which open and close against each other rapidly and vigorously. So, Kele is a language which is spoken in the island of Manus, which is north of New Guinea, Kele has both bilabial and alveolar trills. Let me play the bilabial and the alveolar, (pronouncing Kele). So, those were the bilabial, (pronouncing Kele) that is bilabial, (pronouncing Kele) this is alveolar. So, now, we have seen voiceless nasals and trills which are bilabial or alveolar and something which we had not seen so far.

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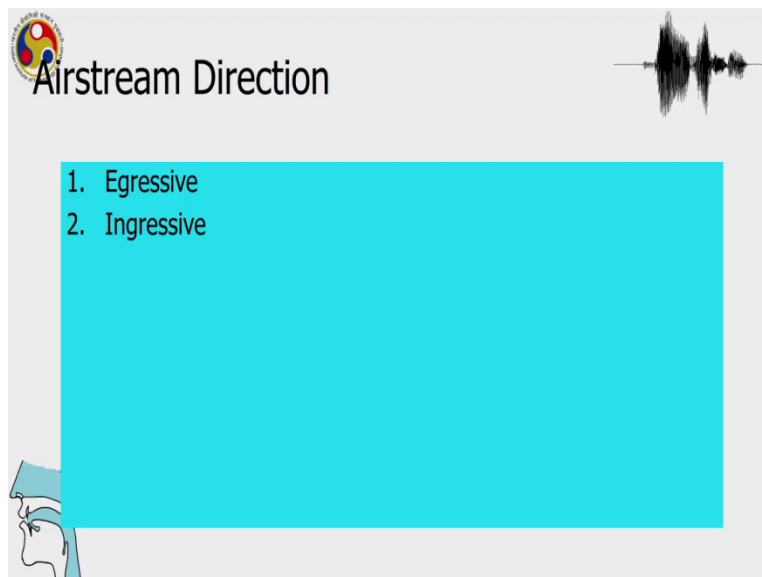
The slide features a logo in the top left corner, a waveform in the top right, and a profile of a human head in the bottom left. The main content is a cyan box containing a numbered list.

Airstream Mechanism

1. Pulmonic
2. Glottalic
3. Velaric

And other aspects, which we will cover is that of the airstream mechanism that is pulmonic, glottalic or velaric, languages can contrast.

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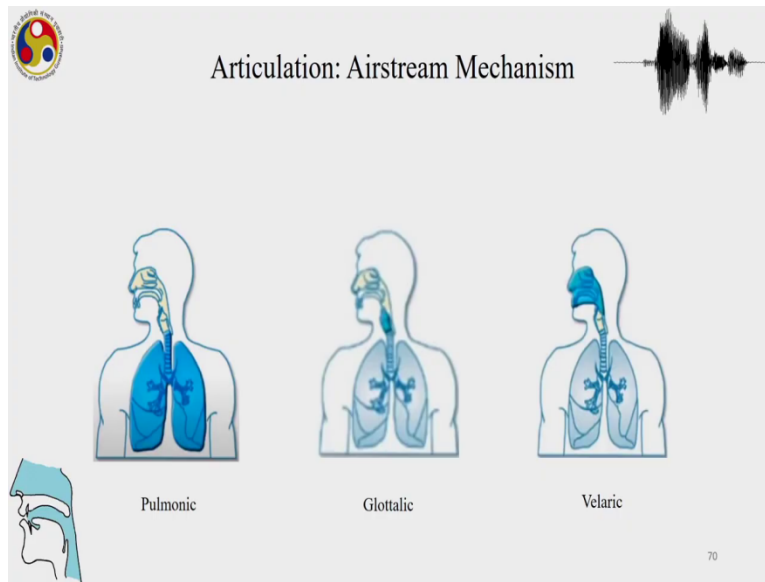
The slide features a logo in the top left corner, a waveform in the top right, and a profile of a human head in the bottom left. The main content is a cyan box containing a numbered list.

Airstream Direction

1. Egressive
2. Ingressive

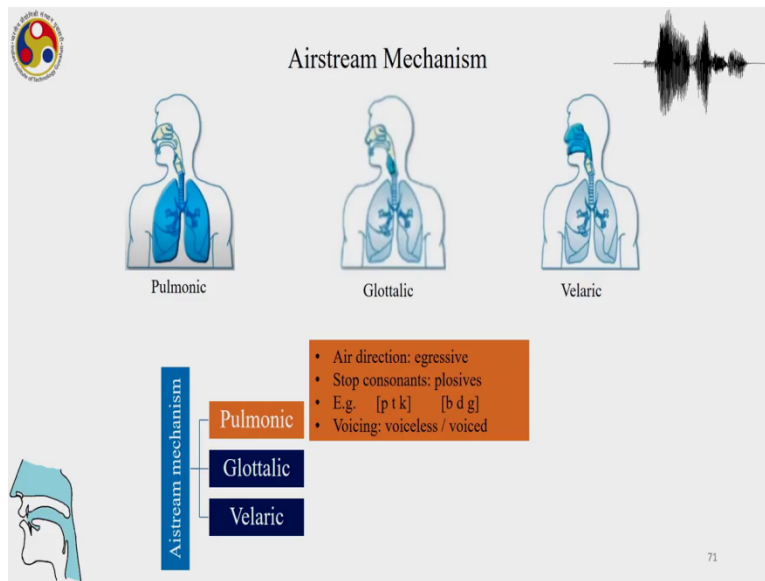
And importantly, another aspect that we have to consider in this lecture is that of airstream direction, which also gives a particular shape and color and flavor of sounds, and which may not be available in the languages which are most commonly seen or spoken in the languages of the world.

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So, the pulmonic egressive airstream mechanism is the one which is most commonly employed for the production of sounds. However, there are sounds, which do not use the pulmonic egressive airstream mechanism and they can be glottalic, they can be velaric as well.

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And for the production of the pulmonic airstream mechanism egressive, the air is pushed out the lungs and then the vocal tract gives the shape to the sounds which are produced. So, all normal sounds are produced by a pulmonic airstream mechanism.

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Airstream Mechanism

Pulmonic Glottalic Velaric

Airstream mechanism

- Pulmonic
- Glottalic
 - Egressive
 - Ingressive
- Velaric

- Air direction: egressive
- Stop consonants: ejectives
- E.g. [p' t' k']
- Voicing: voiceless

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Airstream Mechanism

Pulmonic Glottalic Velaric

Airstream mechanism

- Pulmonic
- Glottalic
 - Egressive
 - Ingressive
- Velaric

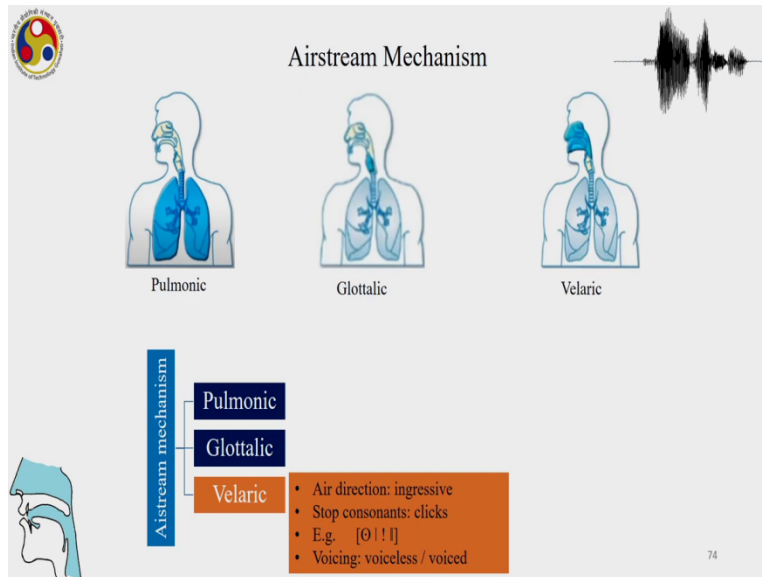
- Air direction: ingressive
- Stop consonants: implosives
- E.g. [ɓ ɗ]
- Voicing: voiced

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And also then there are others like the glottalic, where the airstream is egressive and can produce sounds like ejectives and we have mostly voiceless egressive sounds. And then we have here, please note that this is the symbol that was used for the Quechua ejectives with the apostrophe, which we said that we will discuss later in the last lecture. And we already heard a few ejectives in Quechua in last in the previous lecture, and the other air direction, that is possible from the glottalic airstream mechanism is that of ingressive and stop consonants can be implosive and they are mostly voiced.


So, the glottalic airstream produces sounds both in the egressive and that is the air flowing out and ingressive that is the air sucked in and within both directions, sounds are produced.

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In the velaric, airstream mechanism sounds are produced with the air which is sucked inside the velaric region and what is produced with that sound with that air by the velaric airstream is called clicks. So, these are the 3 airstream mechanisms and of which pulmonic is the most commonly used. And then there is glottalic. And velaric. So, talking now about contrast and parameters.

(Refer Slide Time: 20:21)




Contrast and parameters

- Making speech sounds
- Airstream mechanism
- Moving air by exhaling from lungs - pulmonic egressive airstream
- Glottalic egressive airstream – ejective sounds
- Closures in the vocal tract and the vocal folds
- Compressed air released with high pressure from oral closure

Making speech sounds involves the airstream mechanism moving air by exhaling from lungs and pulmonic egressive extreme, the glottalic egressive, extreme and ejective sounds. Closures in the vocal tract and vocal folds and compressed air released with high pressure from oral closure. So, this is how contrast happens as a result of the use of these airstream mechanisms. Let us look at another group of sounds which are found in some languages.



(Refer Slide Time: 21:13)



SyrA Emphatics

		Plosive		Fricative	
		plain	Emphatic	Plain	Emphatic
Alveolar	Voiceless	ta:r 'revenge'	tʃa:r 'flew'	se:f 'sword'	sʕe:f 'summer'
	Voiced	darb 'path'	dʕarb 'hitting'	zəl 'Humiliation'	zʕəl 'shadow'

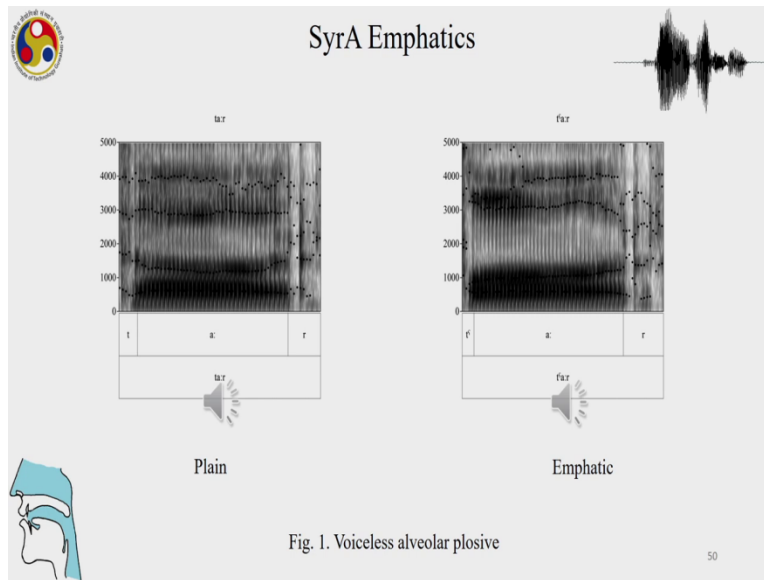
Table 1. Emphatics in Syrian Arabic

So here we have Syrian Arabic. So in Arabic, it is in some varieties of Arabic, we find differences in the way obstruents are produced and these are called emphatics. So what are emphatics? Emphatics are earlier obstruents which are now, which now either have a palatalized,

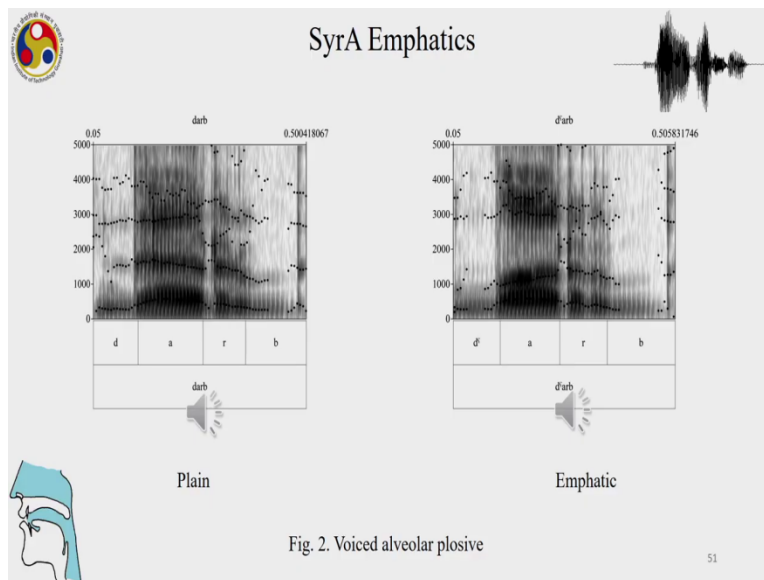
glottalized or laryngealized sounds, so they have a secondary articulation, and that makes them emphatic. So this difference between plain and emphatic consonants in Syrian Arabic.

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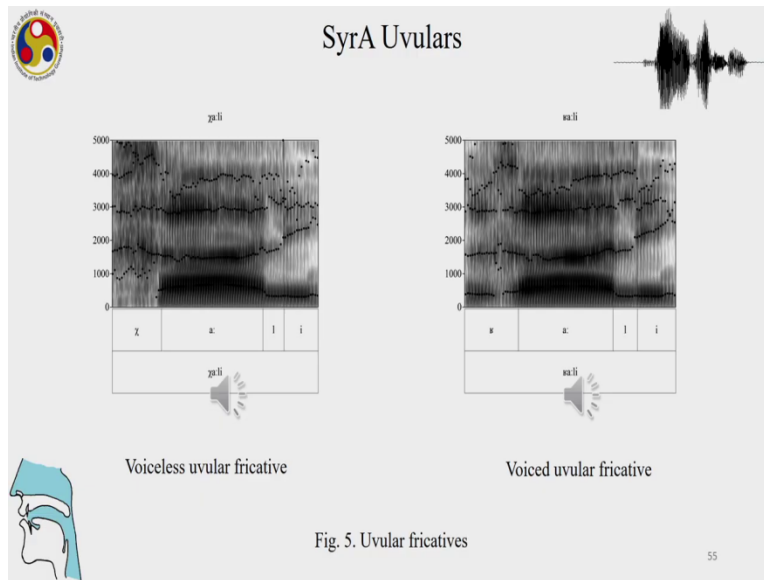
So let us look at a few of them (pronouncing Arabic). That is a plain obstruent, plain stop sound glossal sound. And this is an emphatic, which is glottalized (pronouncing Arabic). So this is a voiceless alveolar plosive in Syrian Arabic, which can contrast based on whether it is an emphatic or a non-emphatic, so it is a plosive either, it is (pronouncing Arabic) this one (pronouncing Arabic) or this one with a glottalized quality to it.

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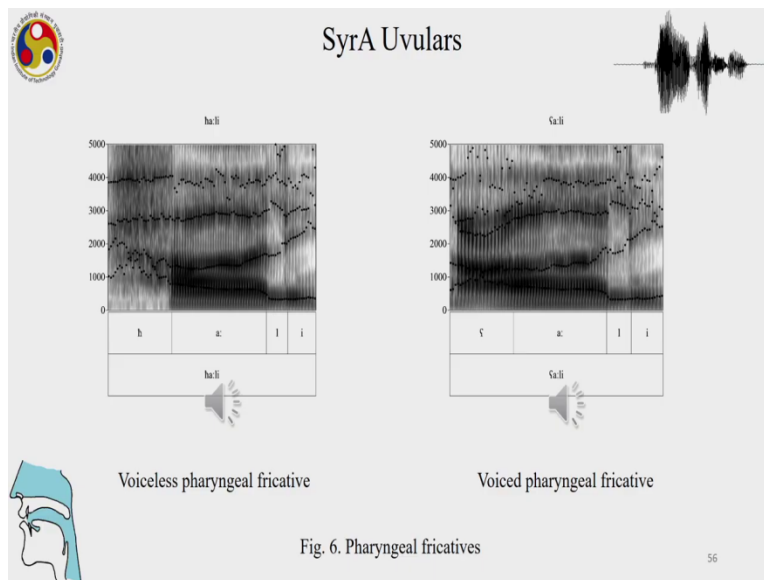
So, another one here is the da, the voiced alveolar plosive, which can be either a plain one or it can be an emphatic one (pronouncing Arabic).

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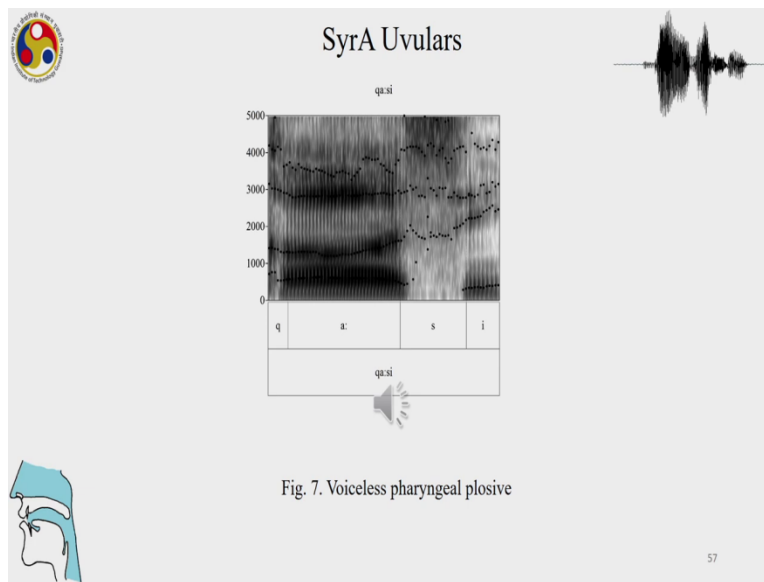
(pronouncing Arabic) So, that is a voiceless uvular fricative. (pronouncing Arabic) That is a voiced uvular fricative. So, both examples are from Syrian Arabic.

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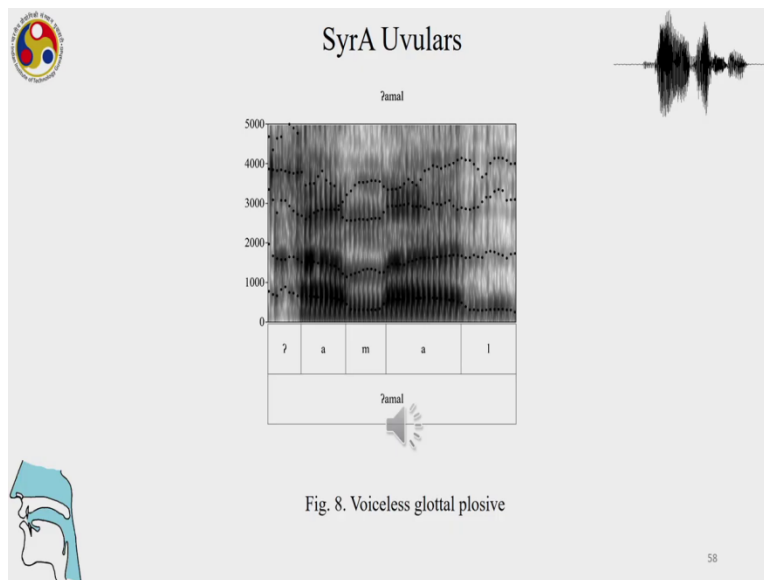
Then there are the pharyngeal fricatives in this variety of Arabic. So, again, we can have the fricative which is a non-emphatic like a plain one and an emphatic one. (pronouncing Arabic)

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(pronouncing Arabic) So we can also have a voiceless pharyngeal plosive.

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(pronouncing Arabic) Glottal, voiceless glottal plosive etc.

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Other Places of Articulation




• One dialect of Hebrew has uvular and pharyngeal fricatives

**Hebrew
(Oriental dialect)**

	Uvular	Pharyngeal	Glottal	
Initial	 ħ imia <small>'chemistry'</small>	 ħ or <small>'hole'</small> ʕ or <small>'skin'</small>	 h em <small>'them'</small> ʔ or <small>'light'</small>	
Medial	 maħ ar <small>'he sold'</small>	 naħ ar <small>'snored'</small> naʕ ar <small>'made a donkey noise'</small>	 na har <small>'river'</small> jaʔ on <small>'noise'</small>	
Final	 laħ <small>'for you' [fem.]</small>	 laħ <small>'humid'</small> naʕ <small>'moved'</small>	 la h <small>'for her'</small>	



SyrA Uvulars




	Uvular	Pharyngeal	Glottal
Plosive		qa:si <small>'hard'</small>	ʔamal <small>'hope'</small>
Fricative	ʒa:li <small>'my uncle'</small>	ħa:li <small>'expensive'</small>	ħa:li <small>'my condition'</small>
			ʕa:li <small>'high'</small>

Table 2. uvular, pharyngeal & glottal sounds in Syrian Arabic


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So, a dialect of Hebrew also has uvular and pharyngeal (pronouncing Hebrew) and some of these overlapped and the distinction here is again (pronouncing Hebrew) uvular, pharyngeal and glottal (pronouncing Hebrew). So, here we can see, (pronouncing Hebrew) the uvular sound (pronouncing Hebrew) the pharyngeal sounds can be contrastive. Earlier, we saw that the uvular fricatives in Arabic, the uvular pharyngeal and glottal sounds are contrast among the fricatives. So, in the plosives we have pharyngeal and glottal.

(Refer Slide Time: 25:13)




SyrA Emphatics



		Plosive		Fricative	
		plain	Emphatic	Plain	Emphatic
Alveolar	Voiceless	ta:r 'revenge'	tʰa:r 'flew'	se:f 'sword'	sʰe:f 'summer'
	Voiced	darb 'path'	dʰarb 'hitting'	zəl 'Humiliation'	zʰəl 'shadow'


Table 1. Emphatics in Syrian Arabic




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And apart from that, we also have emphatic sounds which are obstruents, but which have a glottalized or glottalized can be glottalized, pharyngealized or laryngealized depending on various other factors mostly historical.

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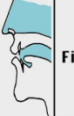


Other Places of Articulation



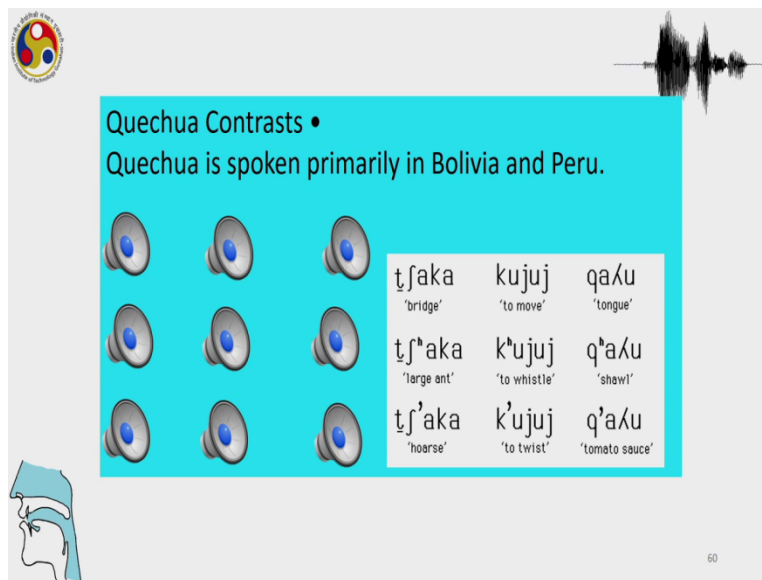
- One dialect of Hebrew has uvular and pharyngeal fricatives

Hebrew (Oriental dialect)					
	Uvular	Pharyngeal	Glottal		
Initial	ħimja 'chemistry'	ħor 'hole' ʕor 'skin'	hem 'them' ʔor 'light'		
Medial	maħar 'he sold'	naħar 'snored' naʕar 'made a donkey noise'	naħar 'river' jaʔon 'noise'		
Final	laħ 'for you' [fem.]	laħ 'humid' naʕ 'moved'	lah 'for her'		












So, now, we see that in Hebrew, there is (pronouncing Hebrew) the Arabic variety that contrasts with pharyngeal fricative and also (pronouncing Hebrew) glottal fricative and glottal stop.

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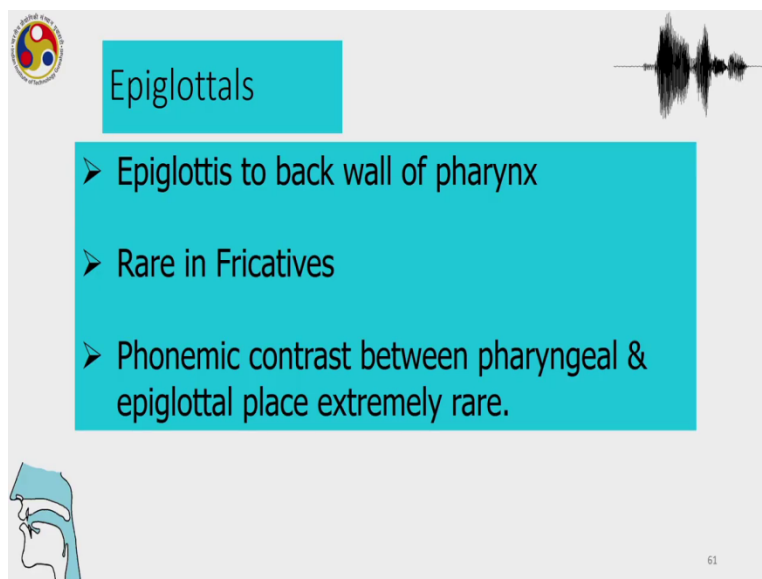
Quechua Contrasts •
Quechua is spoken primarily in Bolivia and Peru.

			tʃaka 'bridge'	kujuj 'to move'	qaʎu 'tongue'
			tʃʰaka 'large ant'	kʰujuj 'to whistle'	qʰaʎu 'shewi'
			tʃʼaka 'hoarse'	kʼujuj 'to twist'	qʼaʎu 'tomato sauce'

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Quechua also has uvular sounds and we will play these Quechua sounds and Quechua will be important to talk about another type of sounds called epiglottals, so here (pronouncing Quechua).

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Epiglottals

- Epiglottis to back wall of pharynx
- Rare in Fricatives
- Phonemic contrast between pharyngeal & epiglottal place extremely rare.

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Epiglottals, so, the sounds which are produced towards the back of the mouth, where the epiglottis makes a constriction to the back wall of pharynx. These are called epiglottals, and they are rarely found in fricatives. And what is often found is phonemic contrast between pharyngeal so, what is often not found is a pharyngeal and an epiglottals contrast.

in Idoma among labials, we have labial, we have labial velar, and we also have labialized, apart from velar sound. (pronouncing Idoma) and (pronouncing Idoma) this is the labial velar sound.

We can see the symbol here that is used for the labial velar, we use this diacritic to show that it is one sound, which is both labial and velar as you can see in the text here, that one velar sound, one labial sound, one velar, one labial, one velar, one labial is put together by a diacritic on top.

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Velar

Stops, nasals, fricatives, and approximants

Velar
k g
ŋ
x ɣ
ɰ
l

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So, then, among the back sounds we also have velars. So, velars can be stops, nasals, fricatives and approximants. So, velar stops and velar nasals are quite common across languages. Also the velar fricatives and the velar approximants may not be very common, but these definitely are those stop contrasts found in plenty of languages of the world.

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Linguolabials

- Linguolabials are formed by touching the blade of the tongue to the upper lip.
- Examples from V'enen Taut, a language spoken in Vanuatu (the South Pacific):

Bilabial	Linguo-labial	Alveolar
patak 'my head'	ṭatei 'breadfruit'	
namək 'my spirit'	nənək 'my tongue'	ḵanu 'island'
naβal 'songfest'	naḵət 'stone'	

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So, linguolabials was a sound that we talked about in the beginning of this lecture. So, going now to the front part of our articulation system, let us review the few of the sounds there, linguolabials are formed by touching the blade of the tongue to the upper lip. So, now that we have seen epiglottals, pharyngeal, uvulars, velars which are the back sounds produced at the back region. Let us look at linguolabial. So, these are the 3 bilabial, linguolabial in V'enen Taut. (pronouncing V'enen Taut) So, again, linguolabials are rare in the languages world.

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Coronal

- Yanyuwa Coronal Contrast
- Yanyuwa is spoken in the Northern Territory of Australia
- Yanyuwa has 7 stop place contrasts

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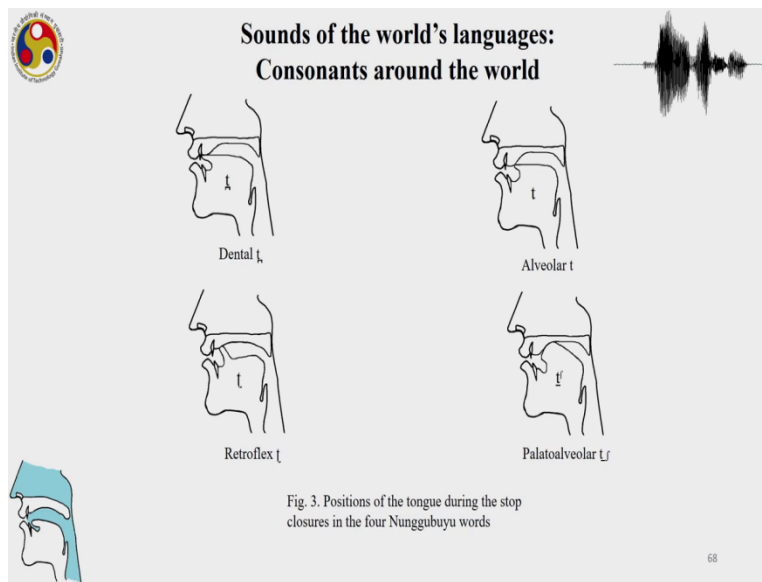
And talking about the rare sounds, in the front part, we have the coronals and among coronals, they can be languages like Yanyuwa and a few other languages which have at least 7 stop place contrast in the coronal region alone.

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Place of Articulation	IPA Symbol	Meaning
Bilabial	wubuwingu	'for a small female one'
Laminal dental	wuɖurumaya	'laught'
Apical alveolar	wuduru	'full of food'
Apical retroflex	wuɖɭa	'in the stomach'
Palatoalveolar	wuɖɭa	'into the grass'
Front velar	gugulu	'sacred'
Back velar	wugugu	'grandparent'

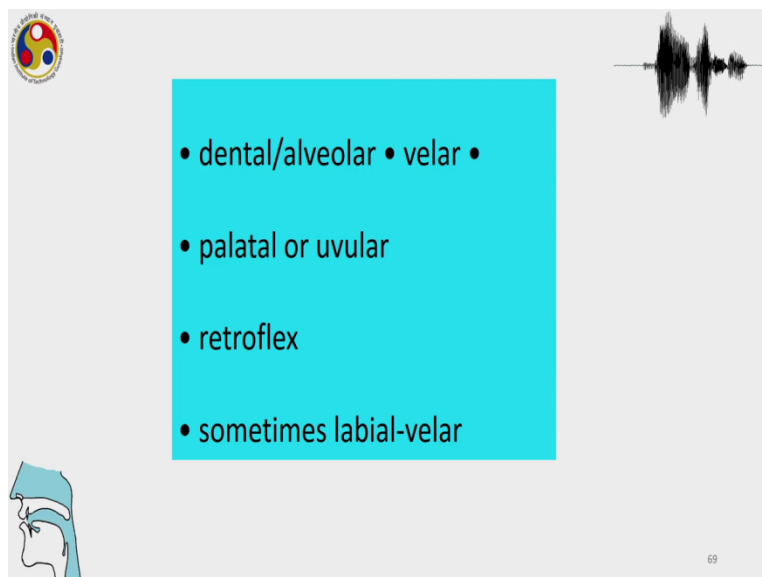
So these are the Yanyuwa stop contrast and all of them till the palato alveolar the apical retroflex, apical, alveolar dental, bilabial are the coronal contrast and there are 2 back sounds, one is a front velar and one is a back velar. (pronouncing Yanyuwa) That is a bilabial laminal dental, (pronouncing Yanyuwa) apical alveolar, (pronouncing Yanyuwa) apical retroflex, (pronouncing Yanyuwa) palato-alveolar and front velar versus back velar (pronouncing Yanyuwa).

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So, talking about contrast, in the coronal region, we have languages like Nunggubuyu, so where the stop contrast can be seen in among the dental, alveolar, retroflex and palato-alveolar. So, these are the gestures that you see here for the dental, for the alveolar, for the retroflex and the palato-alveolar. And it is possible so even though there are not a lot of languages, which contrast the dental with the alveolar because those place of articulations are quite close in the vocal tract, but they are seen in quite a few languages. And here we have one language which contrasts with dental and alveolar and retroflex and also palato-alveolar.

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So talking about contrast in languages, dental and alveolar, most often if there is a dental contrast, an alveolar contrast is not there. So this is summarizing the most common inventories, it is not to say that the dental and alveolar contrast does not exist as we have seen, just seen it does exist. However, most commonly if there is a dental stop, then the corresponding alveolar stop or fricative is not there.

So if that is there, if dental in alveolar or alveolar stop or fricative contrast is there, then very often among the stops, velar is also found. And if there is a third contrast, and it is common to find the palato-alveolar, palatal or uvular if some languages have very many back contrast, then if there is sometimes another place of articulation that could be retroflex and sometimes it could be labial velar.

So, these are the common patterns seen in the languages of world, but as we have seen, there are so many variations that are possible to have among the places of articulation that you can have linguolabials, you can have other places like pharyngeals, epiglottals, etc., and which are not the most commonly seen contrast in the languages of the world. But we have covered the rare contrast as well as we are trying to give you an overview of not just a rare contrast, but also what is generally seen in the language of the world.

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Lateral vs. Central / Approximants (liquids glides)

- Lateral
 - Air passes out of the sides
- Central
 - Air passes out centrally

Lateral fricative			ɬ	ɮ					
Approximant	ʋ		ɹ	ɻ	ɻ	ɻ	ɻ	ɻ	ɻ
Lateral approximant			l	ɭ	ʎ	ʎ	ʎ	ʎ	ʎ

So, before we go on to other aspects of sound production, let us see a few other things like laterality versus centrality. So, a lateral sound is when air passes out through the sides central are the ones when air passes out centrally.

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1. Airstream Mechanism/direction
2. Glottal state
3. Part of Tongue
4. Primary Place of Articulation
5. Manner of Articulation
6. Centrality
7. Nasality

- Lateral
 - Air passes out of the sides
- Central
 - Air passes out centrally

Lateral fricative				ɬ	ɮ					
Approximant		ʋ	ɹ	ɻ	ɻ̥	ɻ̥̥̥	ɻ̥̥̥̥̥			
Lateral approximant			l	ɭ	ʎ	ʎ̥	ʎ̥̥̥			

Now, talking about the various aspects of sound production, we just saw lateral versus central, there are other things as well. So, when we discussed articulatory phonetics, if you recall, then we said that the 3 most important things which help you distinguish consonants is place of articulation, manner of articulation and state of the glottis. But, as we see now, that there may be

quite a few other properties among consonants, which also give consonants their particular shape and their particular distinctive properties.

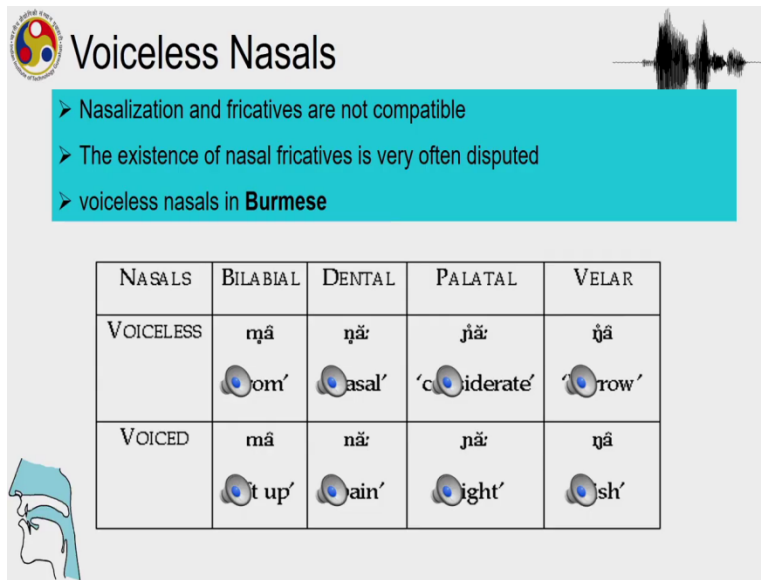
So, that is not just because of place of articulation, manner of articulation, there can be other things like airstream mechanism, the direction of airstream also. So whether it is the airstream which is coming in or it is the airstream, which is inhale or exhale. So, the mechanism which is used is the pharyngeal, the glottalized or the velarized airstream mechanism and glottal state which we already know.

But apart from the glottal state of voiced and voiceless, there could be other phonation differences. So, it could be both for vowels and consonants, vowels and consonants can be both breathy and creaky. Apart from the modal phonation voicing and the most open state of the glottis that is voiceless and the most closed state of that of the glottal stop, there could be other properties that give consonants their distinctive features and consonants as well as vowels.

And the other aspect is which we studied, which we looked at in the beginning of this lecture is that a part of tongue is it apical, laminal, subapical is a dorsal all those properties also give consonants a particular distinctive properties. So, a place of articulation and remember, there is not just primary place of articulation, there could be also secondary as we saw in the emphatic consonants in Syrian Arabic and they could be any depending on language, you could have laryngealized, you could have pharyngeal, we could have glottalized consonants, which is apart from the primary place of articulation, they could also be secondary.

And of course, manner of articulation is very important. And the other aspect is centrality, central or lateral release. And then there is the other aspect which we could see in both consonants and vowels is that of nasality that the velar, the velum lowers and releases air through the nasal cavity and that gives consonants and vowels another distinctive property.

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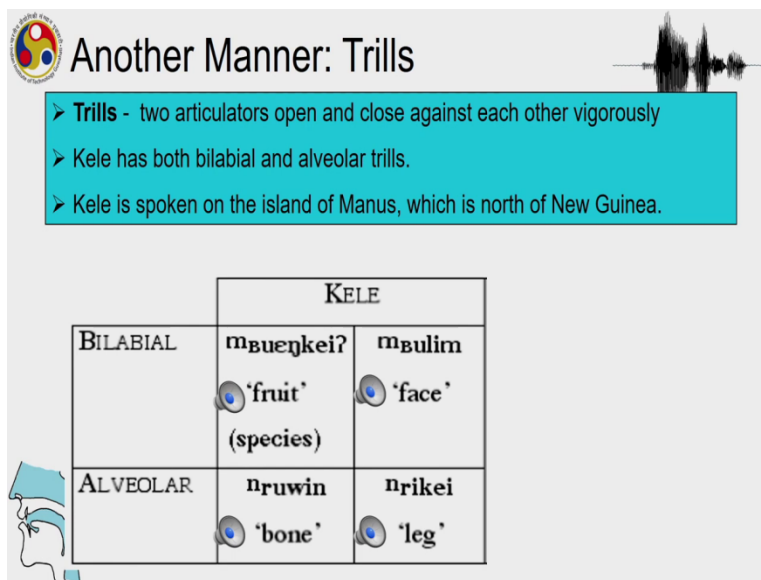
Voiceless Nasals

- Nasalization and fricatives are not compatible
- The existence of nasal fricatives is very often disputed
- voiceless nasals in **Burmese**

NASALS	BILABIAL	DENTAL	PALATAL	VELAR
VOICELESS	ṁá ‘om’	ṅá: ‘asal’	ǰá: ‘cōiderate’	ŋá ‘row’
VOICED	má ‘t up’	ná: ‘ain’	ǰá: ‘ight’	ŋá ‘sh’

So, these are from Ladefoged, sounds of the world’s languages, we find voiceless nasals in Burmese, (pronouncing Burmese) also in Angami. So these are voiceless and nasals in Burmese. The examples and sound files are all from Ladefoged (pronouncing Burmese). So one is bilabial, one is dental. One is palatal and one is velar. These are all the voiceless nasals. (pronouncing Burmese) This is voiced bilabial, (pronouncing Burmese) voiced dental, (pronouncing Burmese) voiced palatal, (pronouncing Burmese) voiced velar.



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Another Manner: Trills

- **Trills** - two articulators open and close against each other vigorously
- Kele has both bilabial and alveolar trills.
- Kele is spoken on the island of Manus, which is north of New Guinea.

	KELE	
BILABIAL	ṁbueŋkei? ‘fruit’ (species)	ṁbulim ‘face’
ALVEOLAR	ṁruwin ‘bone’	ṁrikei ‘leg’





1. Airstream Mechanism/direction
2. Glottal state
3. Part of Tongue
4. Primary Place of Articulation
5. Manner of Articulation
6. Centrality
7. Nasality




And then we have another manner, which is trills where 2 articulators open and close against each other rapidly. And the example is from Kele which has both bilabial and alveolar trills. So, here are some Kele examples of bilabial and alveolar trills. The first examples are bilabial the second ones that you hear are alveolar (pronouncing Kele). So, another aspect is that of centrality versus central versus lateral, which we talked about when we are talking about the properties of consonants centrality.


(Refer Slide Time: 39:06)



Another Manner: Laterals



	Initial	Medial	Final
Laminal dental	l ^h ɪnp 'armpit'	al ^h ɪŋ 'burrow'	ɪl ^h bəɫ 'smoke'
Apical alveolar	lubi ^h _ɻ 'thigh'	alɪŋk 'chase'	irmal 'fire saw'
Apical post-alveolar		kaɫat 'sacred board'	aldimaɫ 'west'
Laminal post-alveolar		alɪlk 'smooth'	kuraɫ 'star'



Kaititj is an Australian language (Arandic group of the Pama-Nyungan branch) spoken in the Northern Territory

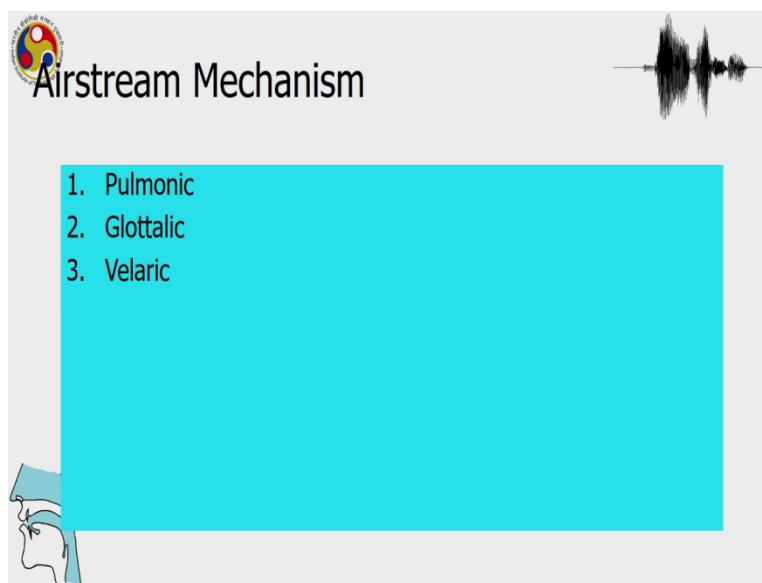
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So, there can be another property not exactly a manner, but the property of laterals. So, this is Kaititj is an Australian language, it is a Arandic group of the Pama-Nyungan branch spoken in

Northern Territory. So, here, these examples on top are the laminal dental (pronouncing Kaititj). And then we have apical alveolar (pronouncing Kaititj) and then apical post alveolar (pronouncing Kaititj) and laminal post alveolar (pronouncing Kaititj).

So, these are lateral, these are examples that we see of laterals, which could be laminal dental, like the examples here, which could be apical alveolar, as in the examples here, which could be apical post alveolar, and which could be laminal post alveolar. And all of these differences exist in language called Kaititj.

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The slide is titled "Airstream Mechanism". It features a logo in the top left corner, a waveform in the top right corner, and a profile of a human head in the bottom left corner. The main content is a list of three types of airstream mechanisms:

1. Pulmonic
2. Glottalic
3. Velaric

Now, we come to one of the main aspects that which gives consonants and vowels their particular way that one of the very important things which will distinguish consonants and vowels, and also because, not just because of the distinctive property, but also because the airstream mechanism is almost the most basic aspect in the production of consonants. So most of sounds that are produced in the languages of world are almost always pulmonic and that is how humans speak with the pulmonic egressive airstream.

Now, importantly, it is not always that sounds are produced with the pulmonic egressive airstream. And there are a few languages which use the glottalic and velaric airstreams also producing very interesting particular and unique kind of sounds. So we have to remember that the pulmonic egressive is the most commonly used manner airstream mechanism and almost all sounds that we produce are the result of the pulmonic, egressive airstream mechanism.

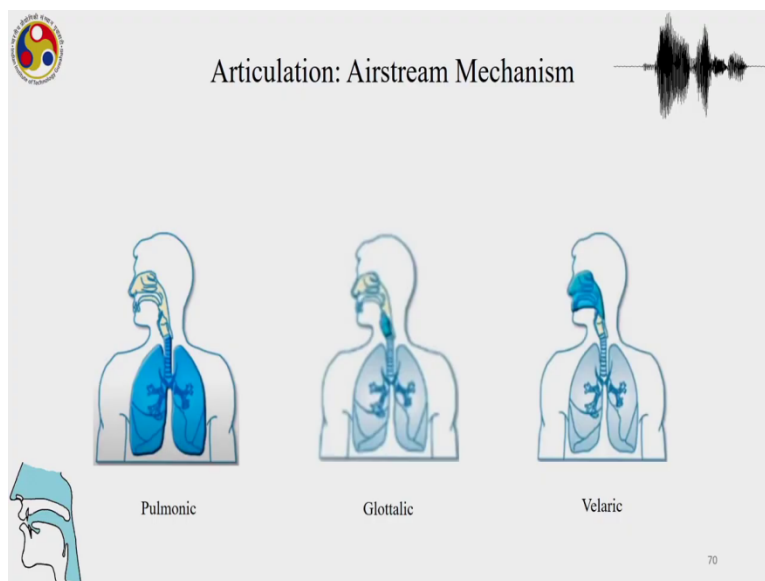
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Airstream Direction

1. Egressive
2. Ingressive

The slide features a logo in the top left corner, a waveform in the top right, and a profile of a human head in the bottom left. A large cyan rectangle covers the central area of the slide.



Articulation: Airstream Mechanism

Pulmonic Glottalic Velaric

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The slide features a logo in the top left corner, a waveform in the top right, and a profile of a human head in the bottom left. Three diagrams of the human vocal tract are shown, illustrating different airstream mechanisms: Pulmonic, Glottalic, and Velaric.

So, here is our pulmonic egressive, and then we have the glottalic, and we have the velaric.

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Airstream Mechanism

Pulmonic Glottalic Velaric

Airstream mechanism

- Pulmonic
- Glottalic
- Velaric

- Air direction: egressive
- Stop consonants: plosives
- E.g. [p t k] [b d g]
- Voicing: voiceless / voiced

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So pulmonic egressive normally, almost all the sounds that we produce are pulmonic egressive.

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Airstream Mechanism

Pulmonic Glottalic Velaric

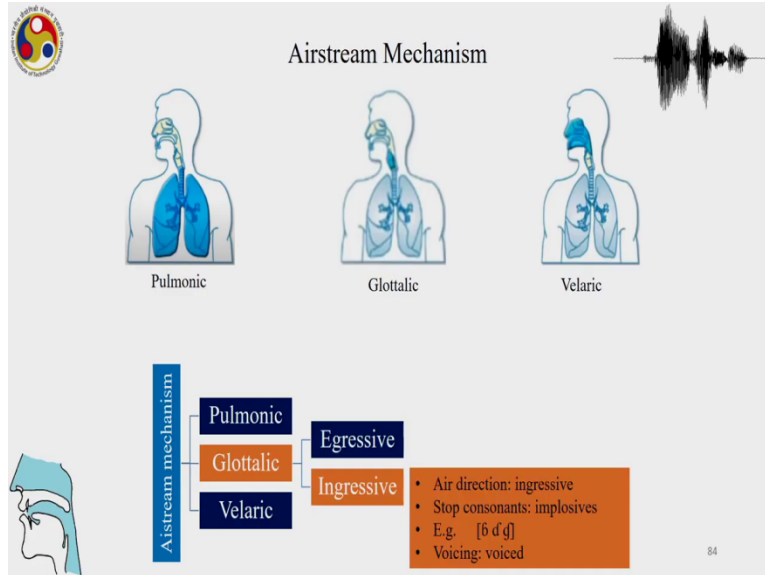
Airstream mechanism

- Pulmonic
- Glottalic
- Velaric

- Egressive
- Ingressive

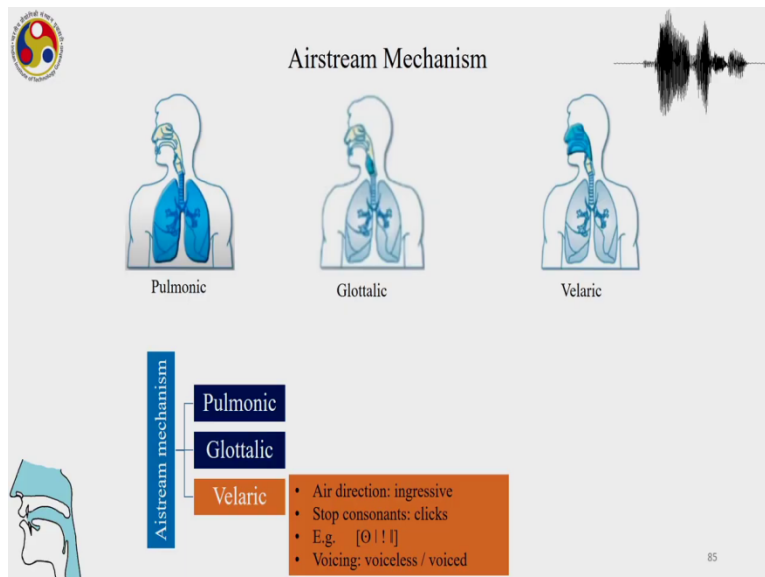
- Air direction: egressive
- Stop consonants: ejectives
- E.g. [p' t' k']
- Voicing: voiceless

83



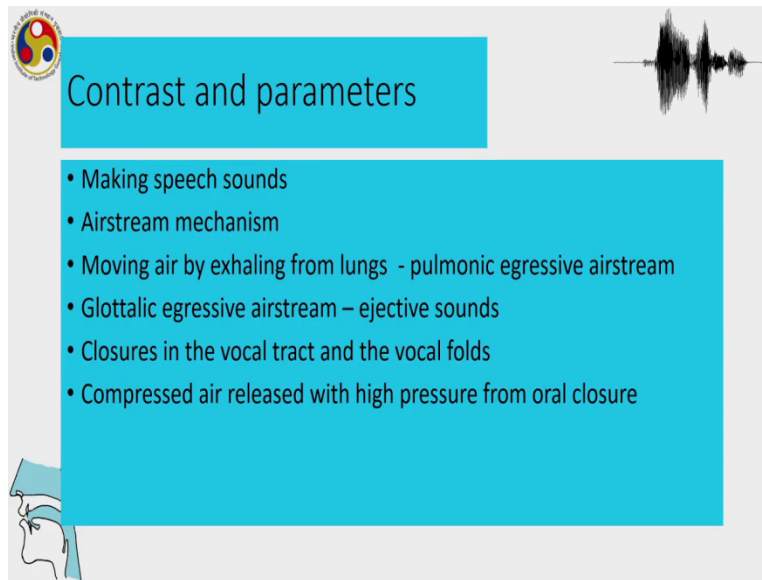
And then with the glottalic airstream, the 2 ways possible, egressive and ingressive. With the egressive airstream mechanism we produce ejectives, the ingressive will produce voiced implosive. So ejectives are mostly voiceless and implosives are mostly voiced.

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And then there are the velaric airstream only at the ingressive direction possible. And in this clicks are produced, and clicks can be both voiceless and voiced.

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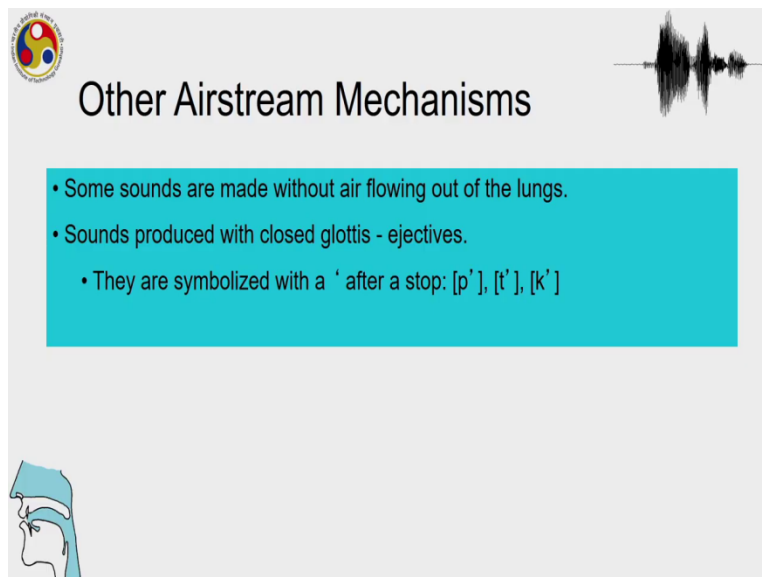
The slide features a logo in the top left corner, a waveform in the top right, and a profile diagram of a human head in the bottom left. The main content is a blue box with the following text:

Contrast and parameters

- Making speech sounds
- Airstream mechanism
- Moving air by exhaling from lungs - pulmonic egressive airstream
- Glottalic egressive airstream – ejective sounds
- Closures in the vocal tract and the vocal folds
- Compressed air released with high pressure from oral closure

So the making of speech sounds involves an airstream mechanism, which we know from the beginning of this course. And we move in by moving air by exhaling from the lungs. The pulmonic air egressive airstream manages to produce most of the sounds, but then there is the glottalic egressive and there is which involves closures in the vocal tract and vocal folds, compressed air is released with high pressure from oral closure.


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The slide features a logo in the top left corner, a waveform in the top right, and a profile diagram of a human head in the bottom left. The main content is a blue box with the following text:

Other Airstream Mechanisms


- Some sounds are made without air flowing out of the lungs.
- Sounds produced with closed glottis - ejectives.
 - They are symbolized with a ' after a stop: [p'], [t'], [k']



Ejectives




- Sounds made with a glottalic egressive airstream mechanism are also known as **ejectives**.
- Ejectives are symbolized with a ['] following a symbol for a stop.
- [ap' a] [at' a] [ak' a]










And then ejectives are made without air flowing out of the lungs. So this is the air in the closed glottis. And as we have seen in the Quechua examples, before we had seen a few ejectives and the ejectives are symbolized.


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Quechua Ejectives



	PALATO-ALVEOLAR	VELAR	UVULAR
VOICELESS	 tʃaka	 kujuj	 qaʎu
	'bridge'	'to move'	'tongue'
EJECTIVE	 tʃ'aka	 k'ujui	 q'aʎu
	'hoarse'	'to twist'	'tomato sauce'



So (pronouncing Quechua), let us create the Quechua ejectives again (pronouncing Quechua). So, those are the palato-alveolar, velar, uvular and these are the ejective sounds (pronouncing Quechua) that is uvular ejective, this is the (pronouncing Quechua) velar ejective, (pronouncing Quechua) this is the palatoalveolar ejective.

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Glottalic Egressives

1. Close the glottis (glottal stop)
2. Make a stop closure
3. Raise the glottis - compresses the air in the supraglottal cavity
4. Release the stop - Air rushes out of the vocal tract - high pressure to low pressure
5. Release the glottal closure - Air rushes out of the lungs - Making a glottal stop

- Sounds which are made in this way use a **glottalic egressive** airstream mechanism.

Now, the airstream mechanism in the glottis can also produce sounds. So, how does that happen? So, the glottis is closed stop closure is made. So, first the glottis is closed and then there is a stop closure and the glottis is raised as a result of which the air is compressed in the supraglottal cavity and then this is released as is usual for all stops, there is complete closure and release.

Here additionally, there is a raising of the glottis and the air rushes out of the vocal tract from the high pressure region, there is a low pressure region created as a result of which the glottal stop is produced and sounds which are producing the glottalic egressive airstream mechanism, they are all always very loud sounds and we heard the Quechua examples. And apart from the glottalic egressive, we can also make from the glottalic region and there is another kind of sounds possible, which are the implosives.

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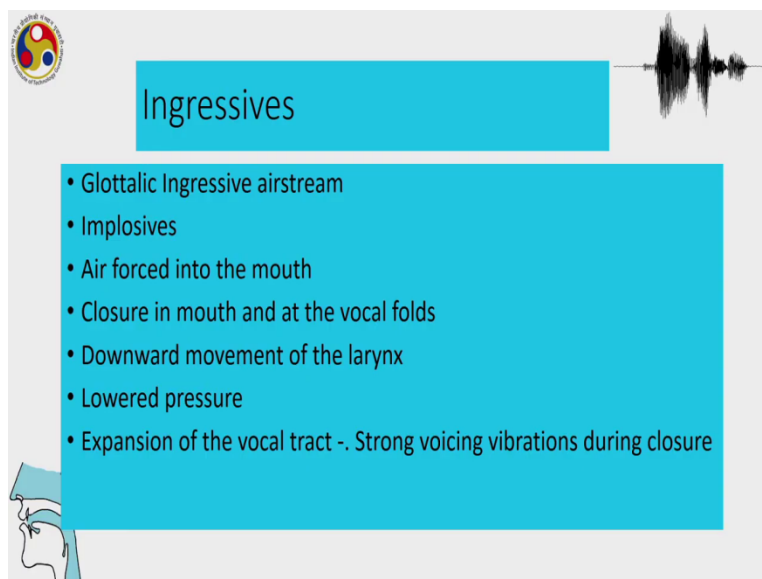
Implosives

- Sounds can also be made when air comes into the mouth.
- dropping the closed glottis and an obstruction for the stop
- Sounds made in this way are called **implosives**.
- Examples from Sindhi (spoken in India):

ɓani 'field' ɠanu 'handle'
banu 'forest' ɡunu 'quality'

So, implosives can also be made when air comes into the mouth. So, remember for the ejectives the glottis is raised; for the implosive the glottis is lowered. So, the dropping the closed glottis and an obstruction for the stop similar to the ejectives or stops, there is this obstruction and sounds made in this way with the lowered glottis are called implosives. And these are examples from Sindhi, (pronouncing Sindhi).

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Ingressives

- Glottalic Ingressive airstream
- Implosives
- Air forced into the mouth
- Closure in mouth and at the vocal folds
- Downward movement of the larynx
- Lowered pressure
- Expansion of the vocal tract - . Strong voicing vibrations during closure

So, again, the glottalic ingressive airstream produces implosives, which the air forced into the mouth closure and add the vocal force and a downward movement of the larynx. And the result

is a lowered pressure and expansion of the vocal cord and strong vibrations because of this closure of the larynx. And as a result we have ingressive. So, air which rushes into the mouth, the glottis is lowered creating a lowered pressure and the larynx is lowered, and it is causing lowered pressure. And as a result, there is some expansion of the vocal tract leading to strong vibrations, this is how in ingressives, glottalic ingressive airstream which results in implosives are produced.

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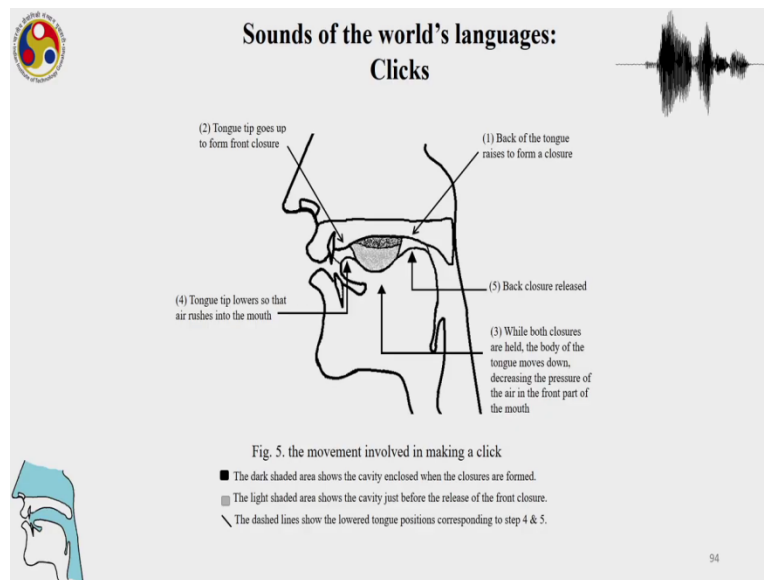
- Velaric Ingressive Sounds**
- Sounds with two closures
- Clicks

	Dental	Alveopalatal	Alveolar lateral
Voicless unspirated velar plosive	ukúk ola 'to grind fine'	ukúk!oða 'to break stones'	úk olo 'peace'

• Xhosa, - southwestern Africa.

This brings us to the final airstream mechanism that we will discuss the velaric ingressive sounds. And these sounds are called clicks. So, with the velaric airstream only the ingressive direction is possible. So the egressive is not possible, which means the air coming into the velaric region. So clicks are either dental alveolar or palatal alveolar lateral. These are from Xhosa in Southwestern Africa.

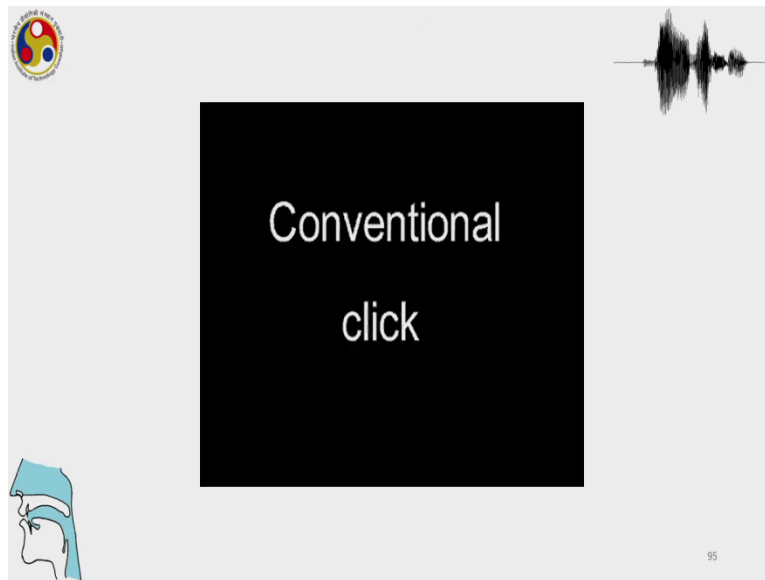
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So this is a diagram showing the movement involved in making a click. So the dark area shows a cavity enclosed when the closures are formed. The light is before the release, so it is a very small area, and then the area is made bigger, and then there is a release. And the dashed line shows the lowered tongue position. So the tongue goes up and down before the release. So another important aspect of clicks is that there are 2 closures. So here the back of the tongue raises to make a closure and there is a front, the tongue tip goes up to former closure. And as a result, this is an alveolar click.

So while both closures are held, the body of the tongue moves down, decreasing the pressure of the air in the front part of the mouth. So the tongue tip lowers, so that air rushes into the mouth. So these are the four gestures involved, the tongue tip goes up, the back of the tongue raises to make a closure and both closures are held and then the body of the tongue goes up. And first, the release happens from the tongue tip. And that is how a loud sound is produced, a back closure is released.

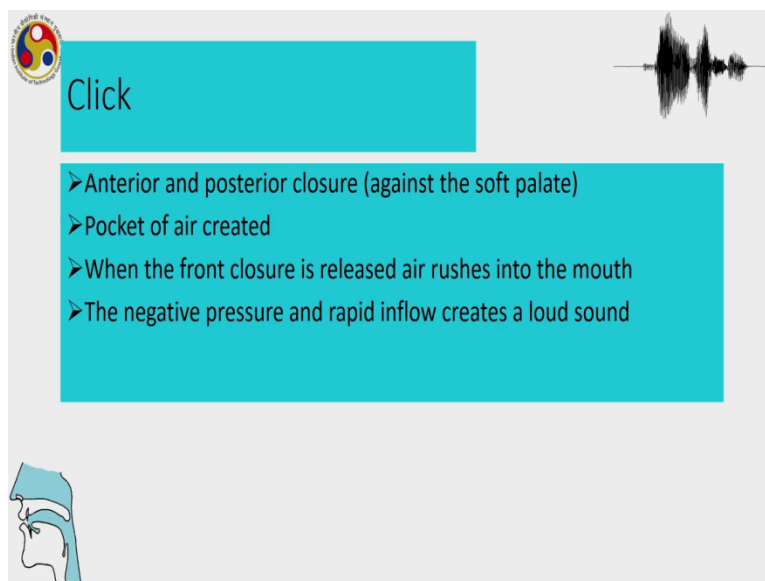
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Conventional
click

95

This slide features a central black box with the text "Conventional click" in white. To the top left is a circular logo with a colorful design. To the top right is a black waveform representing the sound of a conventional click. To the bottom left is a sagittal diagram of a human head and neck, showing the oral cavity. The number "95" is located in the bottom right corner.



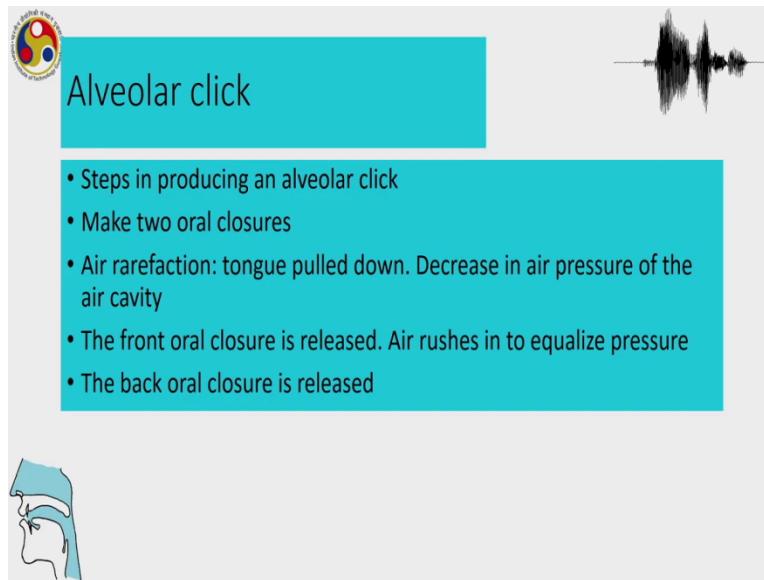
Click

- Anterior and posterior closure (against the soft palate)
- Pocket of air created
- When the front closure is released air rushes into the mouth
- The negative pressure and rapid inflow creates a loud sound

This slide features a central cyan box with the text "Click" at the top. Below it is a list of four bullet points describing the characteristics of a click. To the top right is a black waveform representing the sound of a click. To the bottom left is a sagittal diagram of a human head and neck, showing the oral cavity.

So, as we have just seen, clicks involved 2 closures, anterior and posterior closure, and a pocket of air is created. And when the front closure is released, air rushes into the mouth, and a negative pressure and rapid airflow creates a loud sound. So 2 closures, and pocket of air created. And when the front closure is released, the air rushes into the mouth. So this is the reason a negative pressure is created and there is a rapid inflow.

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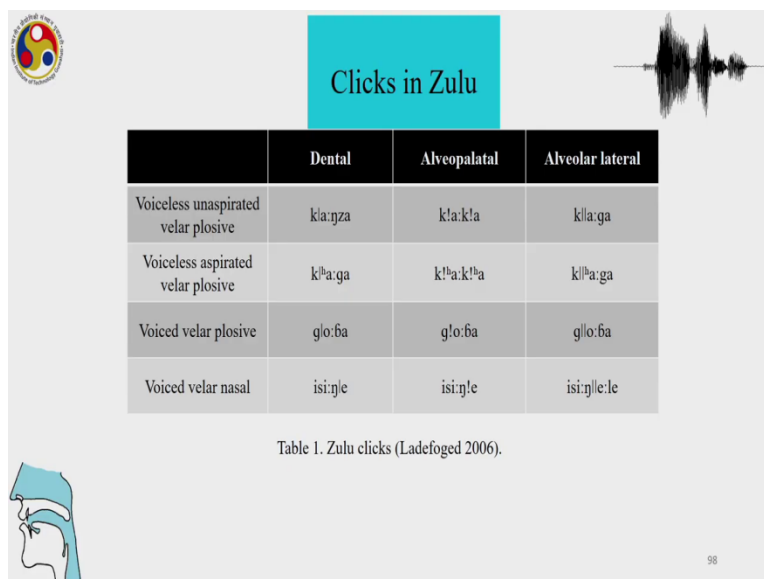


Alveolar click

- Steps in producing an alveolar click
- Make two oral closures
- Air rarefaction: tongue pulled down. Decrease in air pressure of the air cavity
- The front oral closure is released. Air rushes in to equalize pressure
- The back oral closure is released

So as you can imagine, if there is an alveolar click, the front closure of the tongue will be in the alveolar region. So, as usual, there will be 2 oral closures and there will be air rarefaction, which we just studied the negative pressure which we just saw, the negative pressure, because the tongue is pulled down and the front closure is released after that, and the air rushes in to equalize the pressure and after the back closure is, oral closure is released, a very loud sound is produced.

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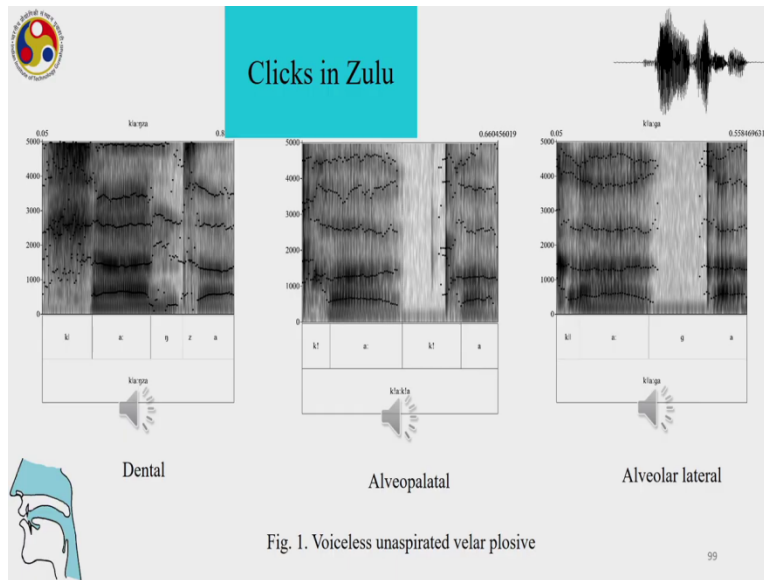
Clicks in Zulu

	Dental	Alveopalatal	Alveolar lateral
Voiceless unaspirated velar plosive	kla:ŋza	k!a:k!a	klla:ga
Voiceless aspirated velar plosive	k!a:ga	k!ʰa:k!ʰa	k!ʰa:ga
Voiced velar plosive	glo:ʙa	g!o:ʙa	g!lo:ʙa
Voiced velar nasal	isi:ŋe	isi:ŋ!e	isi:ŋ!e:le

Table 1. Zulu clicks (Ladefoged 2006).

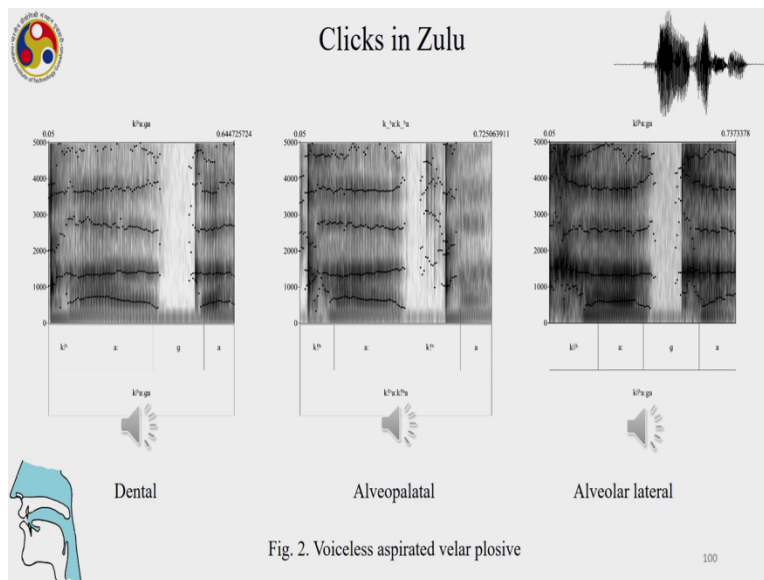
So, these are clicks in IsiZulu. And we can see that they have 3 regions, 3 places of articulation that is dental, alveo-palatal and alveolar lateral.

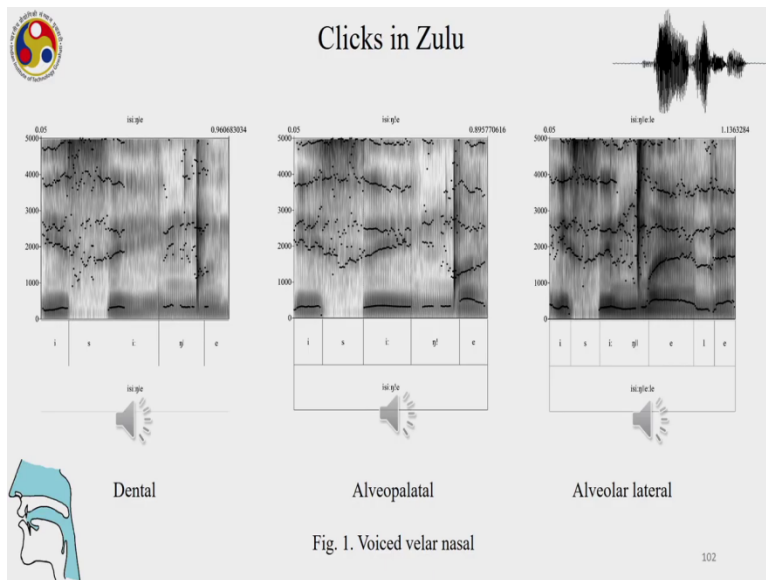
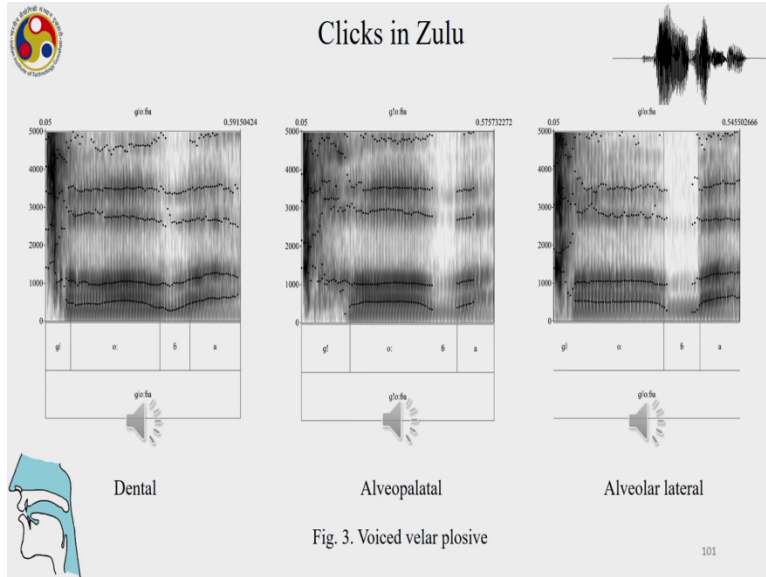
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(pronouncing IsiZulu) So, this is the voiceless unaspirated velar, this is the dental (pronouncing IsiZulu). So, this is the dental, this is the alveolar and this the alveolar lateral. So, what we can see here in the spectrograms is that in the alveo-palatal which is clear, we can see the 2 releases in the spectrogram and we can see that also in the dental region the 2 releases, because of the 2 closures and 2 releases, which are involved in clicks.

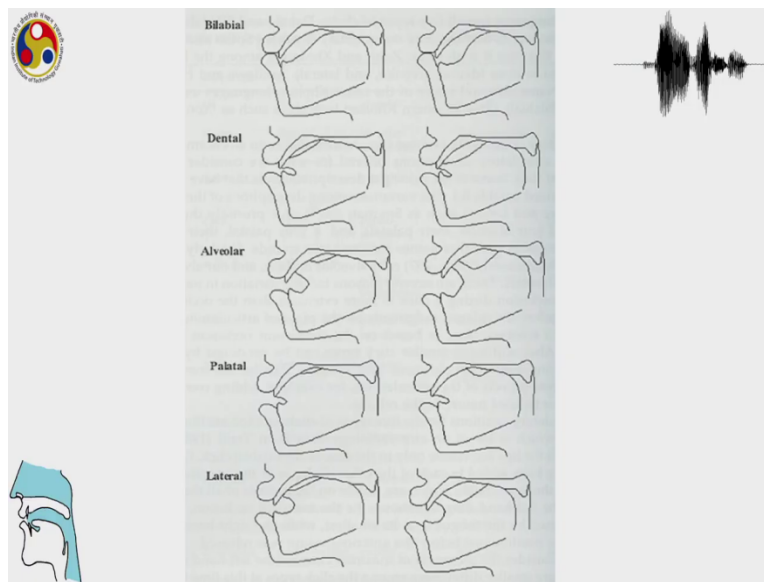
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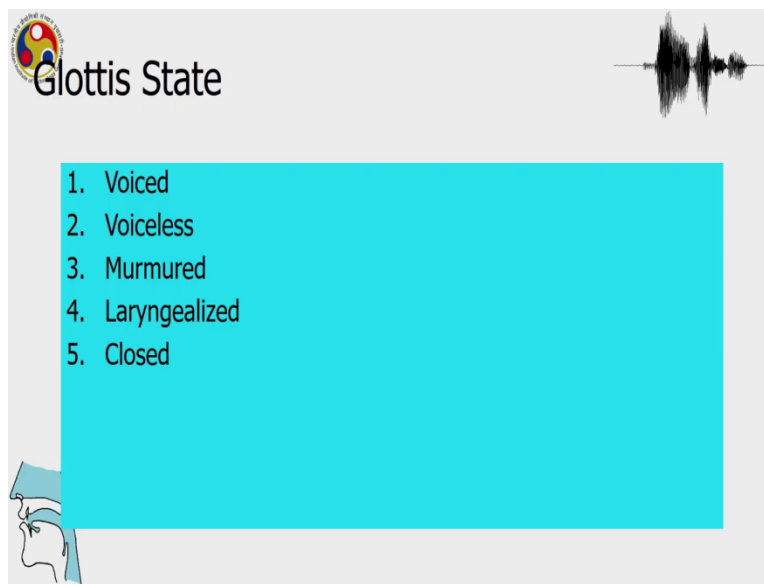
And also another one here (pronouncing IsiZulu). (pronouncing IsiZulu) dental, alveopalatal and lateral.

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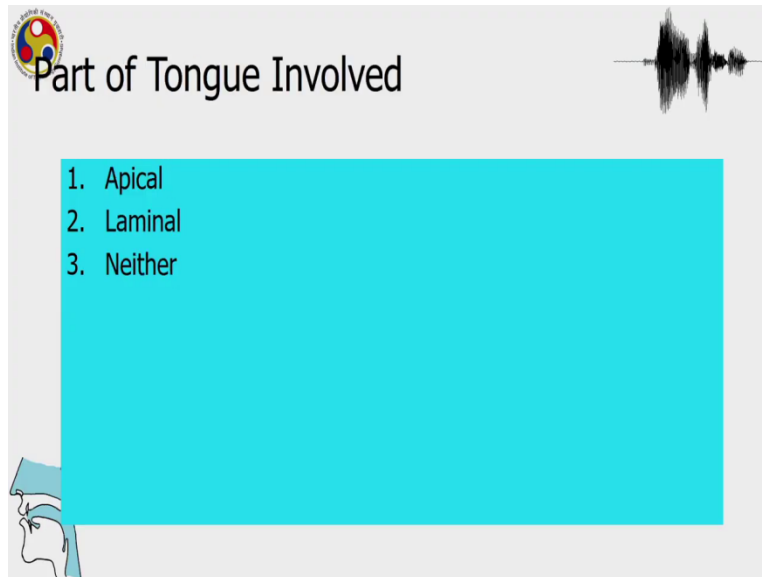
So, these are the movements in the production of clicks. So, we have bilabials here. So, we can see the pocket of air created, tongue lowered and release after that dental and then we can see the pocket of air created again tongue lowered for the alveolar, again we see the tongue making an occlusion here and the alveolar region pocket of air created and in a lowered, which is responsible for the negative energy. So, which is lowered pressure as the air rushes in after the front closure is released. This is a palatal, this is lateral when the air is released from both sides.

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Other aspects of sound production that is glottis state; voiced, voiceless, murmured, laryngealized and closed.

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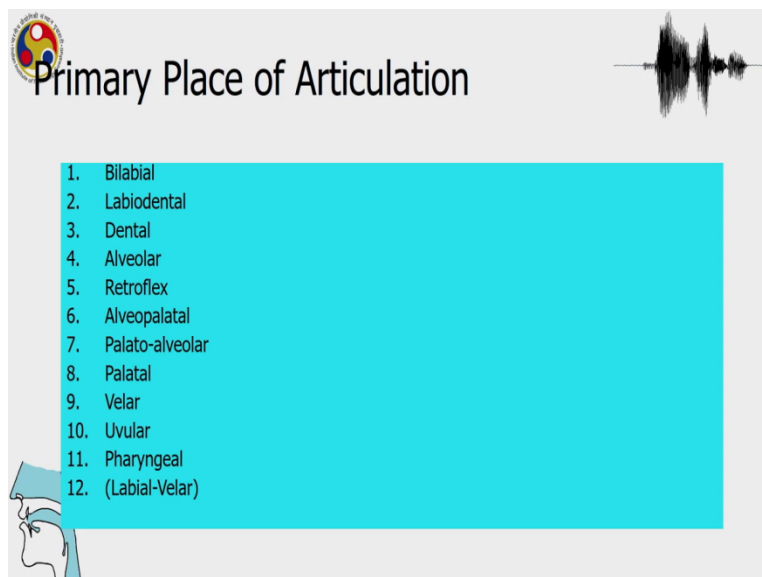
The slide features a logo in the top left corner, a waveform in the top right, and a profile of a human head in the bottom left. The main content is a cyan box containing a list of three options.

Part of Tongue Involved

1. Apical
2. Laminal
3. Neither

Part of tongue involved; apical, laminal and dorsal or subapical.

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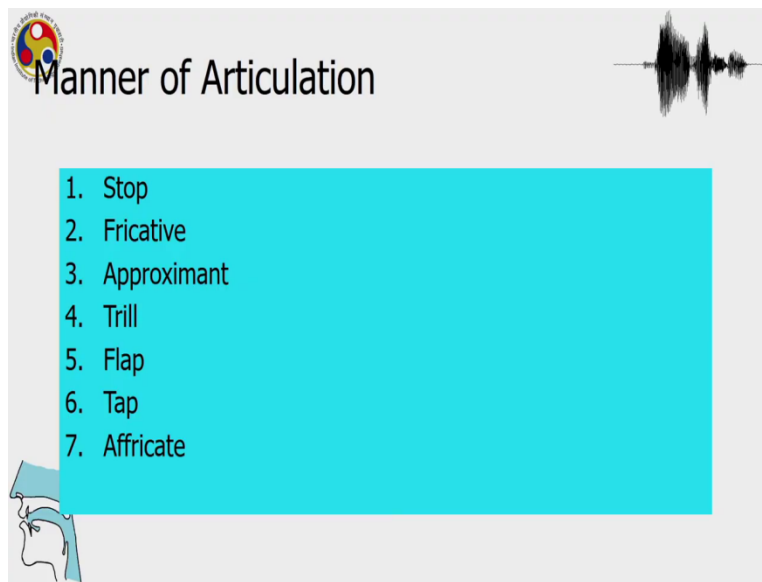
The slide features a logo in the top left corner, a waveform in the top right, and a profile of a human head in the bottom left. The main content is a cyan box containing a list of 12 options.

Primary Place of Articulation

1. Bilabial
2. Labiodental
3. Dental
4. Alveolar
5. Retroflex
6. Alveopalatal
7. Palato-alveolar
8. Palatal
9. Velar
10. Uvular
11. Pharyngeal
12. (Labial-Velar)

These are the primary places of articulation. Here we are summarizing all that we have seen till now; bilabial, labiodental, dental, alveolar, retroflex, alveopalatal, palatoalveolar, palatal, velar, uvular, pharyngeal and labial-velar.

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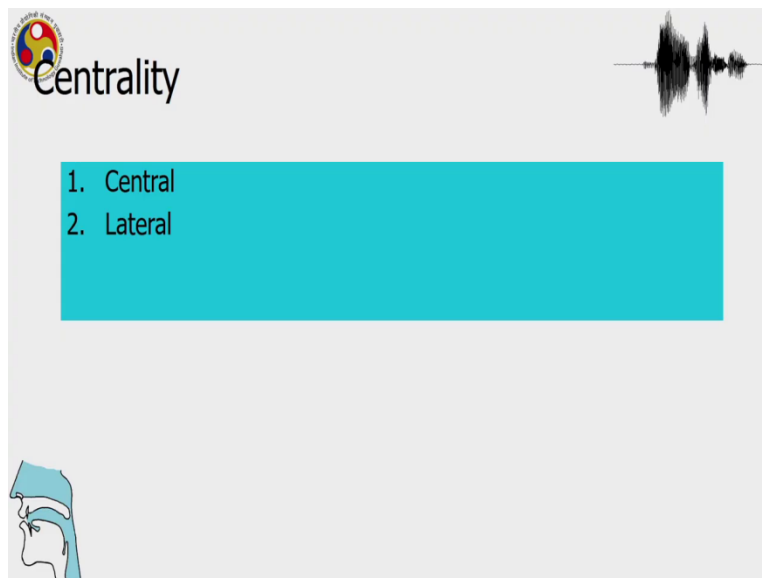


The slide features a logo in the top left corner, the title "Manner of Articulation" in the top center, and a waveform in the top right. A cyan box in the center contains a numbered list of seven articulation manners. A sagittal cross-section of the human head is shown in the bottom left corner.

1. Stop
2. Fricative
3. Approximant
4. Trill
5. Flap
6. Tap
7. Affricate

Manner of articulation could be stop, fricative, approximant, trill, flap, tap, affricate.

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The slide features a logo in the top left corner, the title "Centrality" in the top center, and a waveform in the top right. A cyan box in the center contains a numbered list of two centrality types. A sagittal cross-section of the human head is shown in the bottom left corner.

1. Central
2. Lateral

Centrality, you can have both central and lateral sounds.

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Nasality

1. Oral
2. Nasal

110

Nasality can have both oral and nasal sounds.

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Stops

1. voiced	b
2. voiceless unaspirated	p
3. aspirated	p ^h
4. murmured (breathy)	b ^h
5. implosive	ɓ
6. laryngealized (creaky)	ɓ̥
7. ejective	k'
8. nasal release	ɗ
9. prenasalized	nd
10. lateral release	tɬ
11. ejective lateral release	tɬ'
12. affricate	ts

110

And among stops, these are the different kinds of stops which are possible, we can have voiced stops, voiceless unaspirated, aspirated, murmured breathy sounds, implosives, laryngealized or creaky sounds, which we will see in phonation part, the ejectives which we have already seen, nasal release sounds which are released with the nasal and then prenasalized sounds and these are 2 types of stops that where we can have a nasal release and prenasalized and we can have

lateral release, we can have ejectives, which had laterally release and then of course, there are many types of affricates.

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Nasals, stops and Fricatives

	bilabial	labiodental	dental	alveolar	retroflex	palato-alveolar	palatal	velar	uvular	pharyngeal	labial velar
nasal	m	ɱ	ɲ	n	ɳ	ɲ	ɲ	ŋ			ɲ̠
stop	p b		t̪ d̪	t d	ʈ ɖ	c ɟ	k ɡ	q ɢ			ɸ ɓ
fricative	ɸ β	f v	θ ð	s z	ʂ ʐ	ʃ ʒ	x ɣ	χ ʁ	ħ ʕ		

Again summarizing many of the things that we have discussed since the last class, so, nasals stops, fricatives can contrast along the bilabial dimension. Fricatives and nasals have labiodental there are no stop, stops generally cannot be labiodentals and in the dental place of articulation all 3 are possible, alveolar all 3 are possible, retroflex also nasal stop fricatives are possible, palato-alveolar place of articulation.

Fricatives are often seen and not stops and nasals in the palatal region, all 3 of them in the velar region all 3 manner of articulation, uvular all 3 manners of articulation are possible and the pharyngeal region it is mostly fricatives and in labial velar place of articulation, we find only nasals and stops.

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Summary

Airstream	Direction	Glottis	Tongue	Place	Centrality	Nasality	Manner
Pulmonic	egressive	voiced	apical	bilabial	central	oral	stop
Glottalic	ingressive	voiceless	laminal	labiodental	lateral	nasal	fricative
Velaric		murmured	(neither)	dental			approximant
		laryngealized		alveolar			trill
		closed		retroflex			flap
				palato-alveolar			tap
				palatal			
				velar			
				uvular			
				pharyngeal			
				labial velar			

© 2005 IPA

Again summarizing the entire list of things that we have seen so far, airstream mechanism we can have pulmonic, glottalic, velaric. Direction can be egressive and ingressive. Glottis can be voiced, voiceless, murmured, laryngealized and closed. Tongue could be apical, laminal, neither. Bilabial, so these are all the places of articulation which we just saw, centrality and lateral and nasality can be either oral or nasal. And these are the 6 manners of articulation possible.

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CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			ʀ					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
◌ǀ Bilabial	◌ɓ Bilabial	◌ʼ Examples:
◌ǃ Dental	◌ɗ Dental/alveolar	◌pʼ Bilabial
◌ǂ (Postalveolar)	◌ɟ Palatal	◌tʼ Dental/alveolar
◌ǁ Palatoalveolar	◌ɠ Velar	◌kʼ Velar
◌ǁ Alveolar lateral	◌ɠ Uvular	◌sʼ Alveolar fricative

OTHER SYMBOLS

- ◌ɸ Voiceless labial-velar fricative
- ◌ɰ Voiced labial-velar approximant
- ◌ɲ Voiced labial-palatal approximant

These are the symbols. Thank you for your attention. We will continue in the next class. And we will continue with the sound of the world's languages. We will see how vowels can be different,

and we will see a bit more on phonation and then we will wrap up this section on sound of the world's languages. Thank you for your attention again.