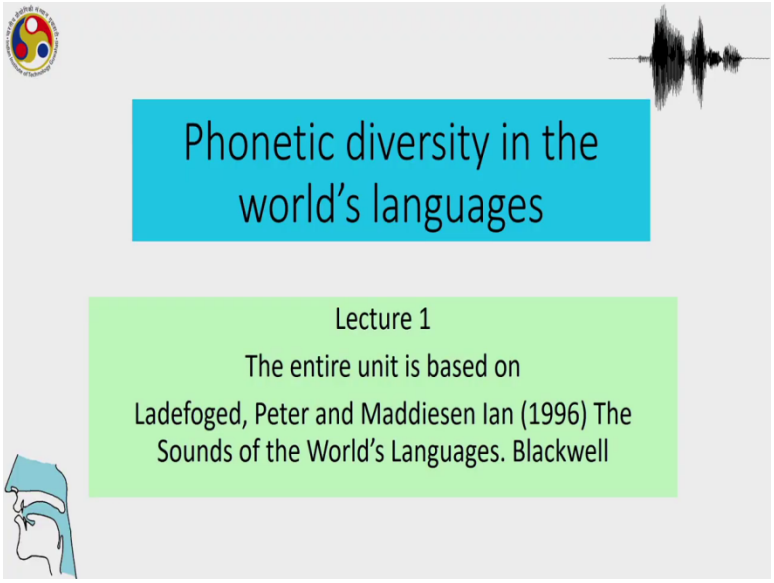
**Phonetics and Phonology: A Broad Overview**
**Professor Shakuntala Mahanta**
**Department of Humanities and Social Science**
**Indian Institute of Technology Guwahati**
**Lecture 06**
**Linguistic Diversity – Consonants and Vowels in the Languages of the World**

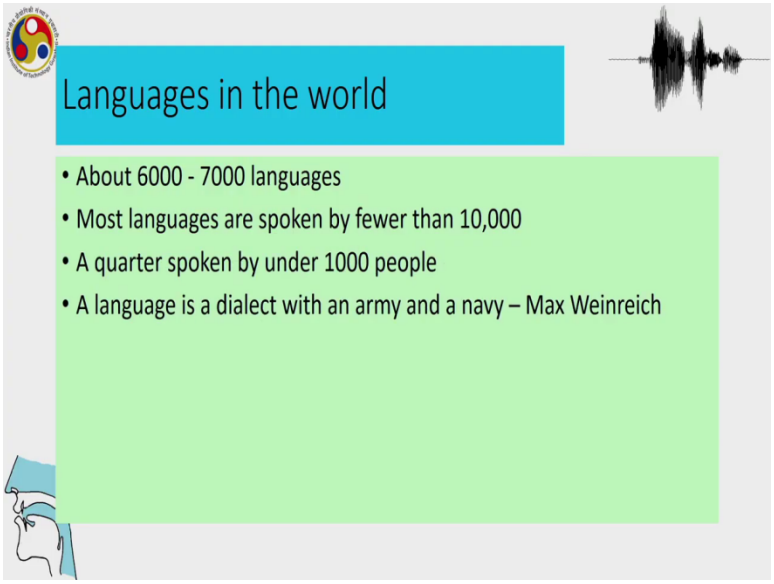
Welcome to the second lecture on Phonetics and Phonology: A Broad Overview, NPTEL MOOC Course.

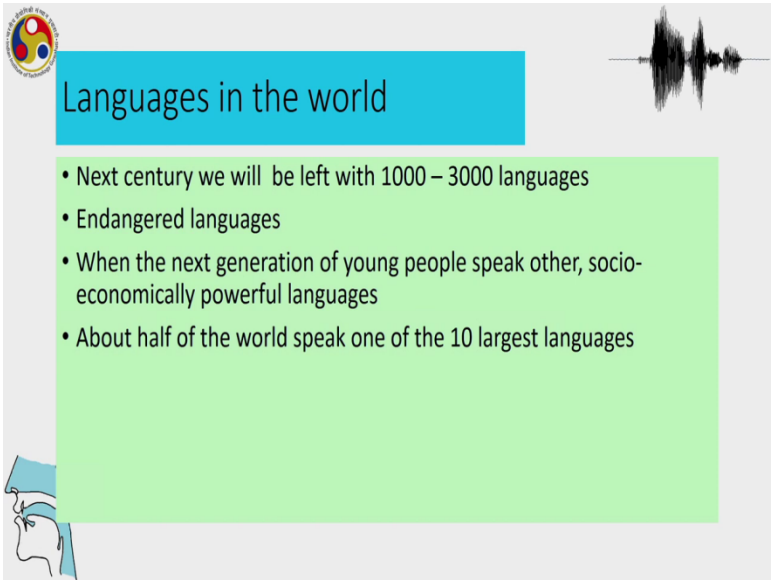
(Refer Slide Time: 0:49)




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.

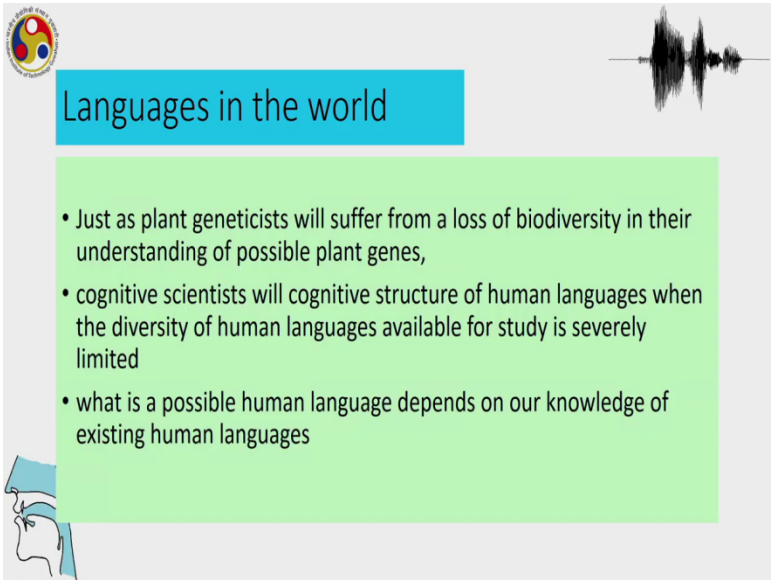
(Refer Slide Time: 0:54)



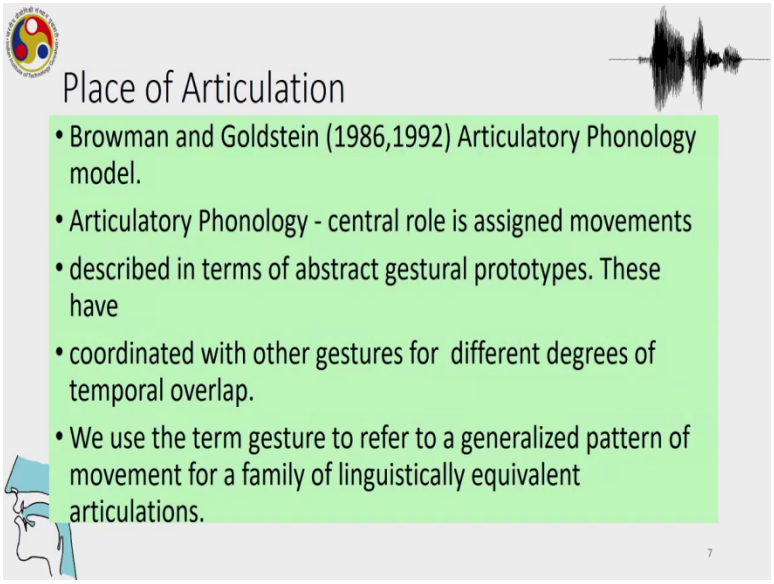

And in lecture 1, we talked about how there are diverse languages in the world and where many languages are threatened because of various economic reasons and because of the pressure on land and people, more and more people are speaking the larger languages. So, as a result, about half of the world's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

(Refer Slide Time: 1:20)




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.

(Refer Slide Time: 1:45)



# 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



# Places of articulation

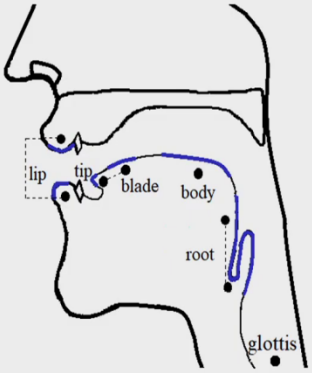
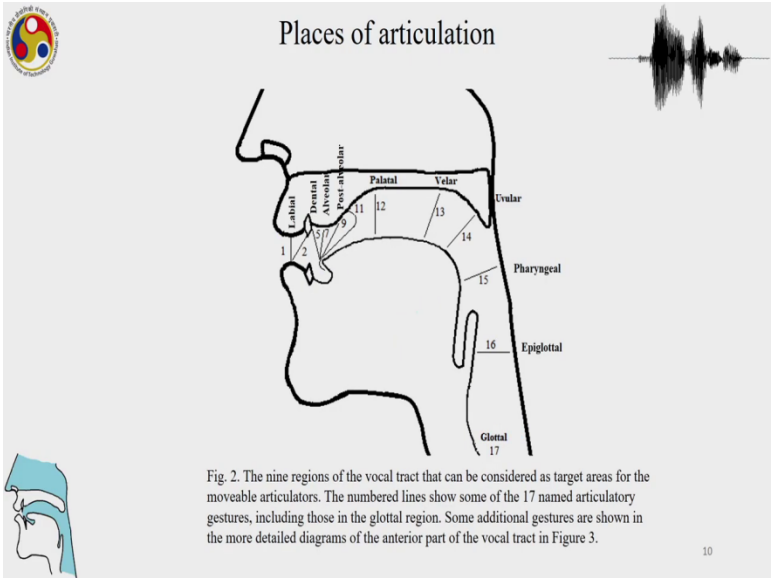
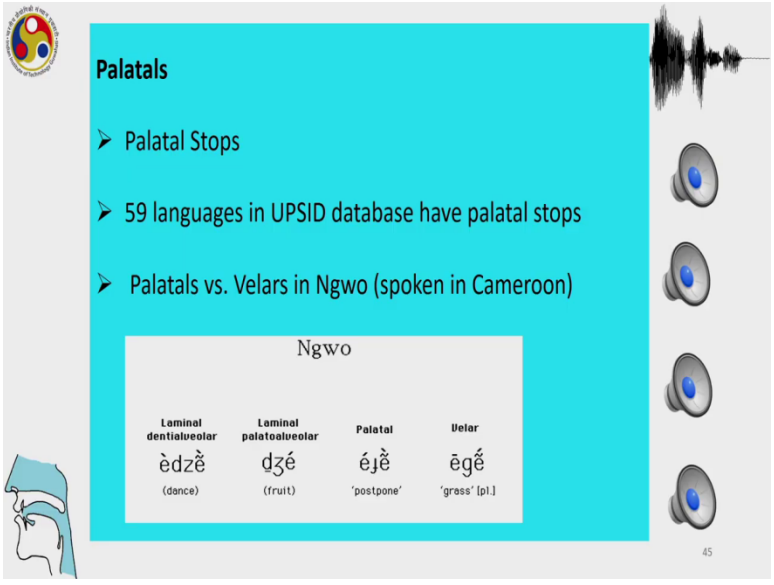



Fig. 1. The five groups of moveable structures forming the active articulators in the vocal tract.




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.

(Refer Slide Time: 2:14)



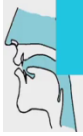
# Place of Articulation

- Alveolar

➢Pairings between active articulator and targets in figures 3 and 4

➢Traditional descriptions imply both the active articualtor and target

➢Not always a complete specification

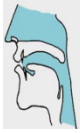


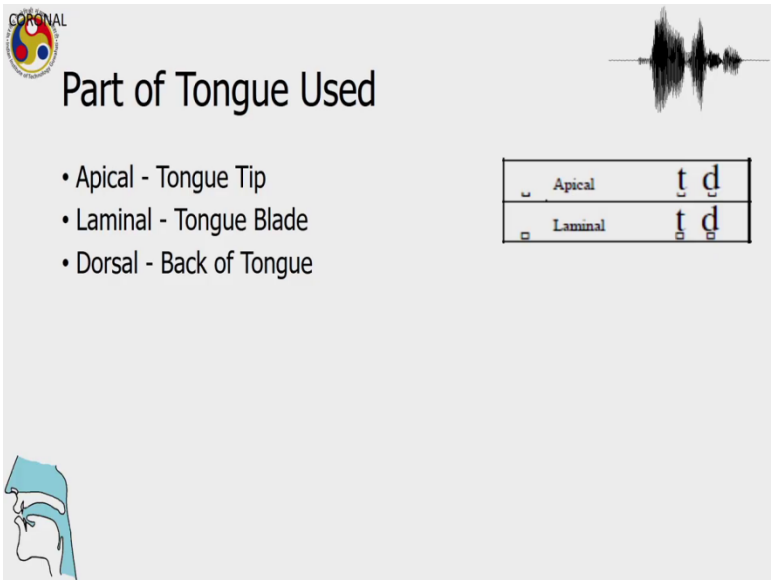


# Linguo-labial in Tonga

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

| | Bilabial | | Linguo-Labial | | Alveolar | |
|---|---|---|---|---|---|---|
| Plosive | **peta** | 'taro' | **t̪e̪t̪e** | 'butterfly' | **t̪a̪n̪a** | 'father' |
| Nasal | **mata** | 'snake' | **n̪at̪a** | 'eye' | **nunua** | 'messenger spirit' |
| Fricative | **βiliu** | 'dog' | **ð̪at̪u** | 'stone' | **sasati** | 'bad' |

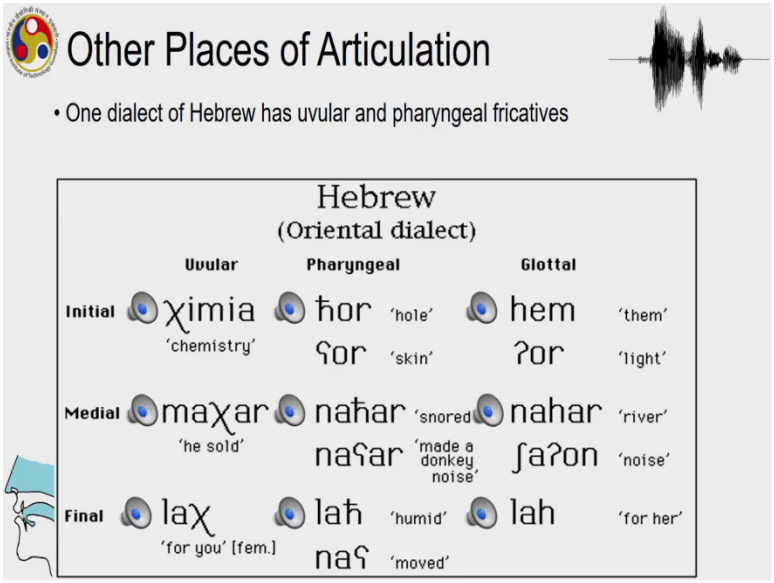





So, we talked about place of articulation as targets and we talked about how the coronal region can be divided into the tip of the tongue, the blade of the tongue, targeting different regions and how we can have sounds that we see in very few languages like linguo-labials that we saw in Vao and linguo-labials 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 coronalary 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.

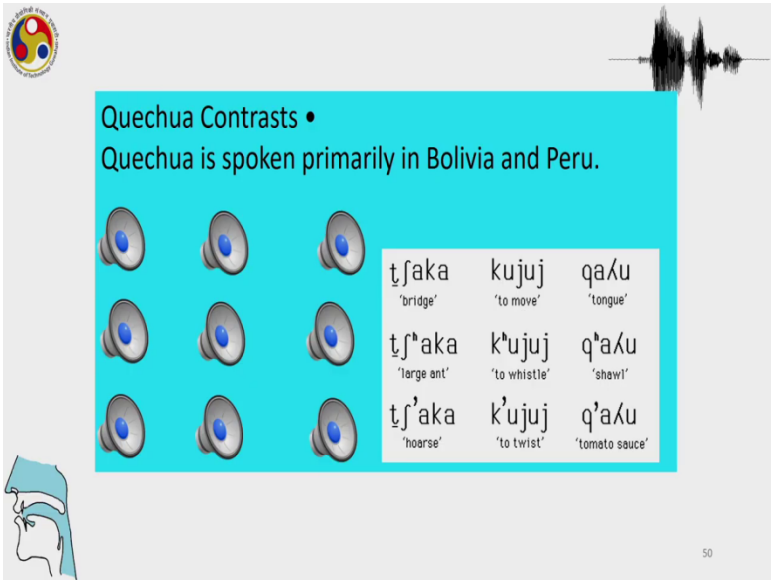
(Refer Slide Time: 03:59)




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).

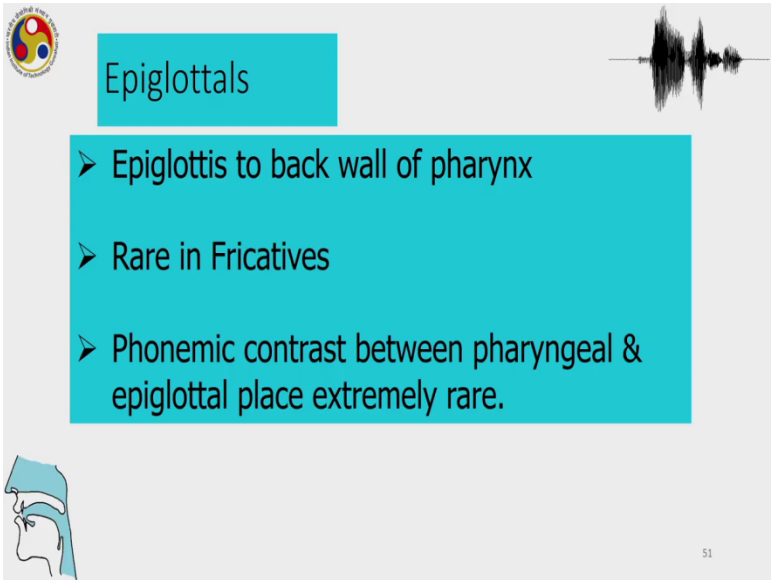
So, which means even in the dorsal region, we can have a three-way distinction as we saw that, even with regard to coronal languages we can have dental and alveolar and palato-alveolar in language and even in the dorsal region, there can be a few contrast as we see that there could be uvular, pharyngeal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

(Refer Slide Time: 5:35)



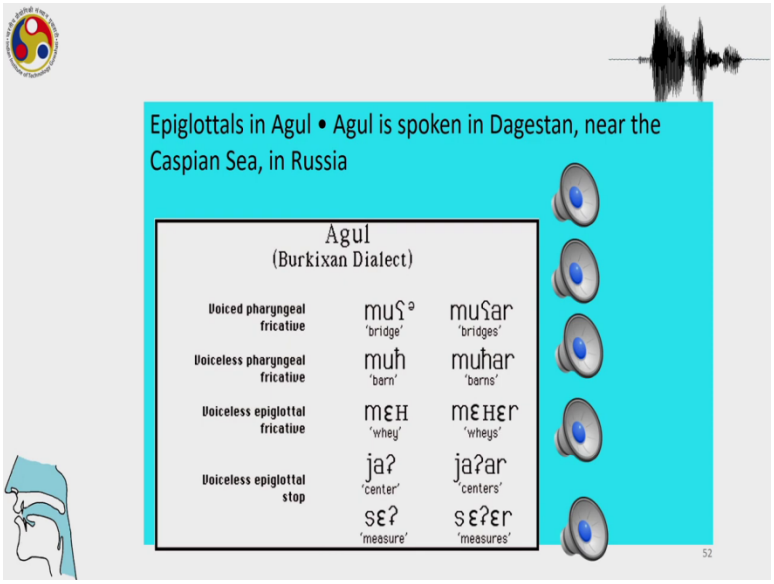

So, in Quechua, another language which has pharyngeal sounds, so (pronouncing Quechua), we will come to the symbol which is used here, that is the apostrophe that is used to show these sounds.

(Refer Slide Time: 6:15)




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.

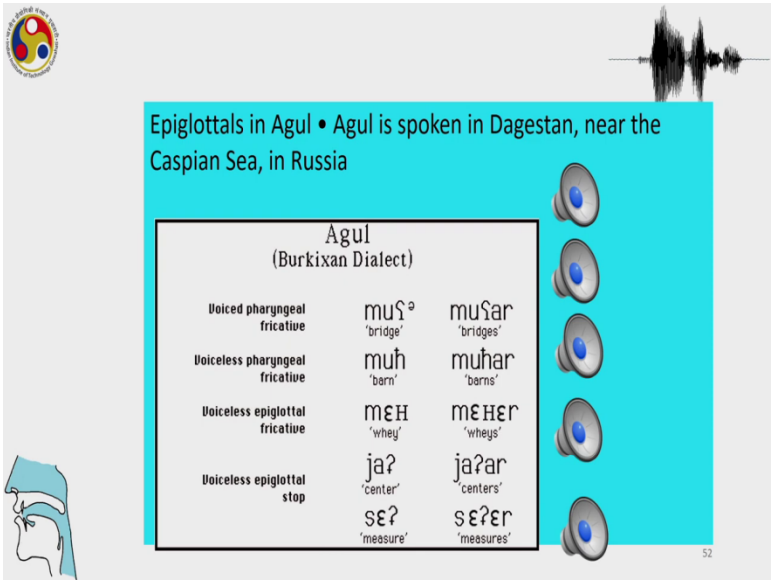
(Refer Slide Time: 06:37)





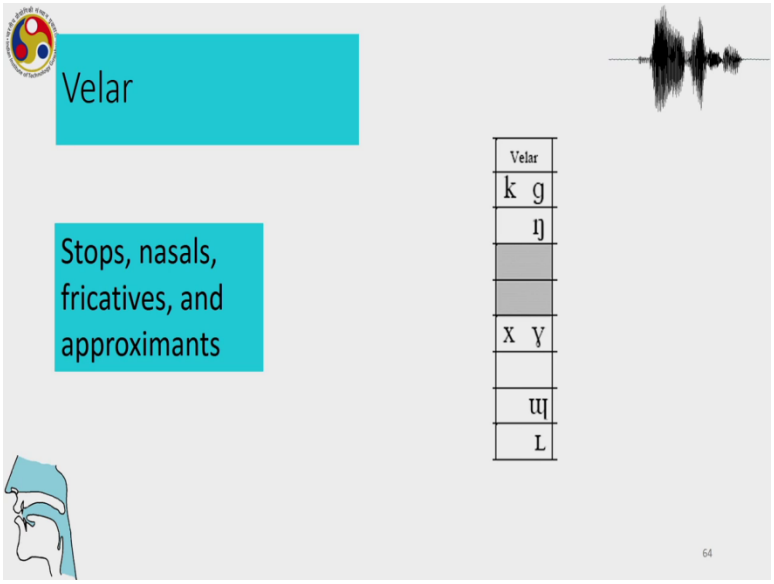
And let us listen to a few epiglottal in Idoma, a language spoken in Nigeria (pronouncing Idoma).

(Refer Slide Time: 06:55)



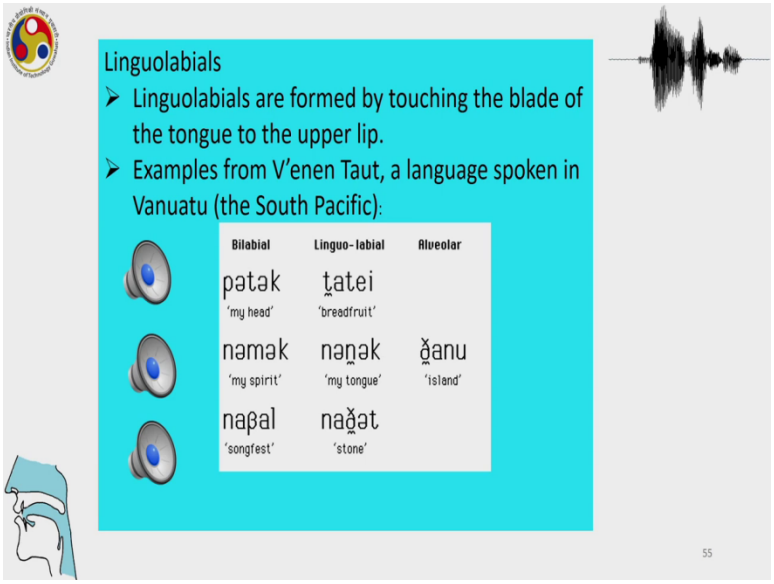

These are the epiglottal in Agul. Agul is spoken in Dagestan near the Caspian Sea in Russia. (pronouncing Agul) This is a voiced pharyngeal fricative, (pronouncing Agul) voiceless pharyngeal fricative, (pronouncing Agul) voiceless epiglottal fricative (pronouncing Agul) and a voiceless epiglottal stop.

(Refer Slide Time: 07:26)



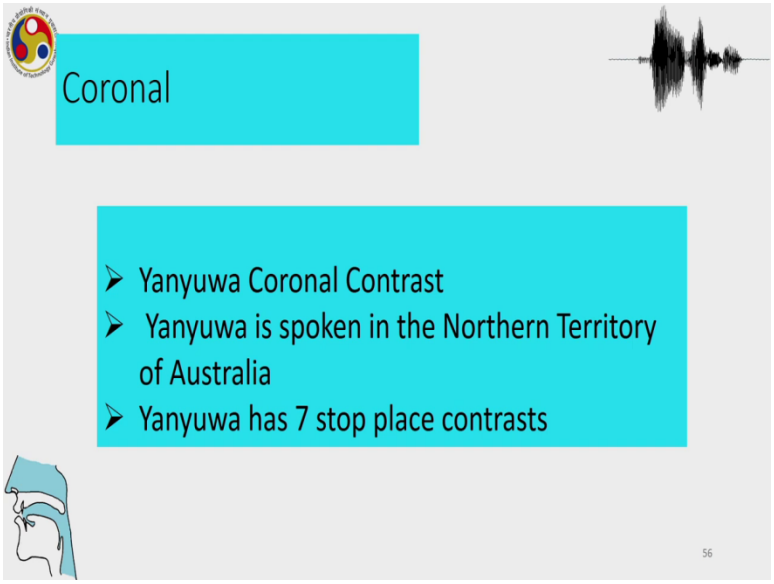

So, now, let us look at a few other types of other places of articulation, we have not heard velar stops, but velars are possible in as stops, as nasals, as fricatives and as approximants.

(Refer Slide Time: 07:44)




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)

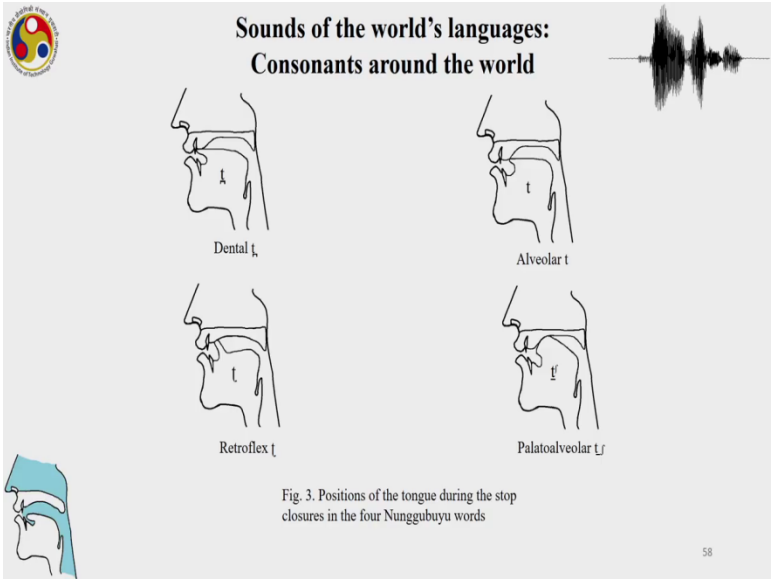



Finally, going back to the coronal contrast, we want to see how many stop contrast can languages possibly have. So, the largest number of stop contrast that is seen in a language called Yanyuwa and we have Yanyuwa data from the Ladefoged and Maddiesen repository and we can see the 7 place stop place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

(Refer Slide Time: 08:30)

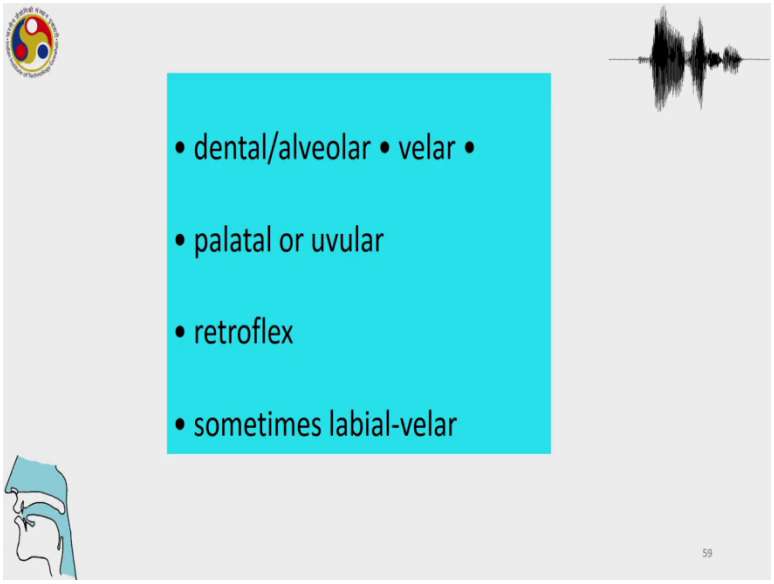

And Yanyuwa has bilabial, laminal dental, apical alveolar, apical retroflex. So, all these coronal sounds and then palato alveolar and then a velar and a front velar as well as a back velar, (pronouncing Yanyuwa). So finally, that was the front velar and this is the (pronouncing Yanyuwa) back velar. 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.

(Refer Slide Time: 09:28)



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.

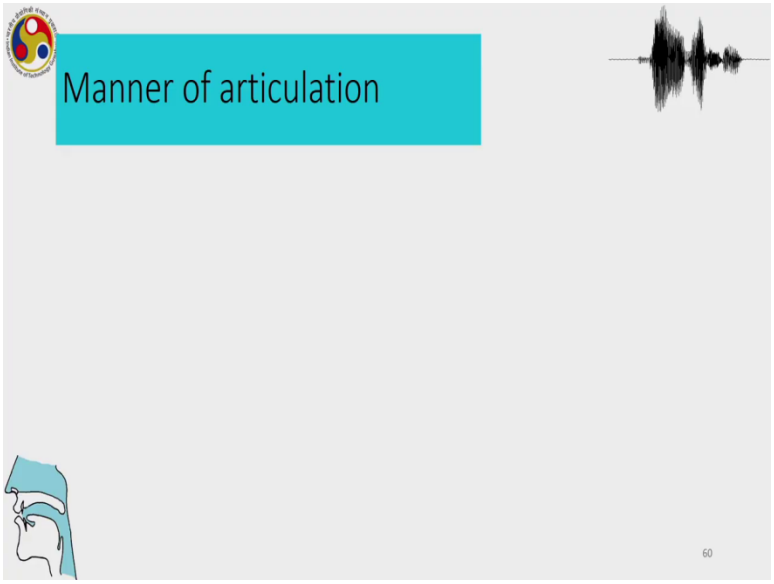
(Refer Slide Time: 09:44)

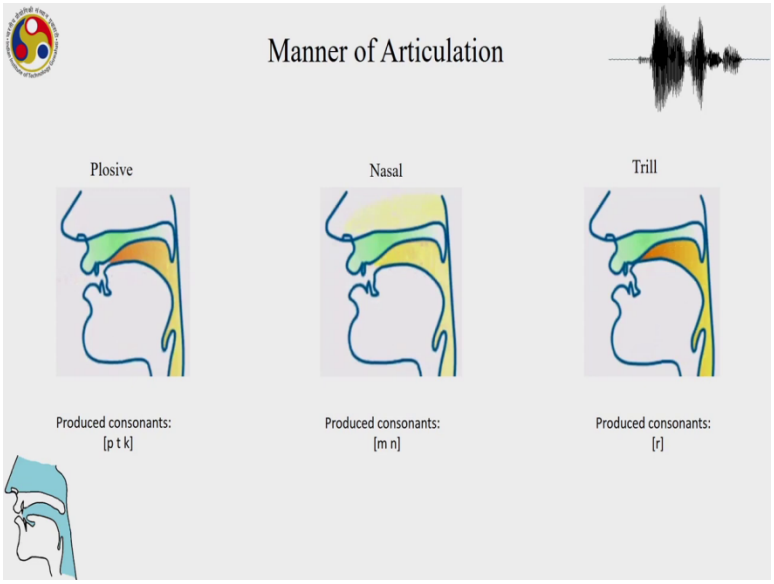



So for language, these are the common contrast that we see in languages. So languages can have dental alveolar so it is not very common to have both a dental and an alveolar contrast but that is also seen as we saw examples. But it's most commonly either the dental or alveolar place of articulation. 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.

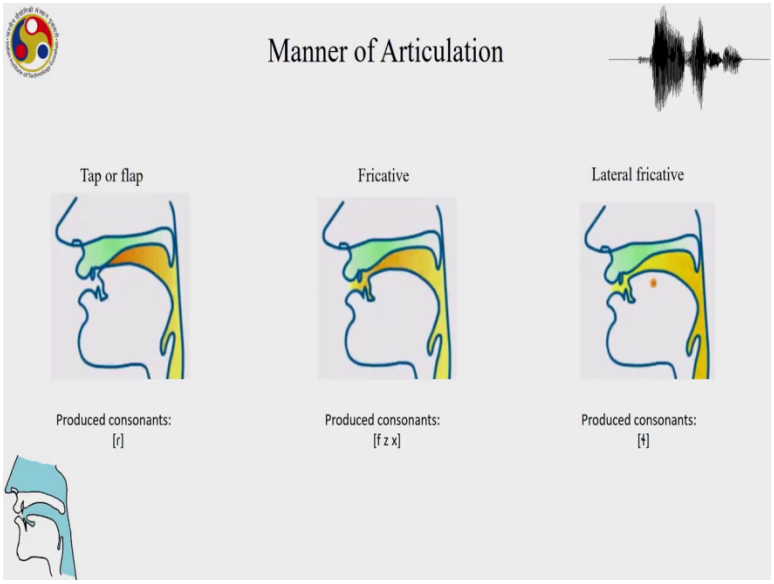
(Refer Slide Time: 11:04)



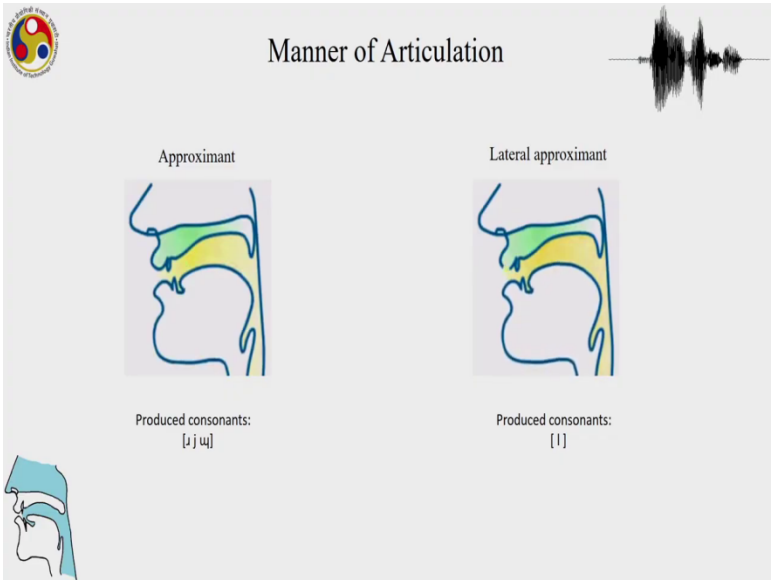

We have seen manner of articulation in the previous lecture on articulatory phonetics. Stops require complete closure, nasals also required to complete closure if they are stopped, nasal stops, but then the velum is lowered and air is released through the nose. And then we have rapid sort of vibrating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

(Refer Slide Time: 11:35)



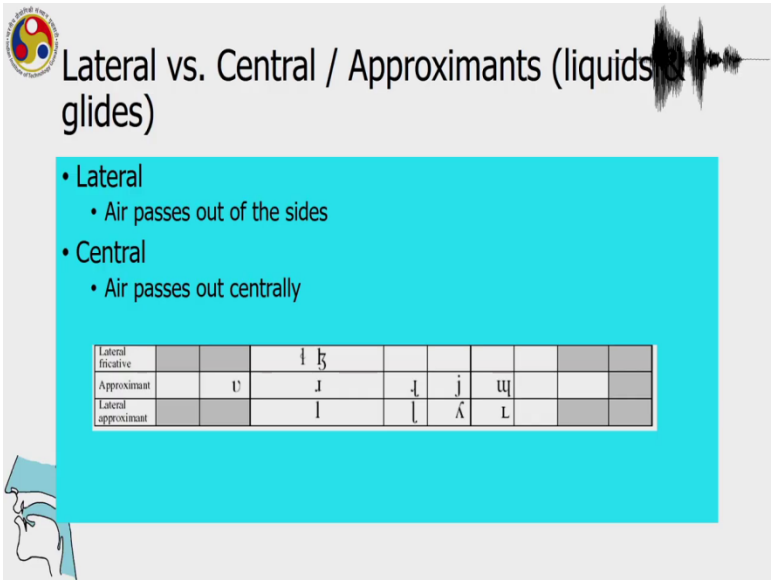

And then we have tap or flap and then we have fricative where we have the occlusion is not like that of the stop where it is not complete closure, but it is harsher and slower release. And we also saw that there could be a difference between centrality and laterality in languages. So we can also have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

(Refer Slide Time: 12:08)




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.

(Refer Slide Time: 12:26)




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

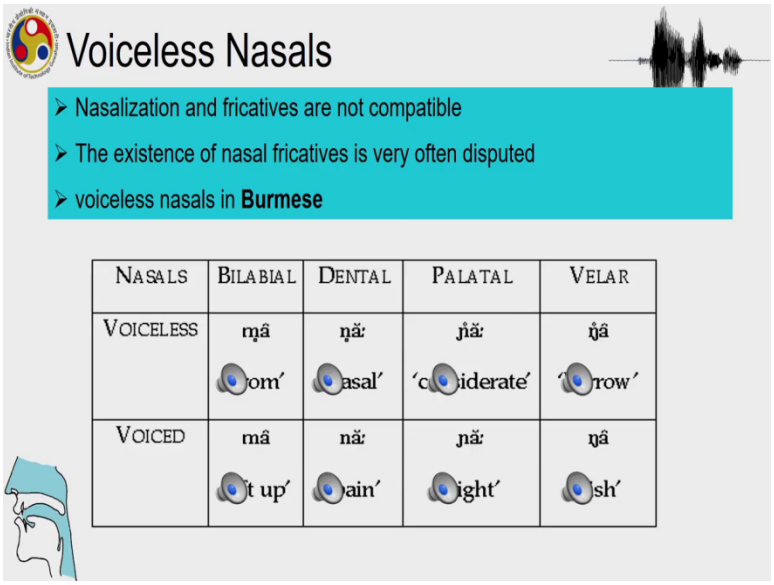
(Refer Slide Time: 12:39)


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.

(Refer Slide Time: 14:10)

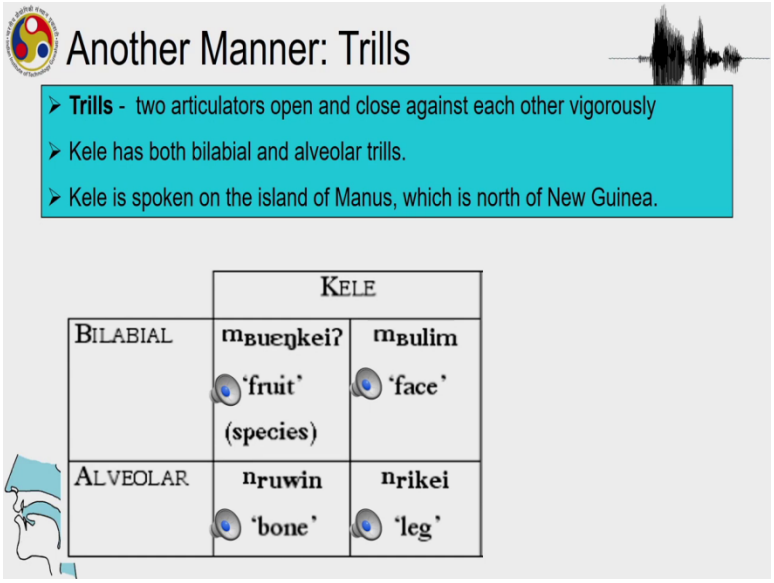



For instance, let us (pronouncing Burmese) see voiceless nasals. As we know nasals involve the release of air through nasal cavity because the lowering of the velum and there is already another closure in the vocal tract. So nasalization and fricatives, are not compatible. And the existence of a nasal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

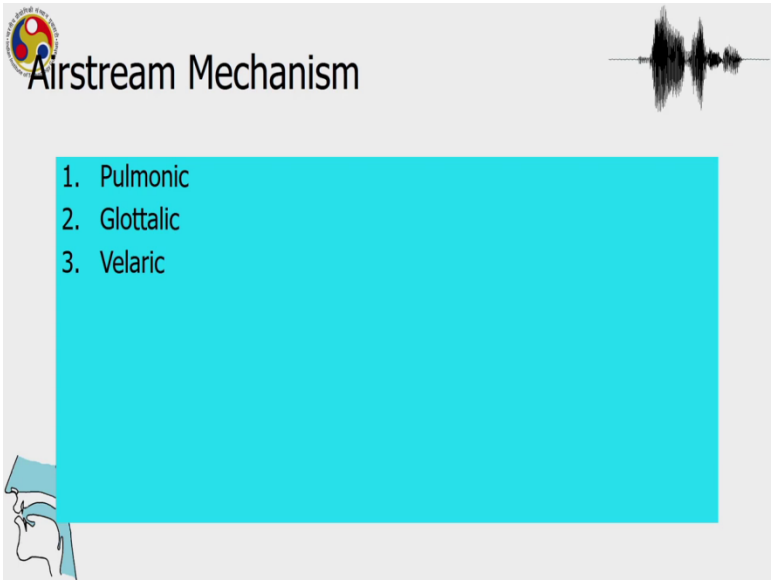
(pronouncing Burmese) that is a bilabial voiceless nasal, (pronouncing Burmese) bilabial dental nasal, (pronouncing Burmese) bilabial palatal nasal, (pronouncing Burmese) that is a bilabial velar nasal. So, (pronouncing Burmese) all these nasals that you heard were voiceless nasals. So, when you heard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

(Refer Slide Time: 16:03)




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.

(Refer Slide Time: 17:15)

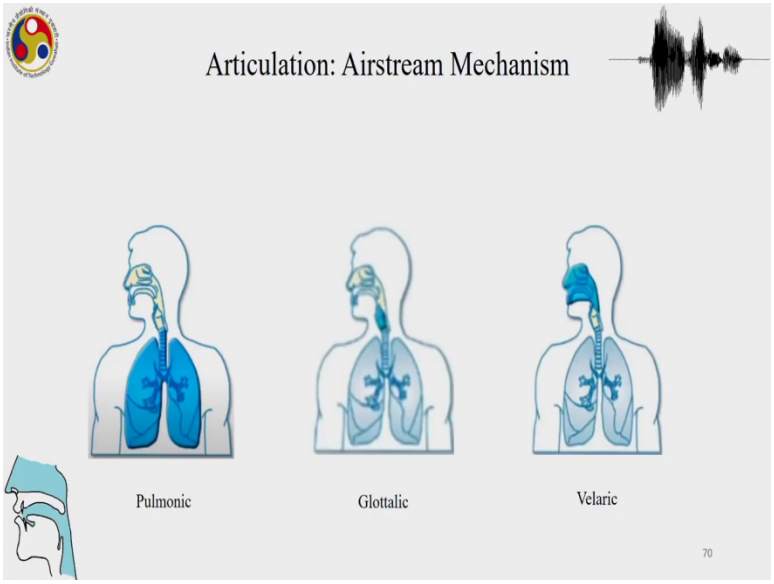



And other aspects, which we will cover is that of the airstream mechanism that is pulmonic, glottalic or velaric, languages can contrast.

(Refer Slide Time: 17:27)

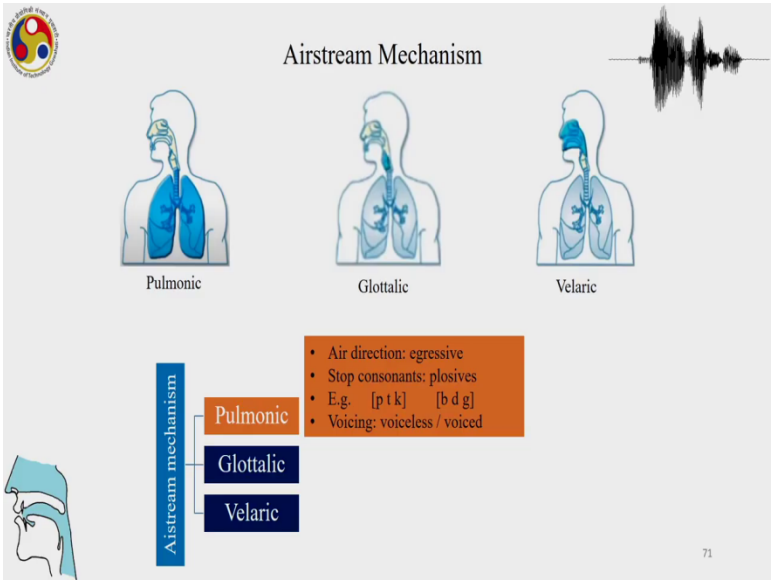

And importantly, another aspect that we have to consider in this lecture is that of airstream direction, which also gives a particular shape and color and flavor of sounds, and which may not be available in the languages which are most commonly seen or spoken in the languages of the world.

(Refer Slide Time: 17:51)



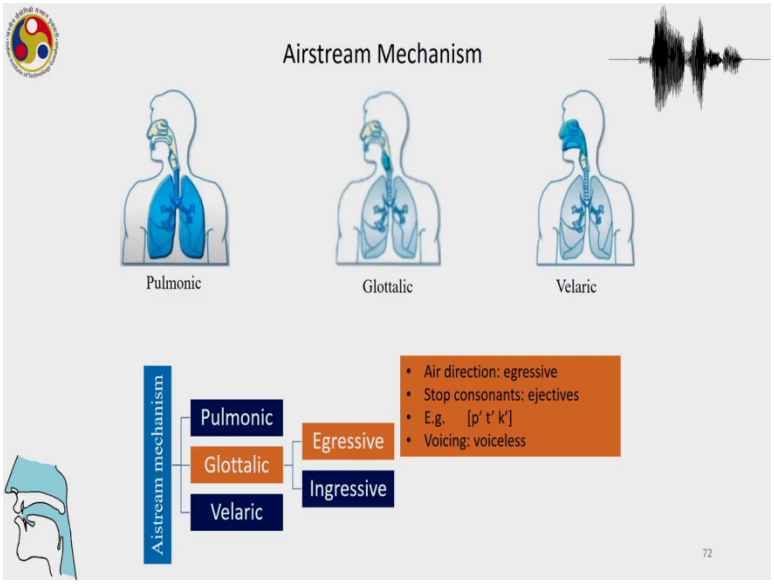

So, the pulmonic egressive airstream mechanism is the one which is most commonly employed for the production of sounds. However, there are sounds, which do not use the pulmonic egressive airstream mechanism and they can be glotallic, they can be velaric as well.

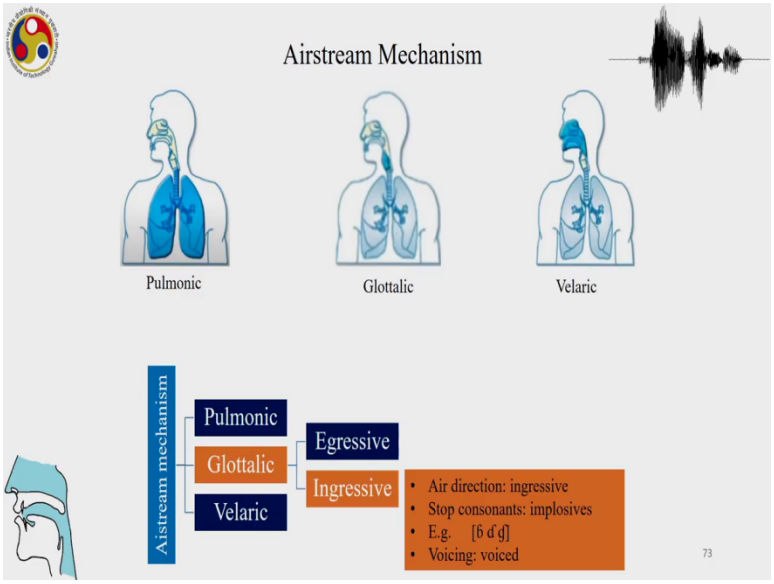
(Refer Slide Time: 18:19)




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.

(Refer Slide Time: 18:41)

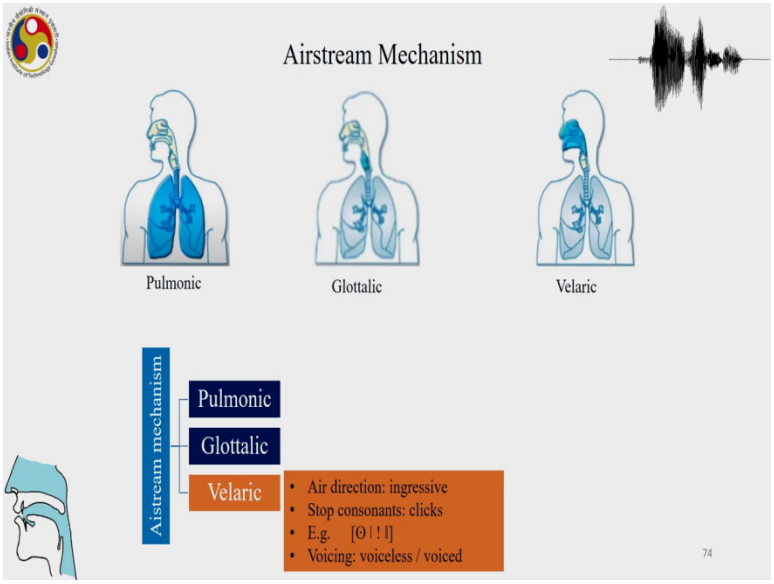



And also then there are others like the glottalic, where the airstream is egressive and can produce sounds like ejectives and we have mostly voiceless egressive sounds. And then we have here, please note that this is the symbol that was used for the Quechua ejectives with the apostrophe, which we said 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.

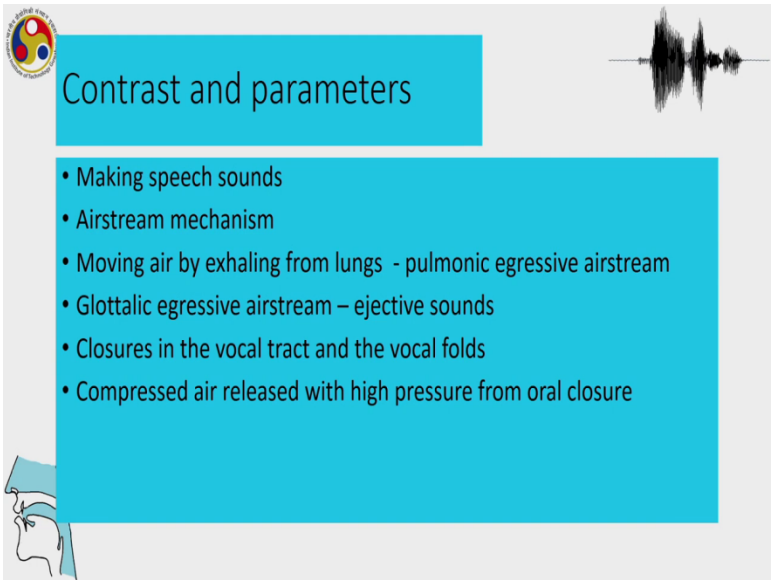
So, the glottalic airstream produces sounds both in the egressive and that is the air flowing out and ingressive that is the air sucked in and within both directions, sounds are produced.

(Refer Slide Time: 20:13)



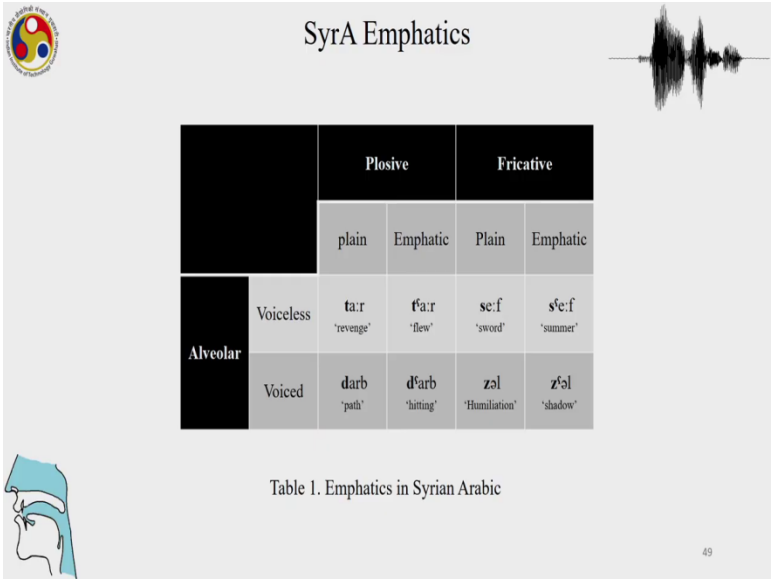

In the velaric, airstream mechanism sounds are produced with the air which is sucked inside the velaric region and what is produced with that sound with that air by the velaric airstream is called clicks. So, these are the 3 airstream mechanisms and of which pulmonic is the most commonly used. And then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

(Refer Slide Time: 20:21)




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.

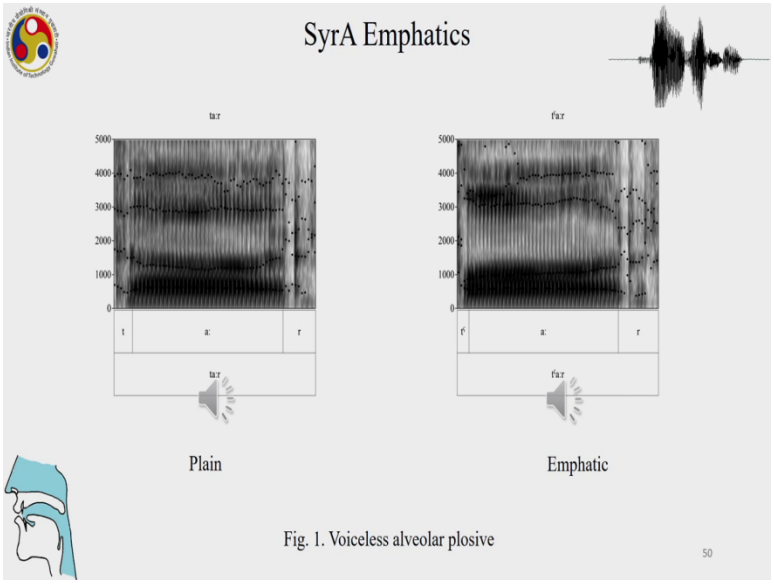
(Refer Slide Time: 21:13)




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,

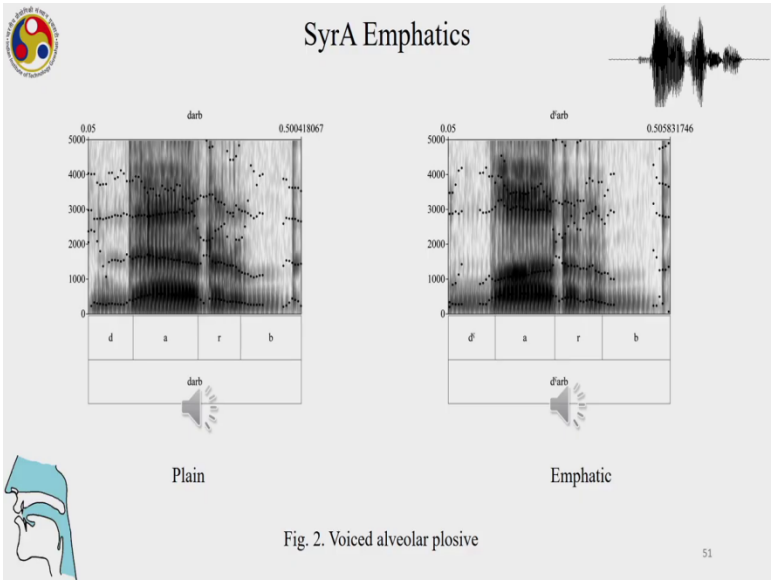
glottalized or laryngealized sounds, so they have a secondary articulation, and that makes them emphatic. So this difference between plain and emphatic consonants in Syrian Arabic.

(Refer Slide Time: 21:45)



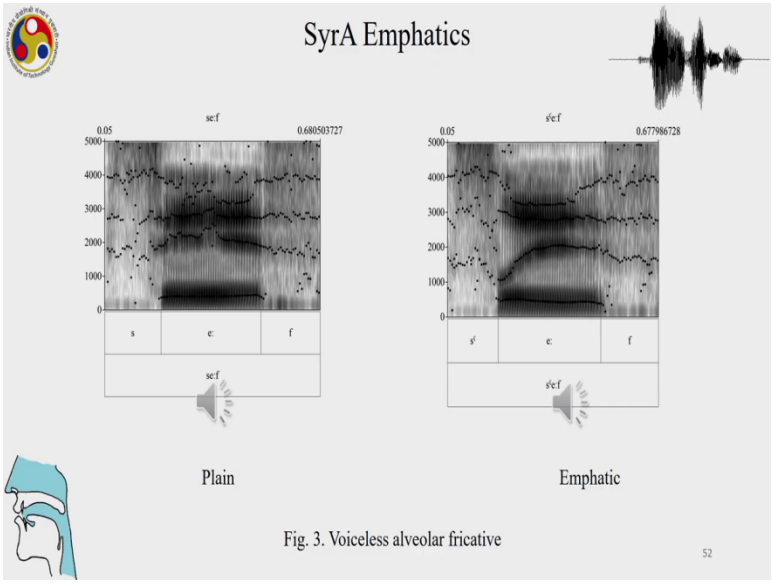

So let us look at a few of them (pronouncing Arabic). That is a plain obstruent, plain stop sound glossal sound. And this is an emphatic, which is glottalized (pronouncing Arabic). So this is a voiceless alveolar plosive in Syrian Arabic, which can contrast based on whether it is an emphatic or a non-emphatic,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

(Refer Slide Time: 22:20)



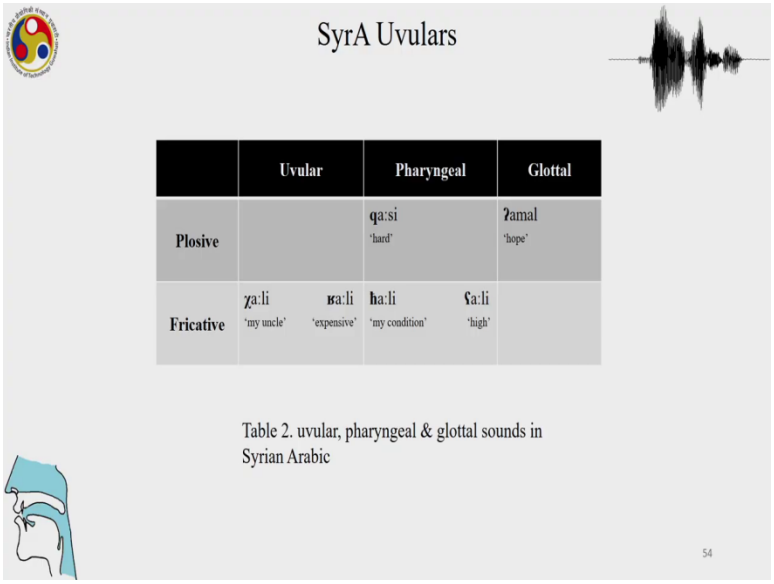

So, another one here is the da, the voiced alveolar plosive, which can be either a plain one or it can be an emphatic one (pronouncing Arabic).

(Refer Slide Time: 22:37)



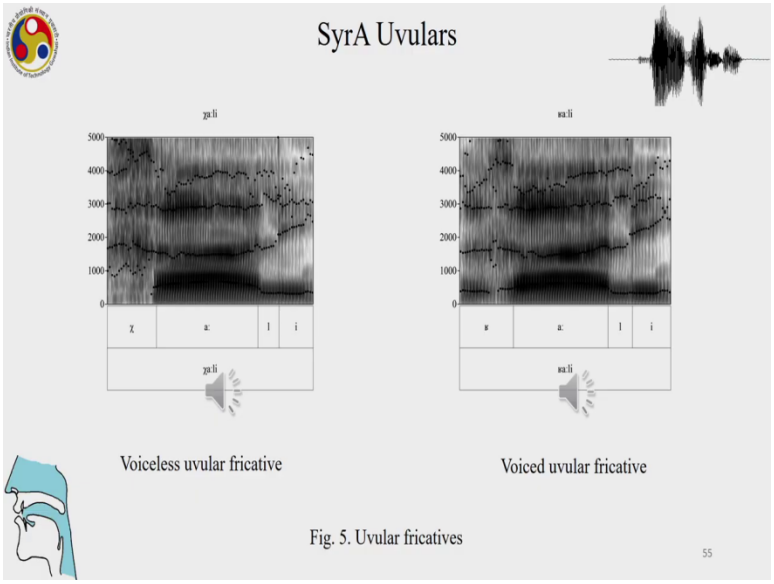

Again, this fricatives, which can be either plain or emphatic. (pronouncing Arabic)

(Refer Slide Time: 22:51)



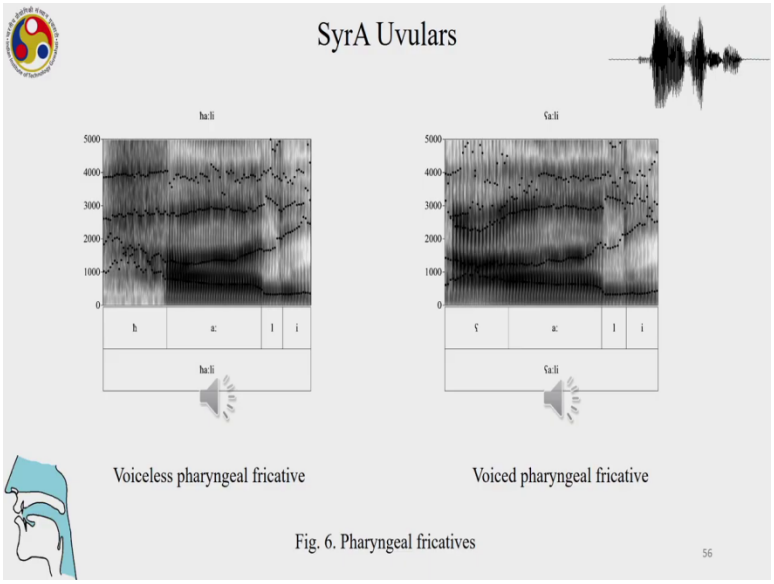

And then there are the Syrian Arabic uvulars. So the Arabic uvulars can be either plosives or they can be fricatives like the ones that we see on the screen, they can be along at the place of articulation being pharyngeal, or glottal. And for the plosive, for the fricatives, we also have uvular place of articulation. And here we have one example of a fricative, which is uvular.

(Refer Slide Time: 23:26)



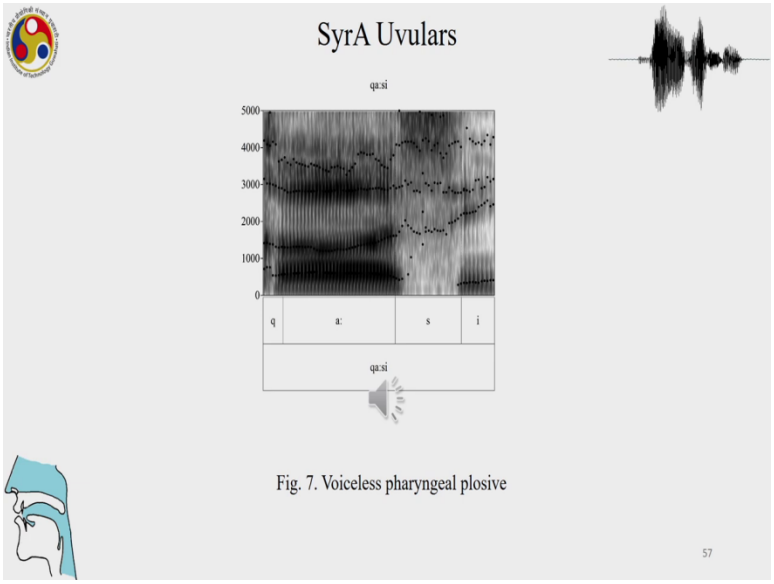

(pronouncing Arabic) So, that is a voiceless uvular fricative. (pronouncing Arabic) That is a voiced uvular fricative. So, both examples are from Syrian Arabic.

(Refer Slide Time: 23:41)



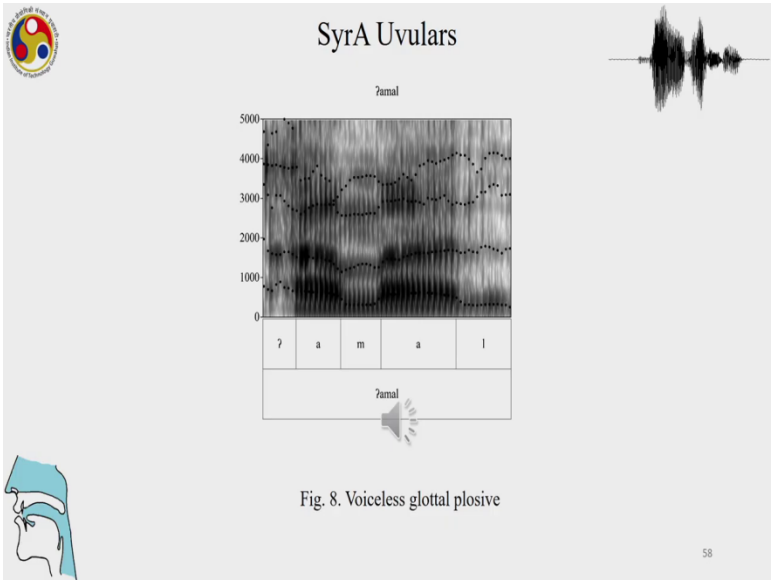

Then there are the pharyngeal fricatives in this variety of Arabic. So, again, we can have the fricative which is a non-emphatic like a plain one and an emphatic one. (pronouncing Arabic)

(Refer Slide Time: 24:03)



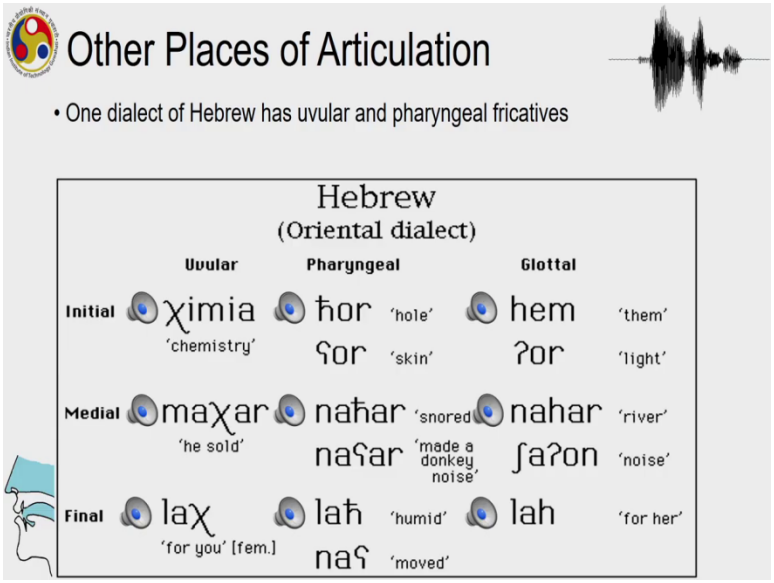

(pronouncing Arabic) So we can also have a voiceless pharyngeal plosive.

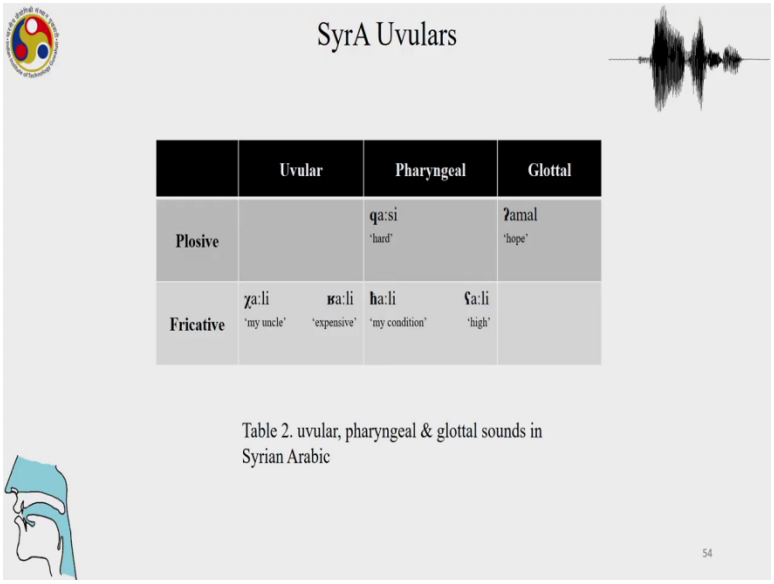
(Refer Slide Time: 24:08)




(pronouncing Arabic) Glottal, voiceless glottal plosive etc.

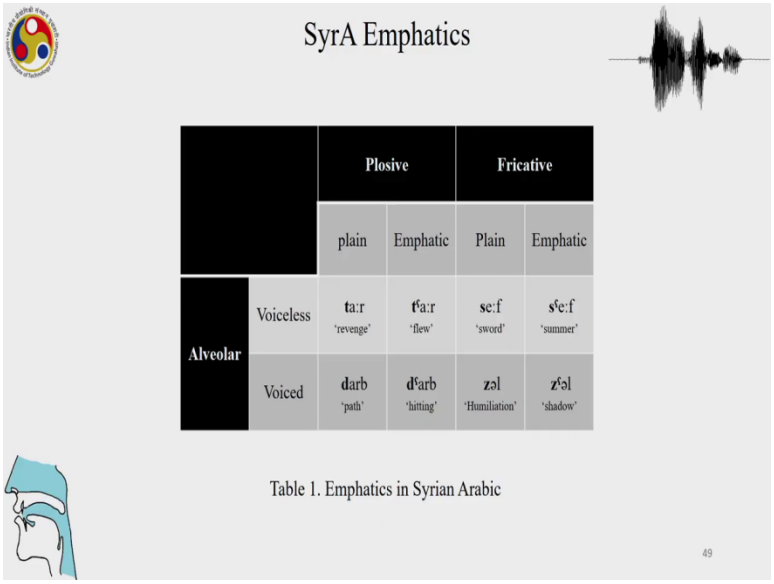
(Refer Slide Time: 24:14)



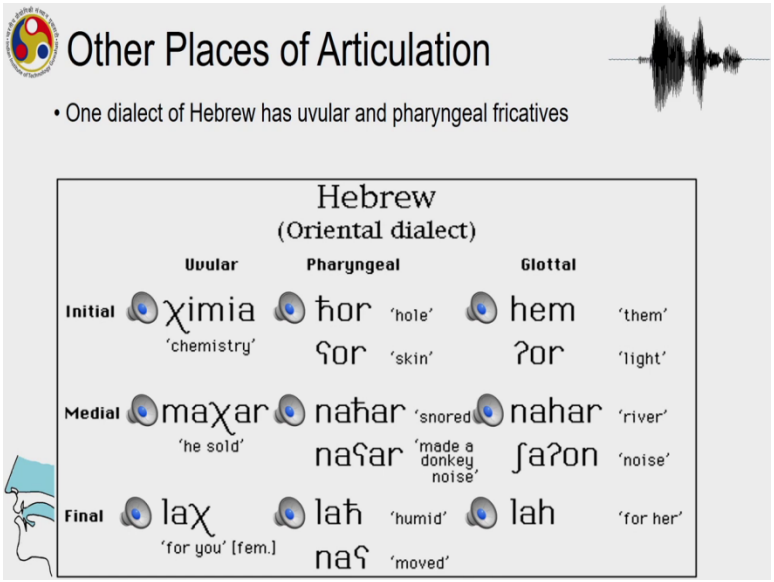

So, a dialect of Hebrew also has uvular and pharyngeal (pronouncing Hebrew) and some of these overplayed and the distinction here is again (pronouncing Hebrew) uvular, pharyngeal and glottal (pronouncing Hebrew). So, here we can see, (pronouncing Hebrew) the uvular sound (pronouncing Hebrew) the pharyngeal 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)



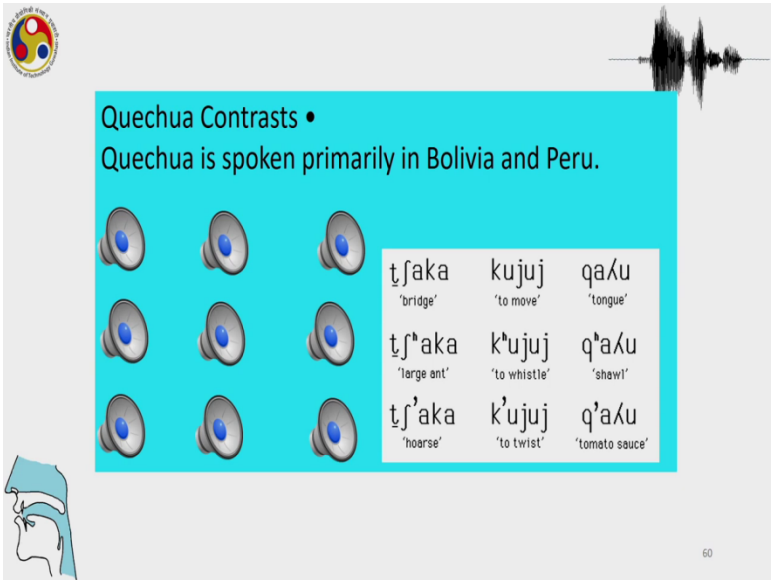

And apart from that, we also have emphatic sounds which are obstruents, but which have a glottalized or glottalized can be glottalized, pharyngealized or laryngealized depending on various other factors mostly historical.

(Refer Slide Time: 25:34)



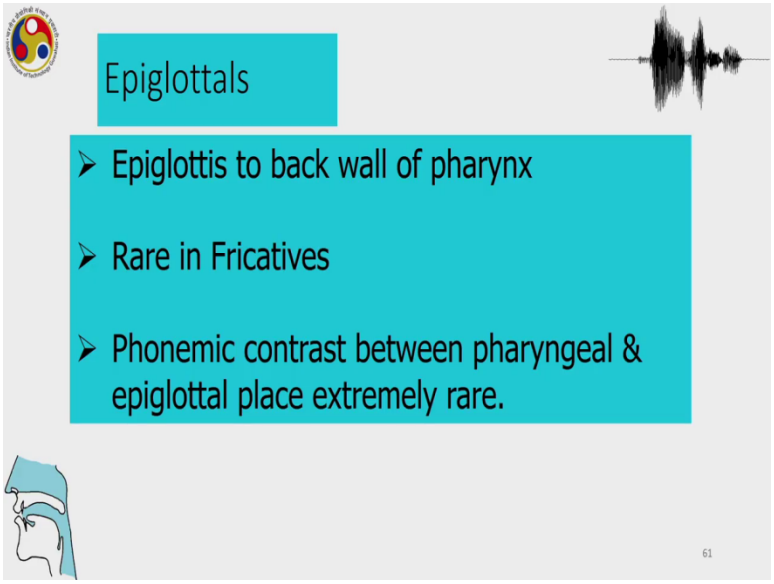

So, now, we see that in Hebrew, there is (pronouncing Hebrew) the Arabic variety that contrasts with pharyngeal fricative and also (pronouncing Hebrew) glottal fricative and glottal stop.

(Refer Slide Time: 25:56)



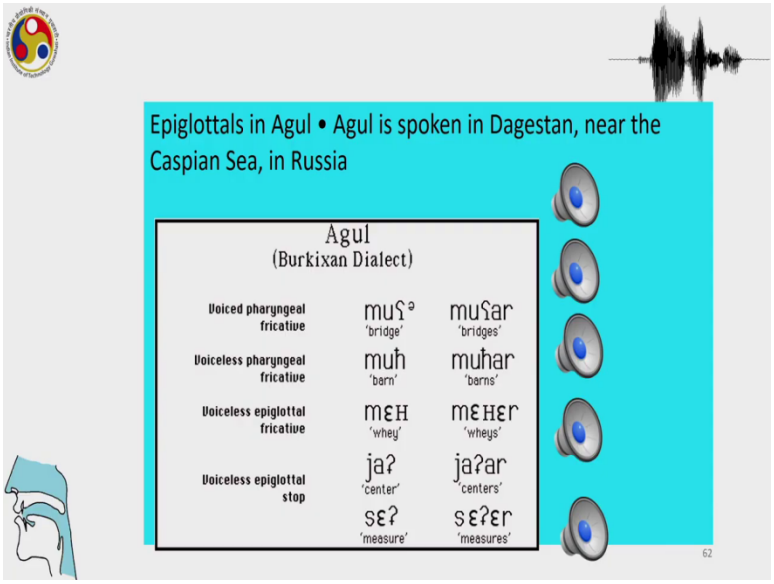

Quechua also has uvular sounds and we will play these Quechua sounds and Quechua will be important to talk about another type of sounds called epiglottals, so here (pronouncing Quechua).

(Refer Slide Time: 26:24)




Epiglottals, so, the sounds which are produced towards the back of the mouth, where the epiglottis is 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.

(Refer Slide Time: 26:53)




So, these examples are from Epiglottals in Agul. Agul is spoken in Dagestan, near the Caspian Sea in Russia. The first one was a voice pharyngeal fricative. The second is a voiceless pharyngeal fricative (pronouncing Agul) and the voiceless epiglottals fricative and voiceless epiglottal stop.

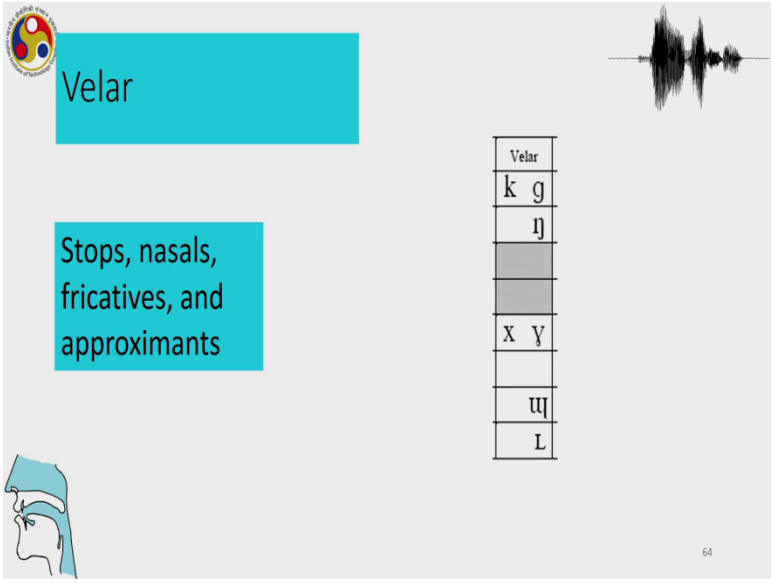
(Refer Slide Time: 27:24)


So, another type of sound are what we have is labial velars. And you hear that in a language called Idoma spoken in Nigeria. Here, the second sound is the labial velar. And you can see that

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.

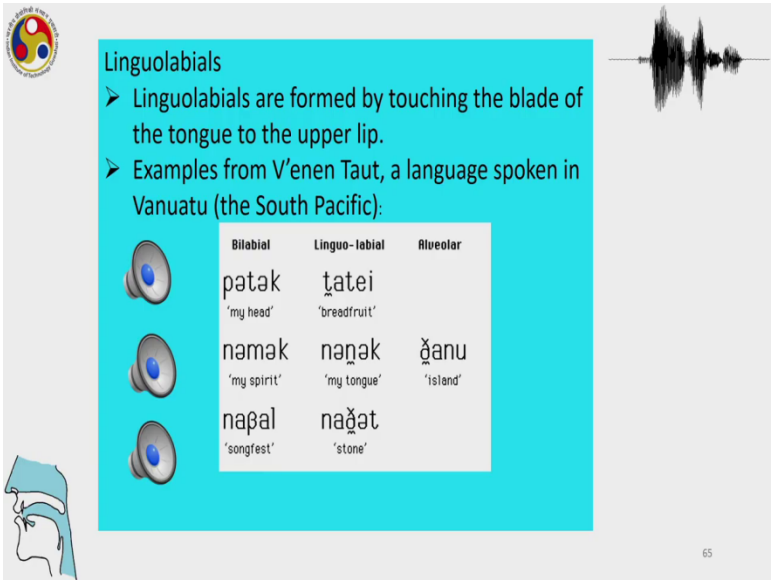
We can see the symbol here that is used for the labial velar, we use this diacritic to show that it is one sound, which is both labial and velar as you can see in the text here, that one velar sound, one labial sound, one velar, one labial, one velar, one labial is put together by a diacritic on top.

(Refer Slide Time: 28:30)



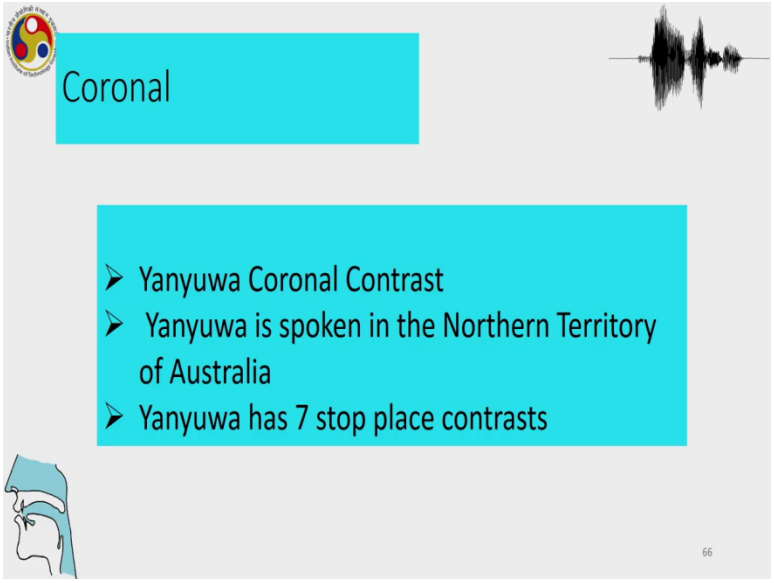

So, then, among the back sounds we also have velars. So, velars can be stops, nasals, fricatives and approximants. So, velar stops and velar nasals are quite common across languages. Also the velar fricatives and the velar approximants may not be very common, but these definitely are those stop contrasts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

(Refer Slide Time: 29:00)




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.

(Refer Slide Time: 30:07)

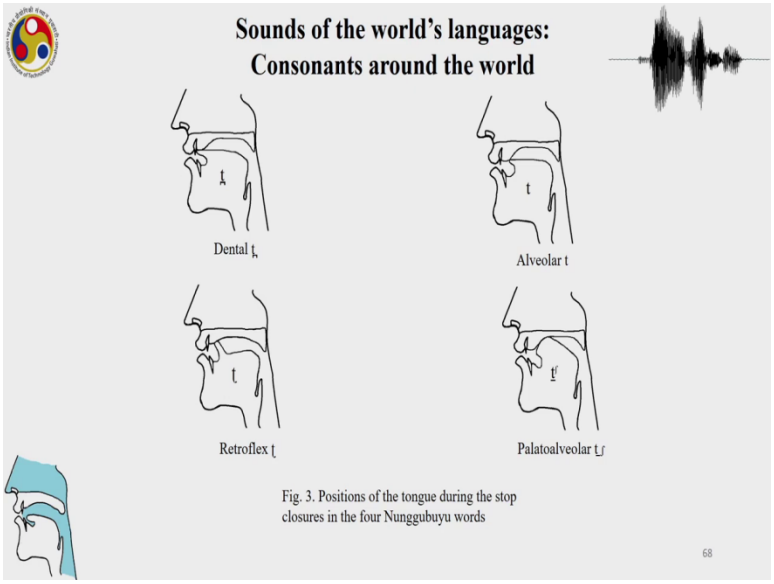


And talking about the rare sounds, in the front part, we have the coronals and among coronals, they can be languages like Yunyuwa and a few other languages which have at least 7 stop place contrast in the coronal region alone.

(Refer Slide Time: 30:20)

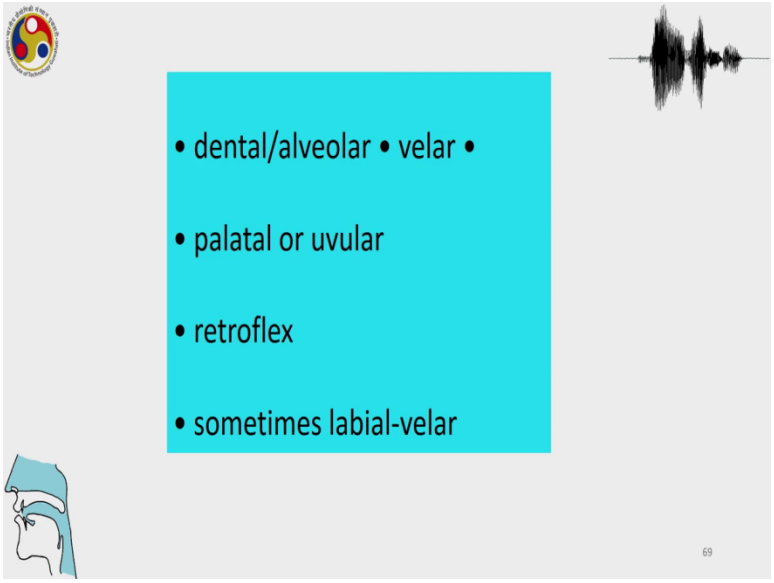

So these are the Yunyuwa stop contrast and all of them till the palato alveolar the apical retroflex, apical, alveolar dental, bilabial are the coronal contrast and there are 2 back sounds, one is a front velar and one is a back velar. (pronouncing Yunyuwa) That is a bilabial laminal dental, (pronouncing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

(Refer Slide Time: 31:15)




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 palate-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 palate-alveolar.

(Refer Slide Time: 32:05)

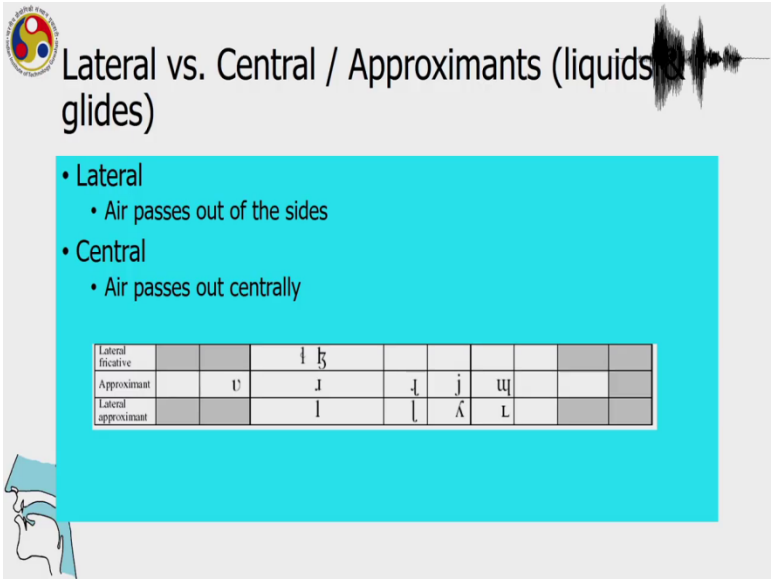


So talking about contrast in languages, dental and alveolar, most often if there is a dental contrast, an alveolar contrast is not there. So this is summarizing the most common inventories, it is not to say that the dental and alveolar contrast does not exist as we have seen, just seen it does exist.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

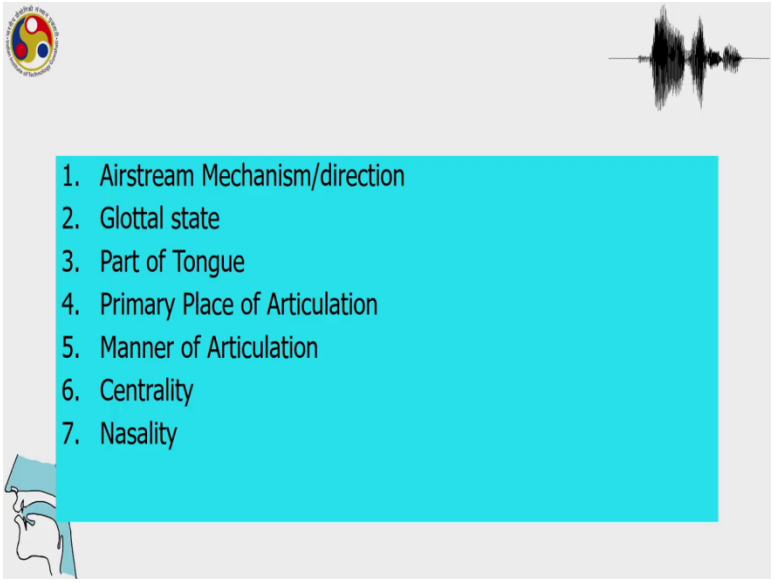
So, these are the common patterns seen in the languages of world, but as we have seen, there are so many variations that are possible to have among the places of articulation that you can have linguolabials, you can have other places like pharyngeals, epiglottals, etc., and which are not the most commonly 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.

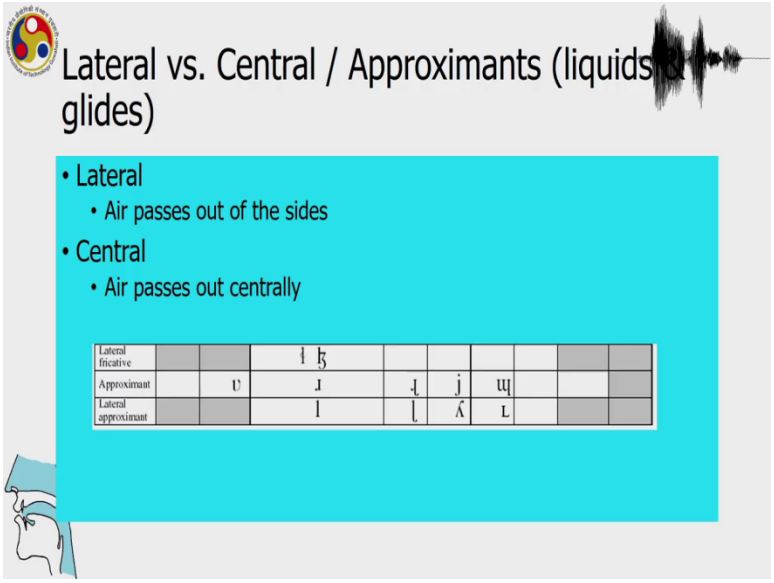
(Refer Slide Time: 33:55)



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.

(Refer Slide Time: 34:16)




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.

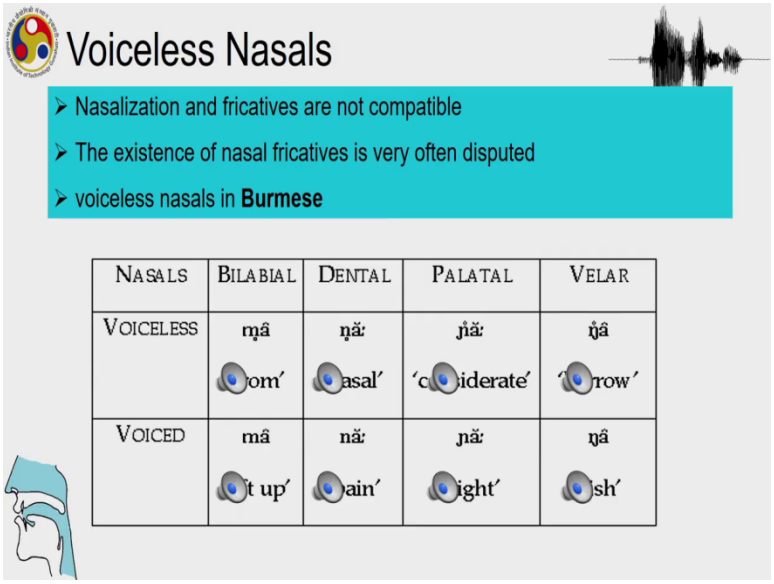
So, that is not just because of place of articulation, manner of articulation, there can be other things like airstream mechanism, the direction of airstream also. So whether it is the airstream which is coming in or it is the airstream, which is inhale or exhale. So, the mechanism which is used is the 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.

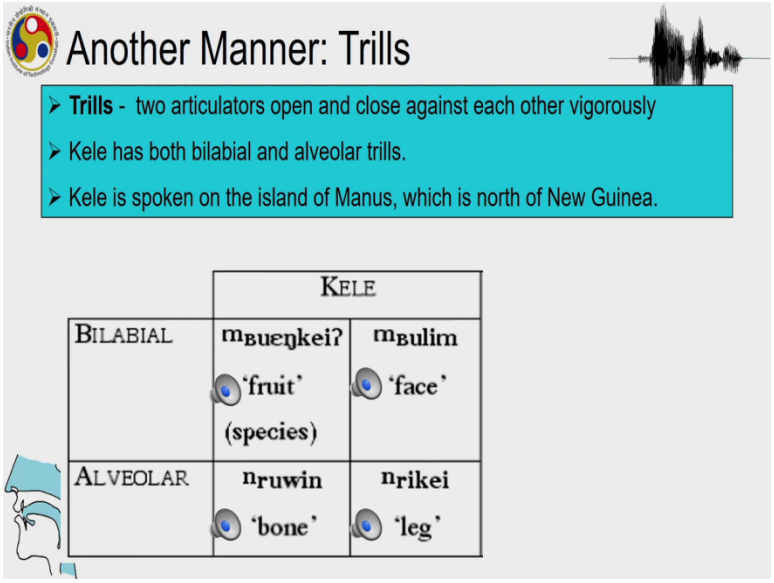
And of course, manner of articulation is very important. And the other aspect is centrality, central or lateral release. And then there is the other aspect which we could see in both consonants and vowels is that of nasality that the velar, the velum lowers and releases air through the nasal cavity and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

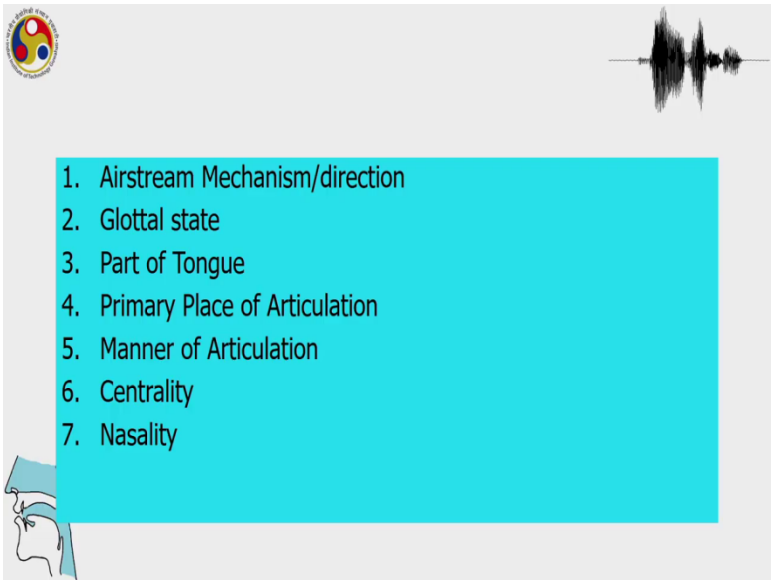
(Refer Slide Time: 37:17)




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.

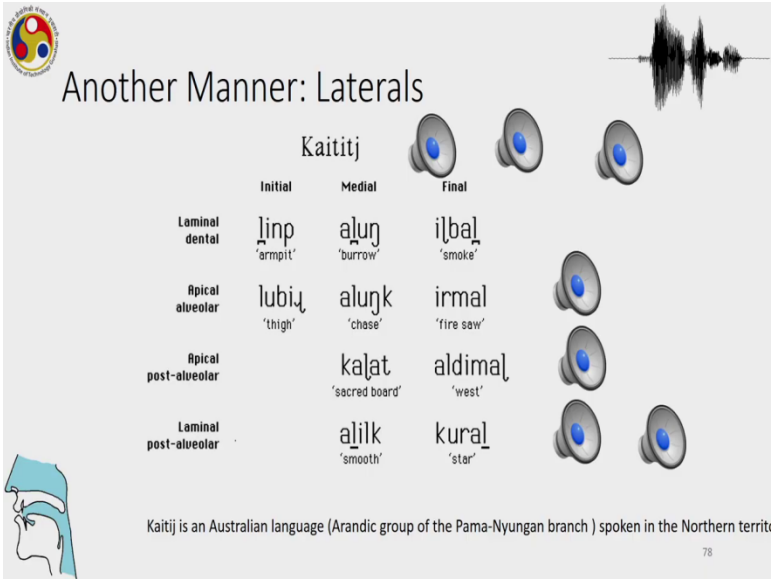
(Refer Slide Time: 38:09)






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)

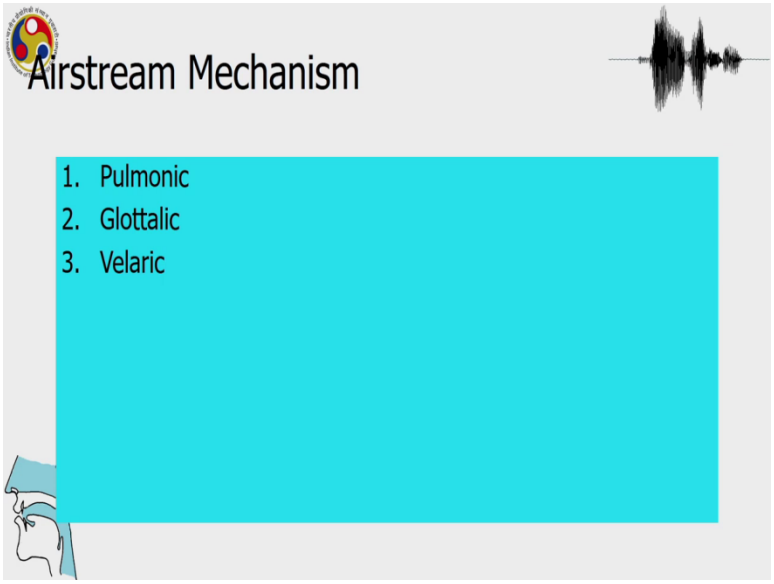



So, there can be another property not exactly a manner, but the property of laterals. So, this is Kaititj is an Australian language, it is a Arandic group of the Pama-Nyungan branch spoken in

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.

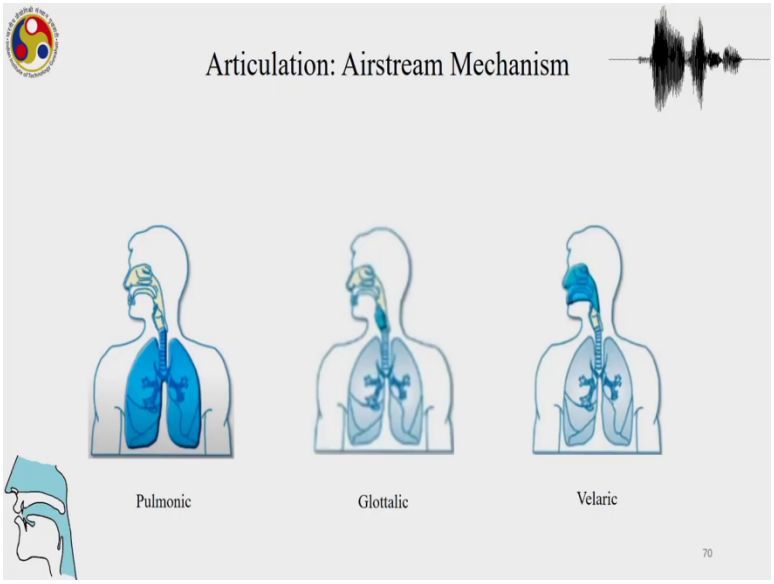
(Refer Slide Time: 40:23)




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.

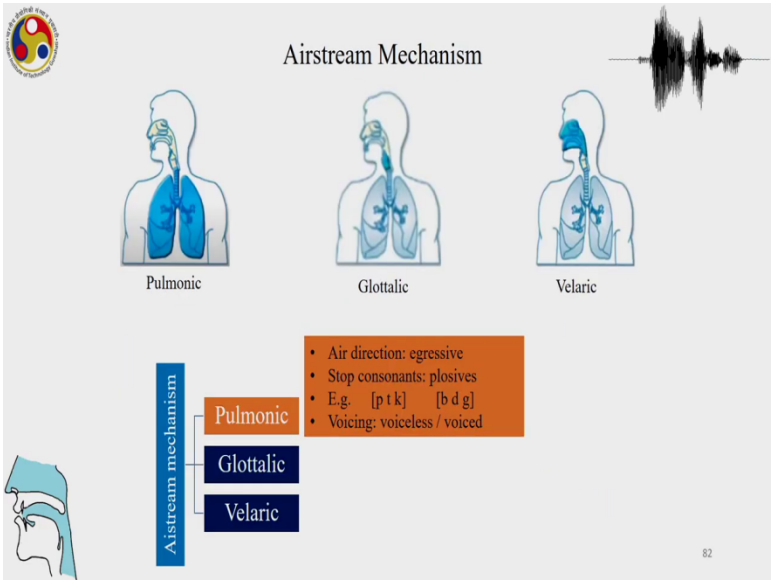
Now, importantly, it is not always that sounds are produced with the pulmonic egressive airstream. And there are a few languages which use the glottalic and velaric airstreams also producing very interesting particular and unique kind of sounds. So we have to remember that the pulmonic egressive is the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

(Refer Slide Time: 41:45)

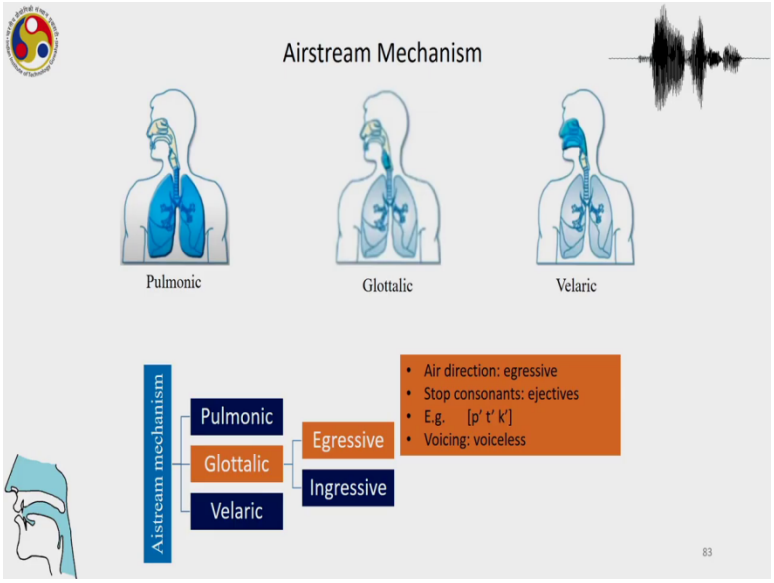

So, here is our pulmonic egressive, and then we have the glottalic, and we have the velaric.

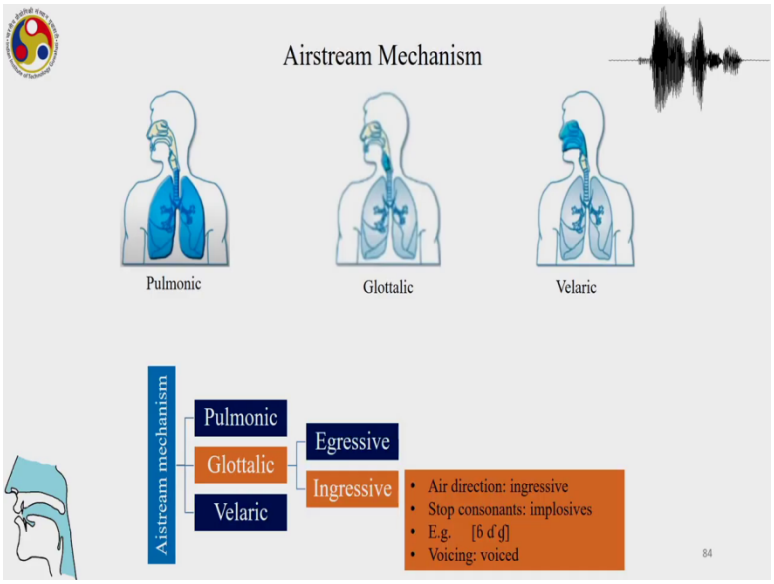
(Refer Slide Time: 41:55)




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

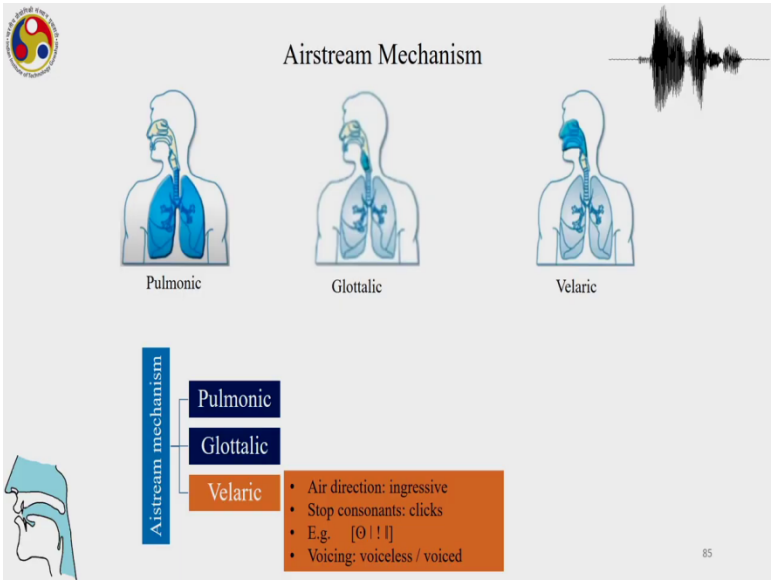
(Refer Slide Time: 42:01)





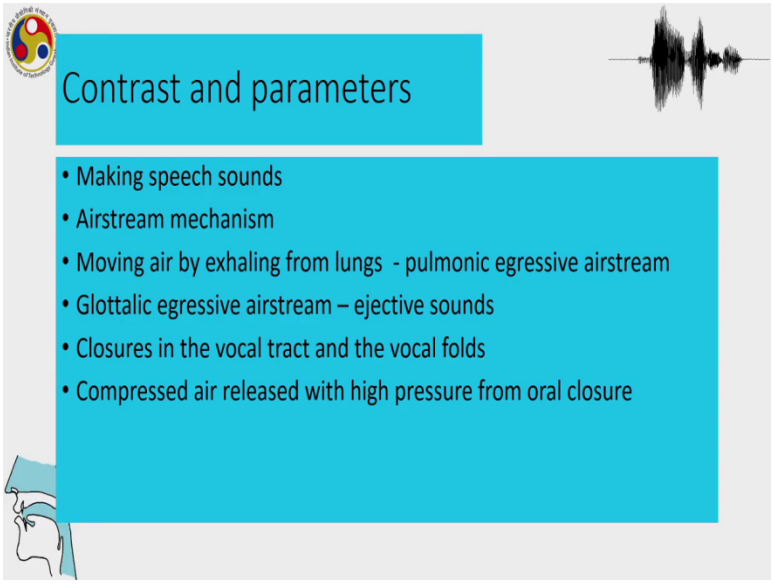

And then with the glottalic airstream, the 2 ways possible, egressive and ingressive. With the egressive airstream mechanism we produce ejectives, the ingressive will produce voiced implosive. So ejectives are mostly voiceless and implosives are mostly voiced.

(Refer Slide Time: 42:24)



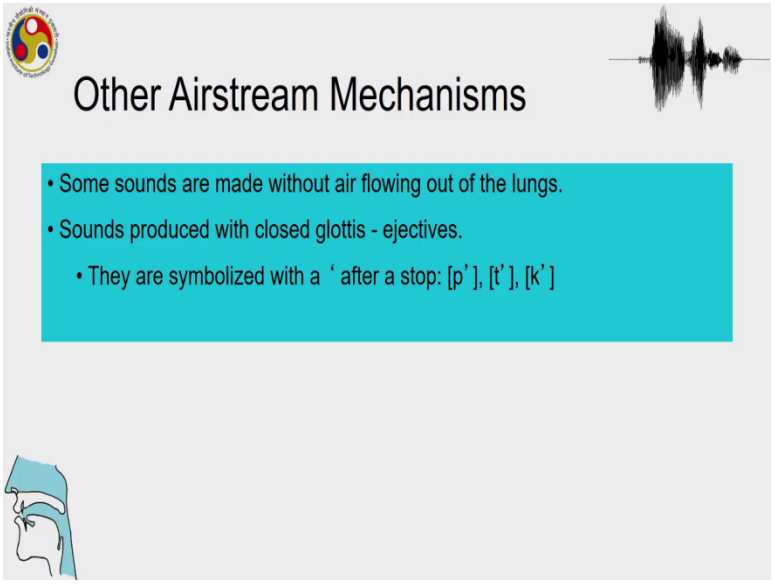

And then there are the velaric airstream only at the ingressive direction possible. And in this clicks are produced, and clicks can be both voiceless and voiced.

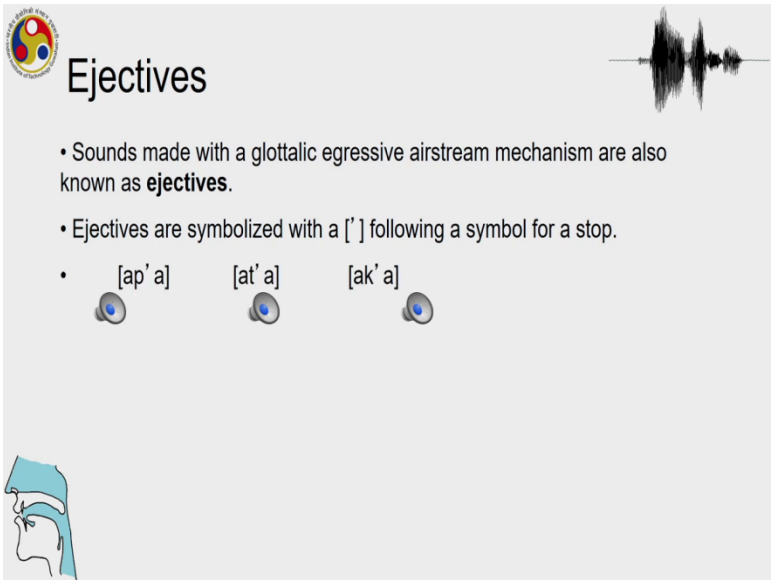
(Refer Slide time: 42:36)




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.

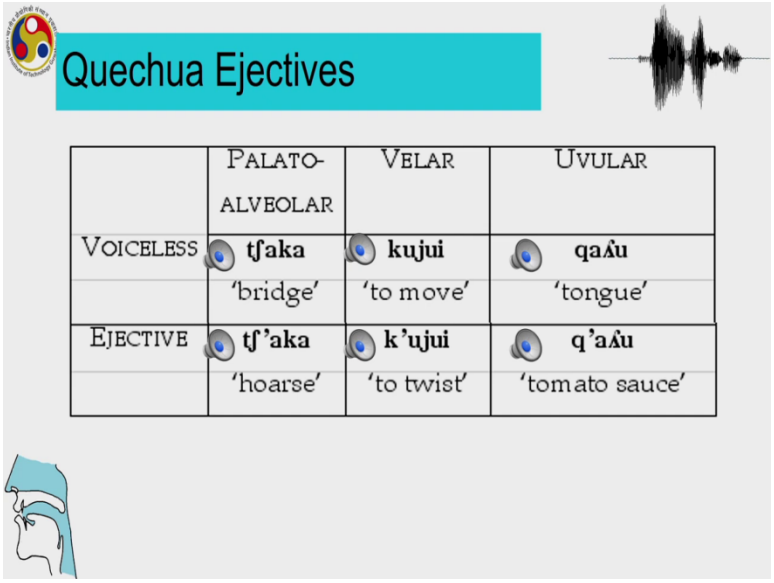
(Refer Slide Time: 43:10)






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.

(Refer Slide Time: 43:34)



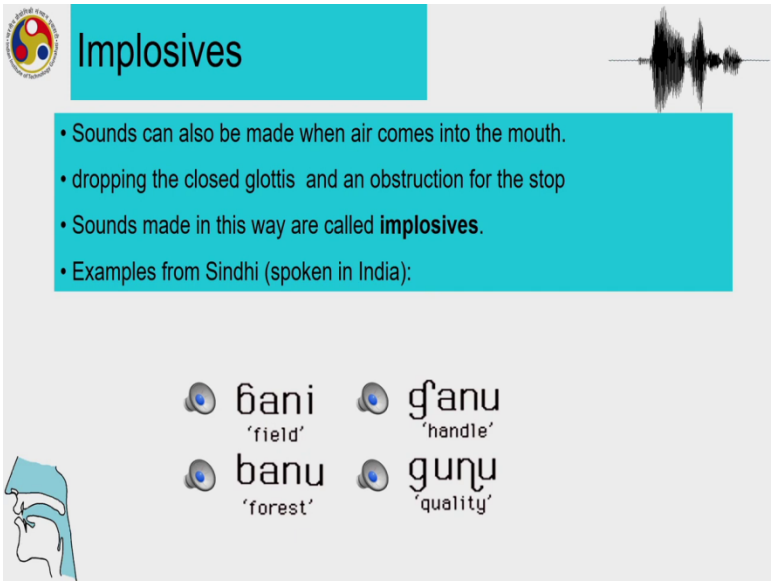

So (pronouncing Quechua), let us create the Quechua ejectives again (pronouncing Quechua). So, those are the palato-alveolar, velar, uvular and these are the ejective sounds (pronouncing Quechua) that is uvular ejective, this is the (pronouncing Quechua) velar ejective, (pronouncing Quechua) this is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

(Refer Slide Time: 44:07)


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.

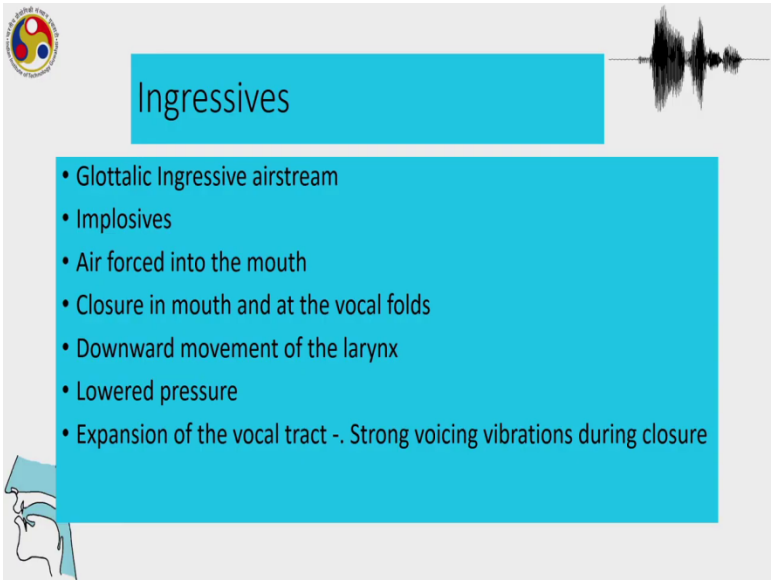
Here additionally, there is a raising of the glottis and the air rushes out of the vocal tract from the high pressure region, there is a low pressure region created as a result of which the glottal stop is produced and sounds which are producing the glottalic egressive airstream mechanism, they are all 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.

(Refer Slide Time: 45:24)




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).

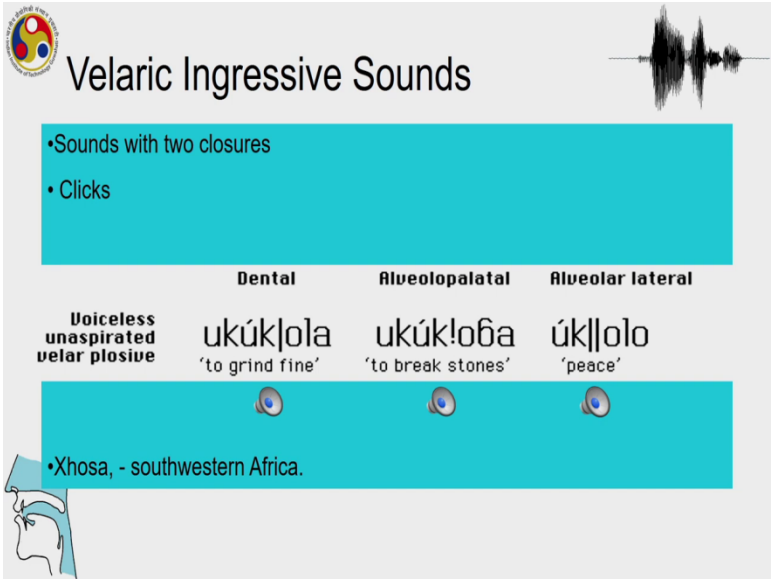
(Refer Slide Time: 46:06)




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

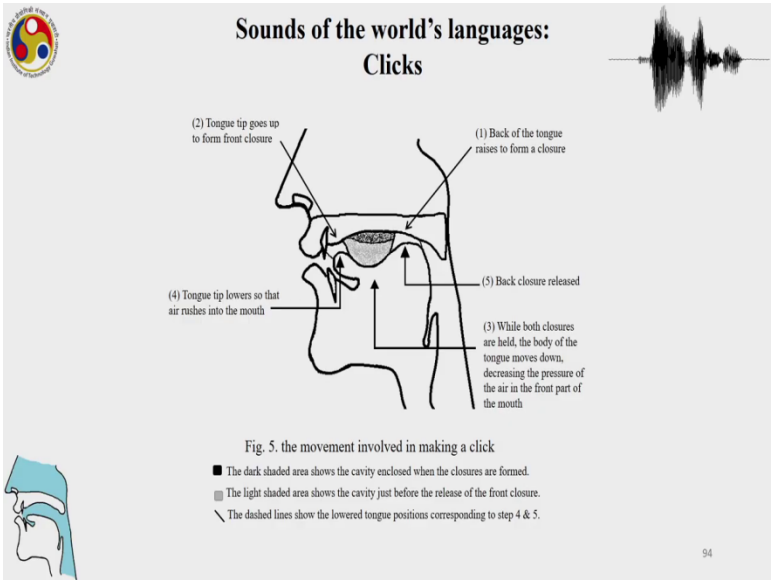
is a lowered pressure and expansion of the vocal cord and strong vibrations because of this closure of the larynx. And as a result we have ingressive. So, air which rushes into the mouth, the glottis is lowered creating a lowered pressure and the larynx is lowered, and it is causing lowered pressure. 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.

(Refer Slide Time: 47:05)




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.

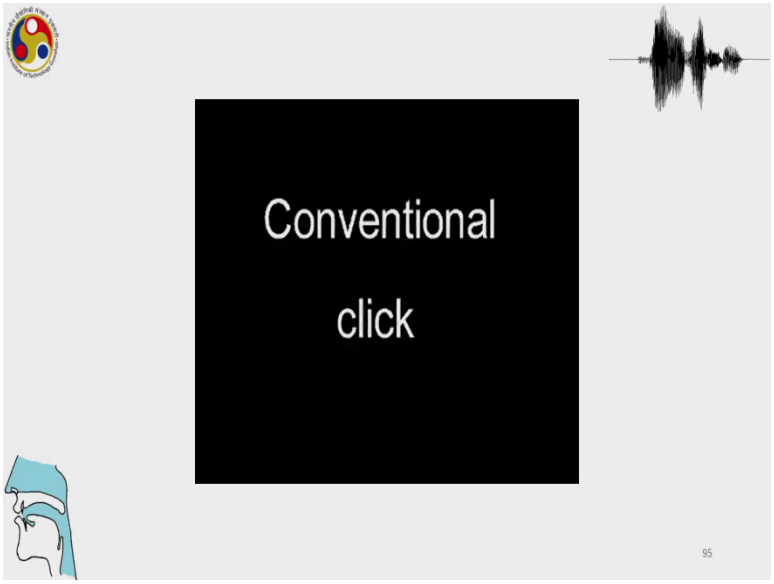
(Refer Slide Time: 47:42)

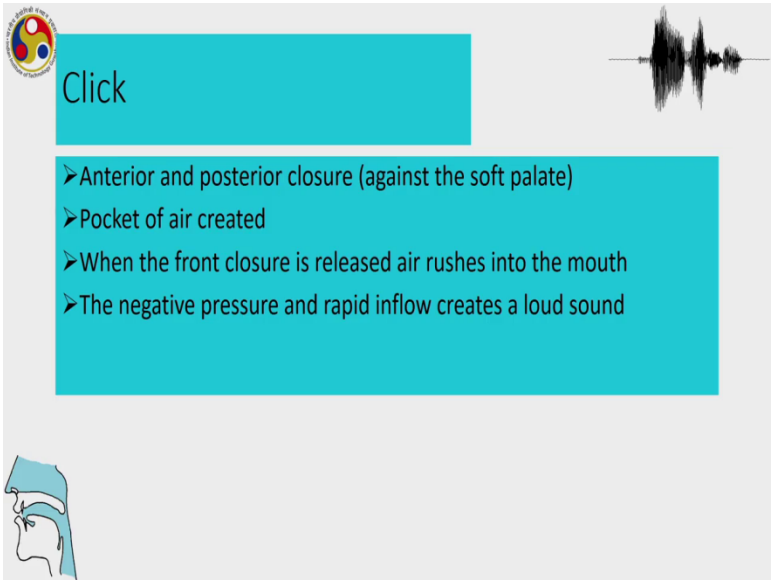



So this is a diagram showing the movement involved in making a click. So the dark area shows a cavity enclosed when the closures are formed. The light is before the release, so it is a very small area, and then the area is made bigger, and then there is a release. And the dashed line shows the lowered 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.

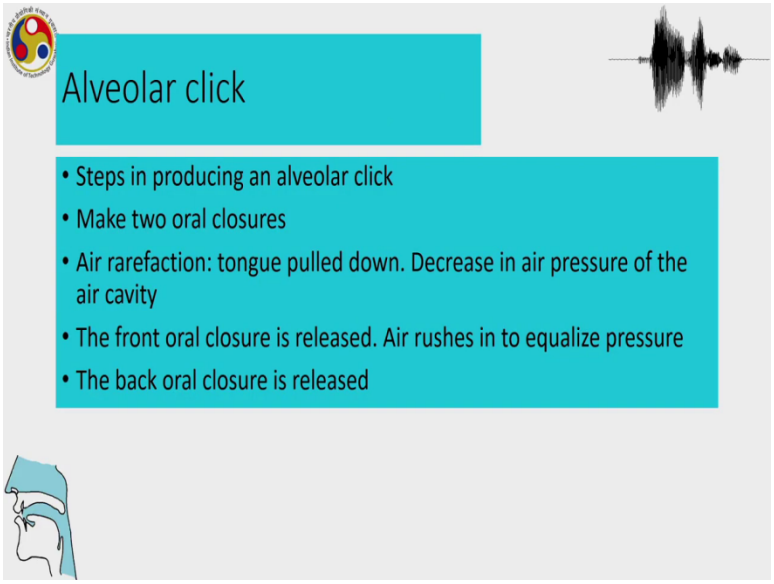
(Refer Slide Time: 49:07)



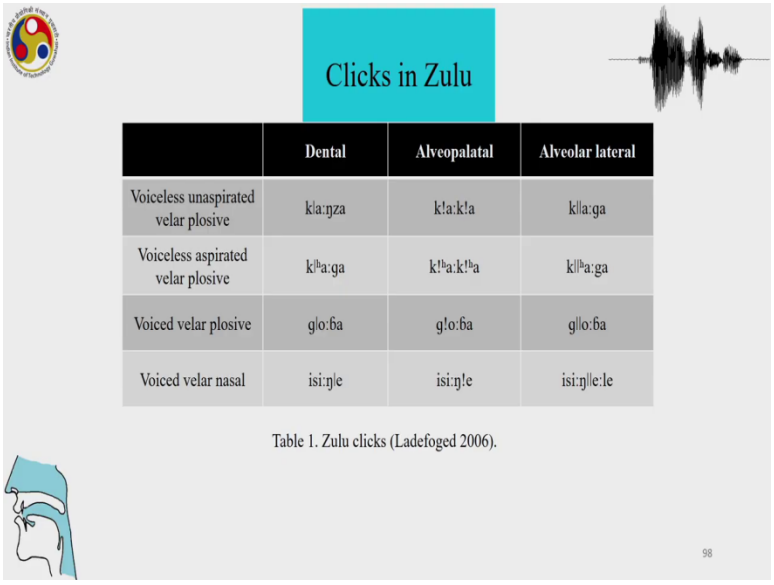

So, as we have just seen, clicks involved 2 closures, anterior and posterior closure, and a pocket of air is created. And when the front closure is released, air rushes into the mouth, and a negative pressure and rapid airflow creates a loud sound. So 2 closures, and pocket of air created. And when the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

(Refer Slide Time: 49:48)



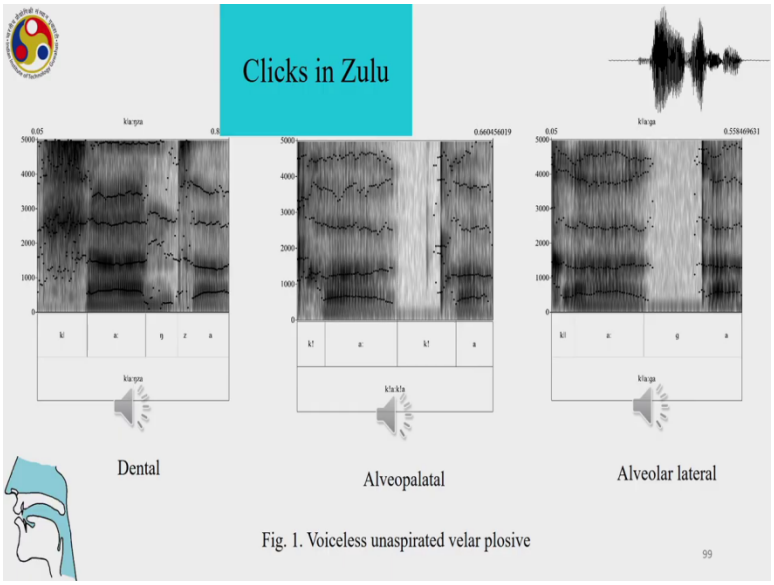

So as you can imagine, if there is an alveolar click, the front closure of the tongue will be in the alveolar region. So, as usual, there will be 2 oral closures and there will be air rarefaction, which we just studied the negative pressure which we just saw, the negative pressure, because the tongue 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.

(Refer Slide Time: 50:24)



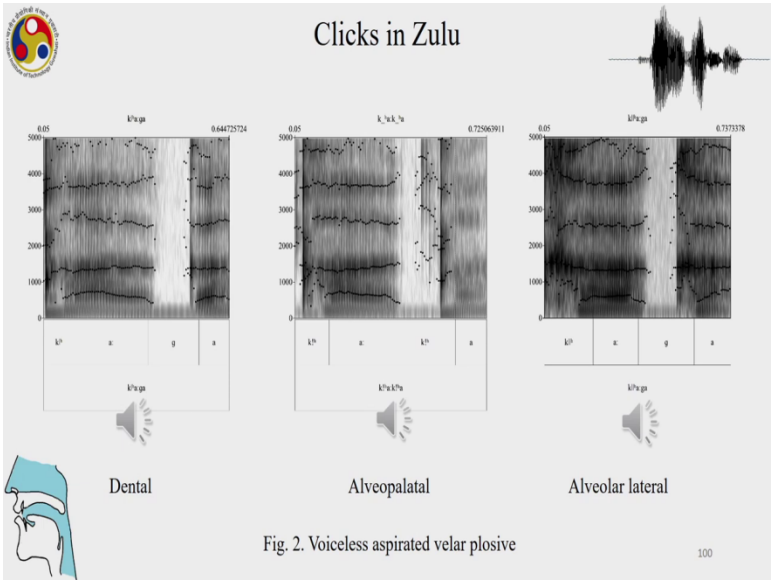

So, these are clicks in IsiZulu. And we can see that they have 3 regions, 3 places of articulation that is dental, alveo-palatal and alveolar lateral.

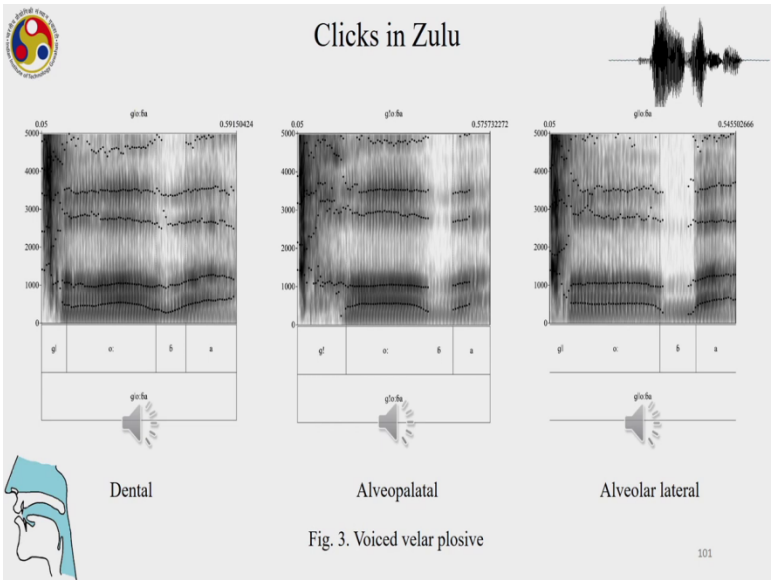
(Refer Slide Time: 50:42)

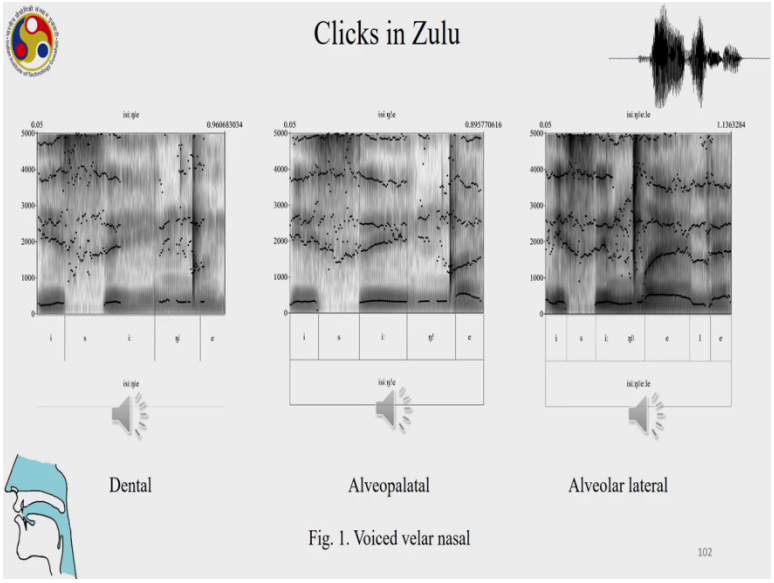



(pronouncing IsiZulu) So, this is the voiceless unaspirated velar, this is the dental (pronouncing IsiZulu). So, this is the dental, this is the alveolar and this the alveolar lateral. So, what we can see here in the spectrograms is that in the alveo-palatal which is clear, we can see the 2 releases 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.

(Refer Slide Time: 51:22)

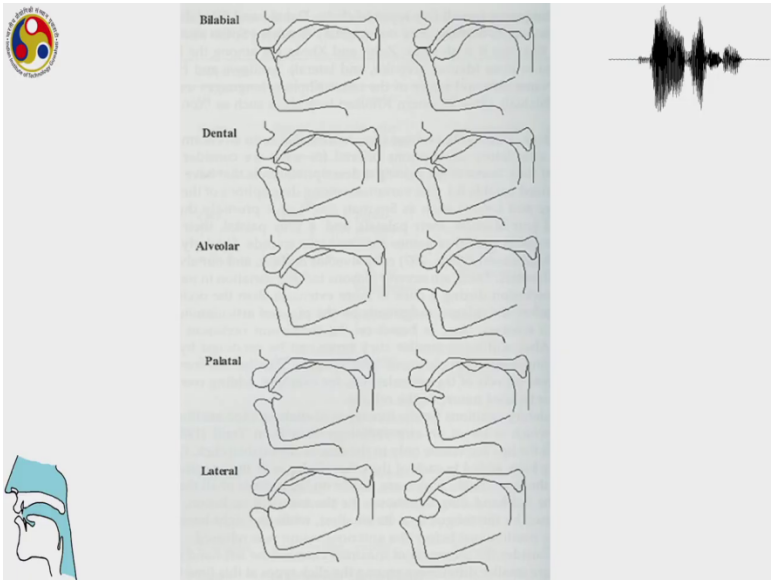




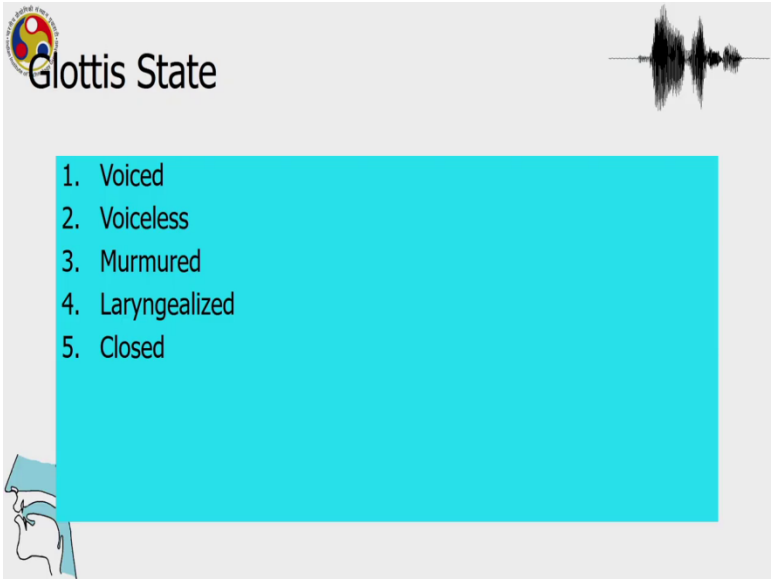

And also another one here (pronouncing IsiZulu). (pronouncing IsiZulu) dental, alveopalatal and lateral.

(Refer Slide Time: 51:54)



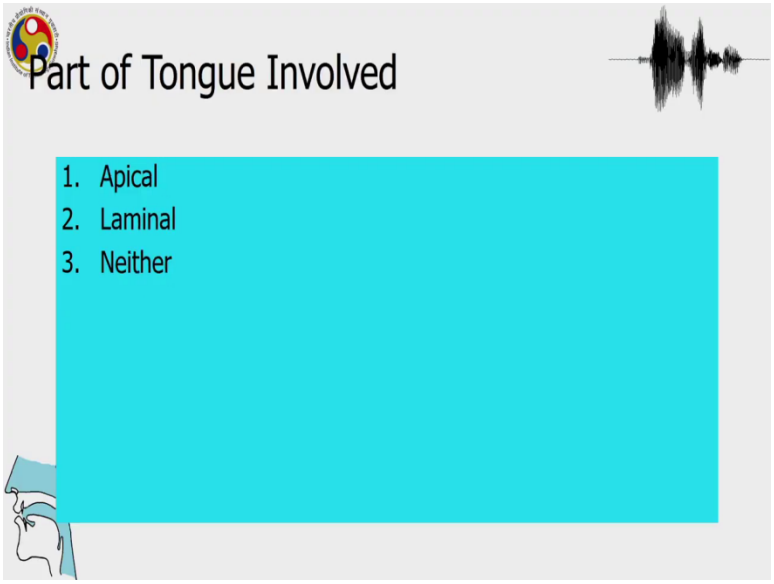

So, these are the movements in the production of clicks. So, we have bilabials here. So, we can see the pocket of air created, tongue lowered and release after that dental and then we can see the pocket of air created again tongue lowered for the alveolar, again we see the tongue making an occlusion 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.

(Refer Slide Time: 52:45)



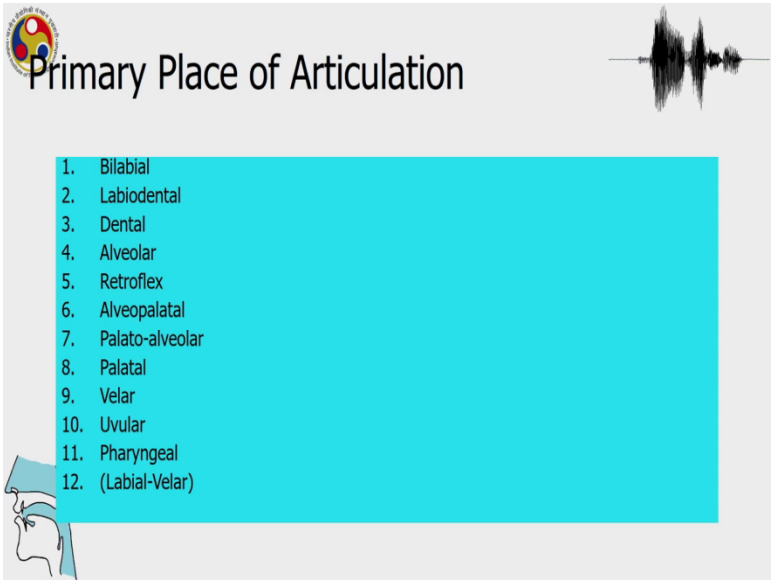
Other aspects of sound production that is glottis state; voiced, voiceless, murmured, laryngealized and closed.

(Refer Slide Time: 52:54)



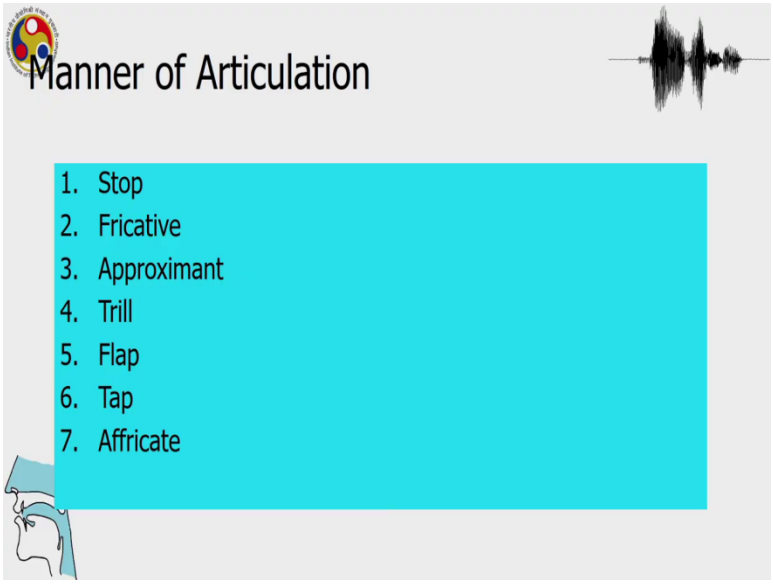

Part of tongue involved; apical, laminal and dorsal or subapical.

(Refer Slide Time: 52:59)



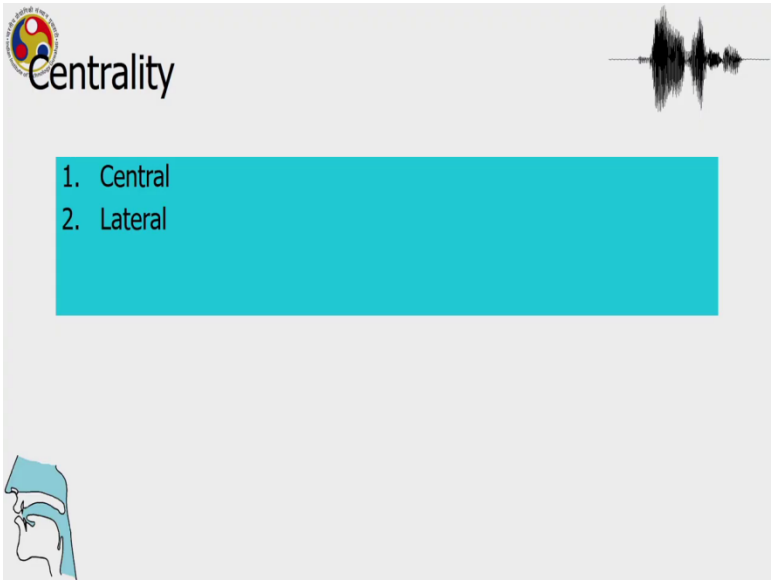

These are the primary places of articulation. Here we are summarizing all that we have seen till now; bilabial, labiodental, dental, alveolar, retroflex, alveopalatal, palatoalveolar, palatal, velar, uvular, pharyngeal and labial-velar.

(Refer Slide Time: 53:18)



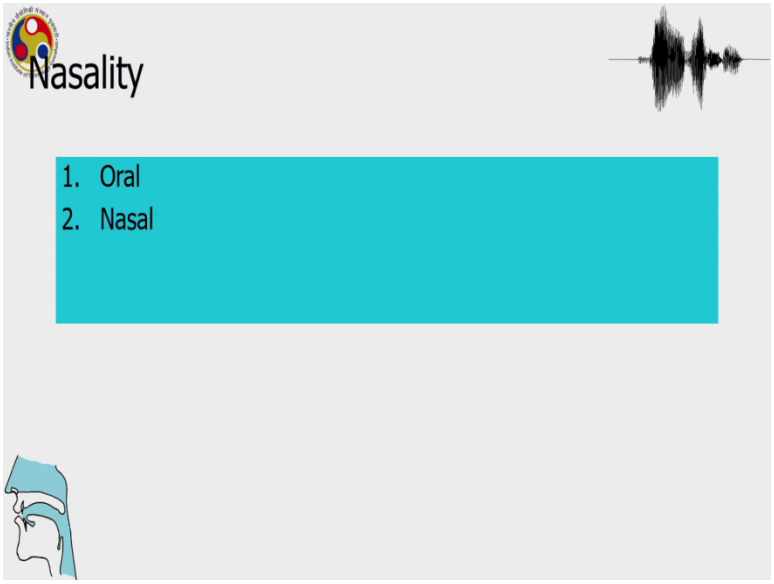

Manner of articulation could be stop, fricative, approximant, trill, flap, tap, affricate.

(Refer Slide Time: 53:27)



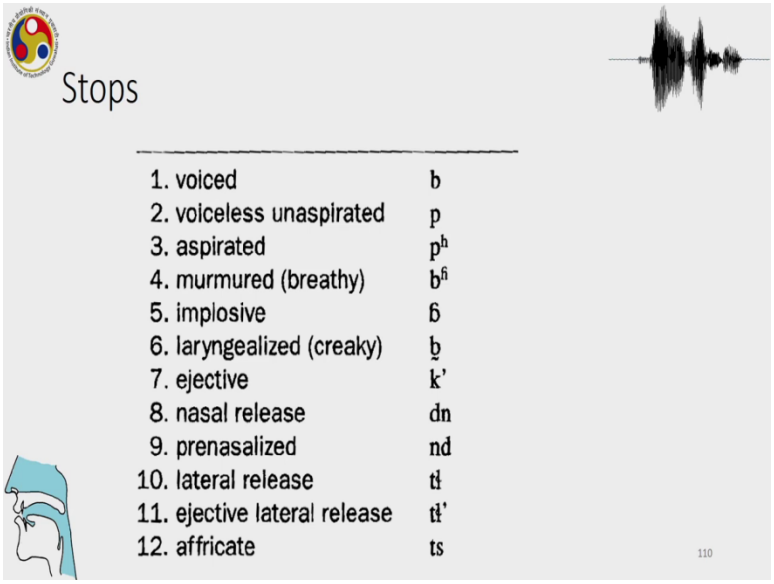

Centrality, you can have both central and lateral sounds.

(Refer Slide Time: 53:31)




Nasality can have both oral and nasal sounds.

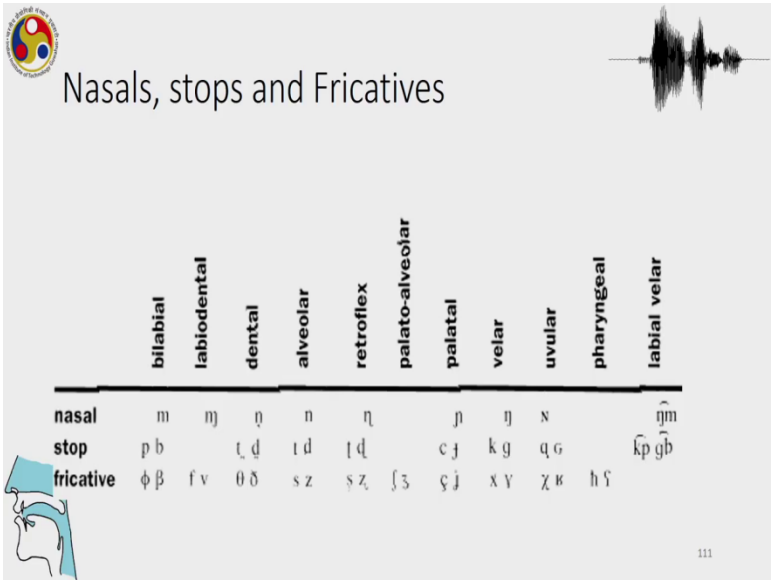
(Refer Slide Time: 53:35)




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.

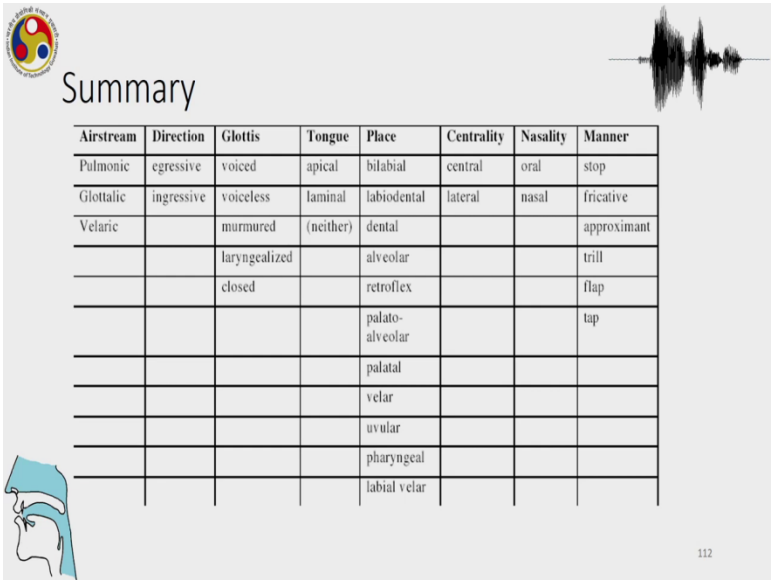
(Refer Slide Time: 54:20)




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.

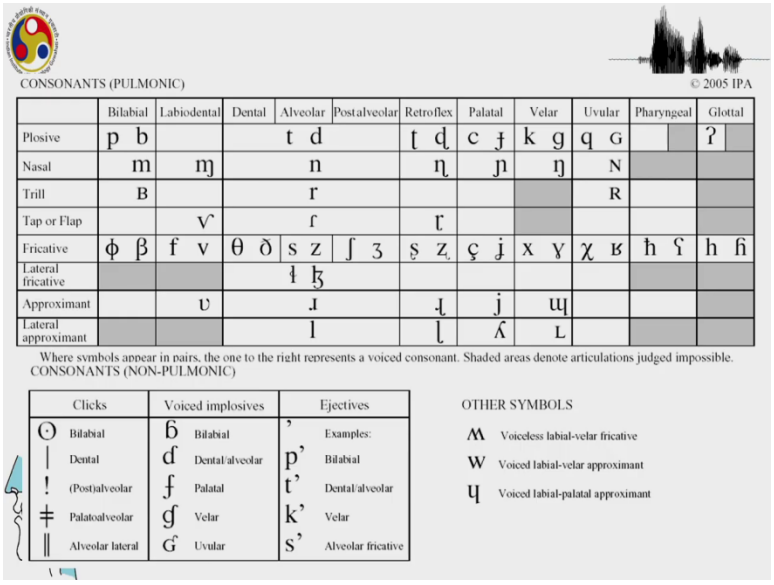
(Refer Slide Time: 55:24)




| 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 | | | |

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.

(Refer Slide Time: 56:05)




| | Bilabial | Labiodental | Dental | Alveolar | Postalveolar | Retroflex | Palatal | Velar | Uvular | Pharyngeal | Glottal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Plosive | p b | | | t d | | ʈ ɖ | c ɟ | k g | q G | | ʔ |
| Nasal | m | ɱ | | n | | ɳ | ɲ | ŋ | N | | |
| Trill | B | | | r | | | | | R | | |
| 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 | | | |

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

OTHER SYMBOLS

ʍ Voiceless labial-velar fricative

w Voiced labial-velar approximant

ɥ 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.