Phonetics and Phonology: A broad overview
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Lecture 2
Articulation of Consonants 2

Welcome to the second lecture on Phonetics and Phonology: A broad overview, NPTEL MOOCs course.

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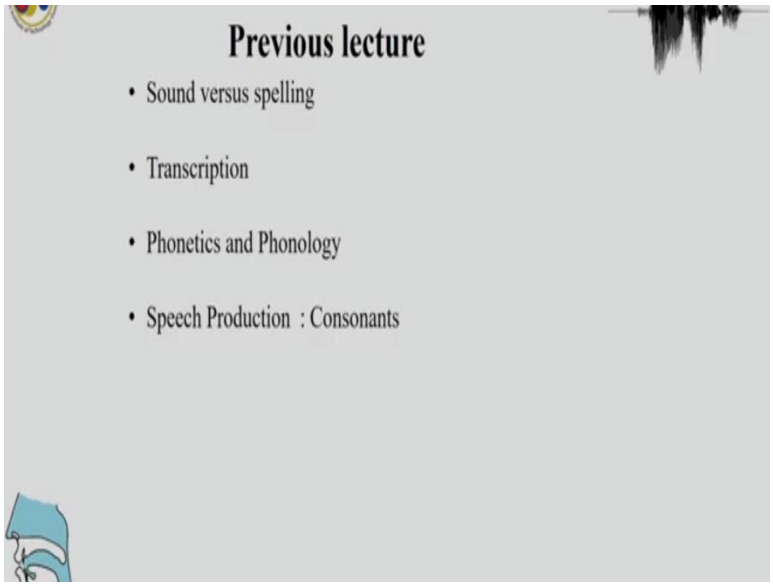

In the previous lecture, we went through the basics of sound and sound representation in linguistics. So we looked at the problems of sound versus spelling. So how writing systems represent them, the sounds that is and how actually we produce them and very often, there may be irregularities in that representation and we showed for instance, how the English system, the writing system can be very irregular and very often it shows that the alphabets actually do not represent the sounds systematically across the writing system.

So you would see in the previous lecture that whenever there is a gh sound, it can be sometimes pronounced as fa, sometimes it is silent and there is always that inconsistency and that is not just with regard to one sound, it is across the writing system of English. Now because of that, there are various degrees of these irregularities across writing system, some systems are more inconsistent, some systems are more consistent. However, linguist need a system to represent the sounds of the languages of the world and that is called the International Phonetic Alphabet.

And we showed a bit of transcription as to how the sounds are represented. We showed with the example from English consonants, what are the symbols that are used for a few English consonants which are not there in the writing system of English. And again, we talked a bit about phonetics and phonology and what are these 2 branches within linguistics, how we understand phonology vis-à-vis phonetics and what the domains that come under these two branches are. Finally we studied a bit about consonants, consonant production.

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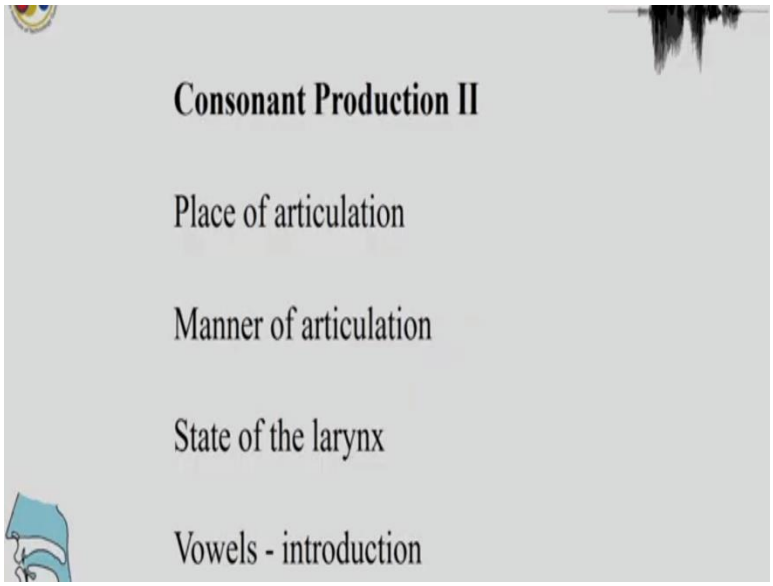

Now in the second lecture, we will talk more about production of consonants. We will see how place of articulation, manner of articulation, state of the larynx and a bit about vowels if there is time.

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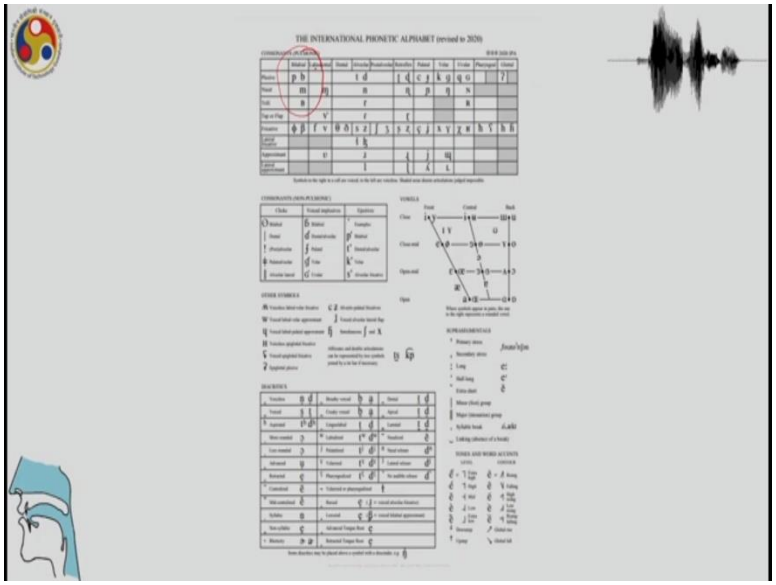

So we are now looking at the International Phonetic Alphabet and we already discussed this in the previous class that all these sounds are represented in letters similar to English in a few instances. However, in other instances like sa, za or in the representation or na or nya or other sounds like sha, ja these are not what we see in English.

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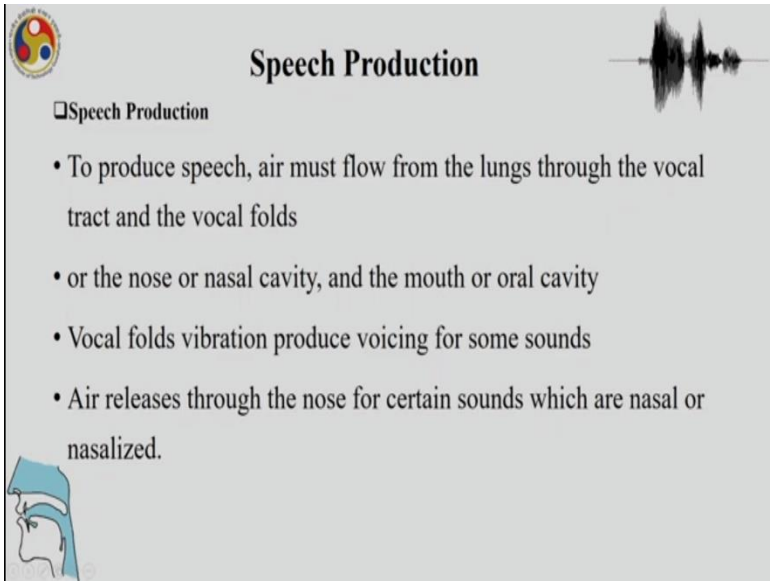

Now coming back to speech production, to produce speech, as we have already discussed, air must flow out from the lungs through the vocal tract and the vocal folds. It could also come out through the nasal cavity, the mouth or the oral cavity and then the vocal folds will vibrate for the

production of some voiced sounds and also air releases through the nose for certain sounds which are nasal or nasalized.

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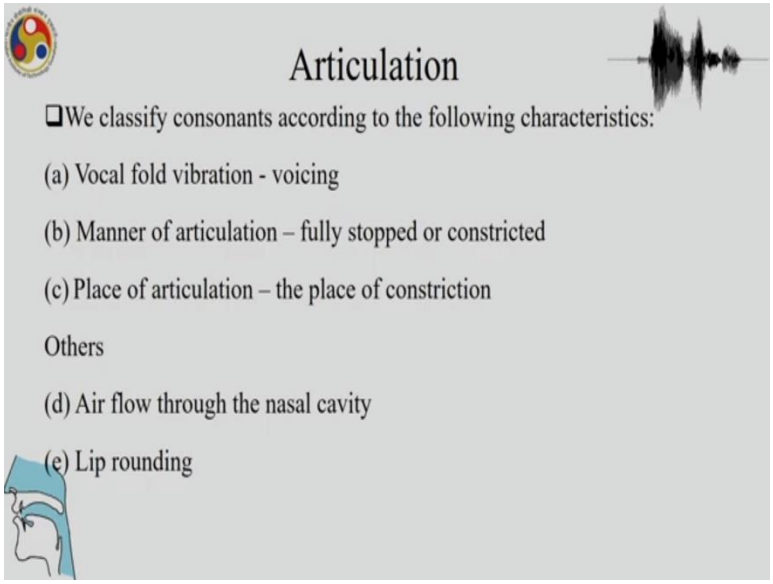

Now what are the important parts of that articulation? So the 3 important things which we already mentioned the other day, place of articulation, manner of articulation and vocal fold voicing. There may be others which characterize the sounds that we produce like air flow through the nasal cavity or lip rounding. So remember that these are important things in articulation.

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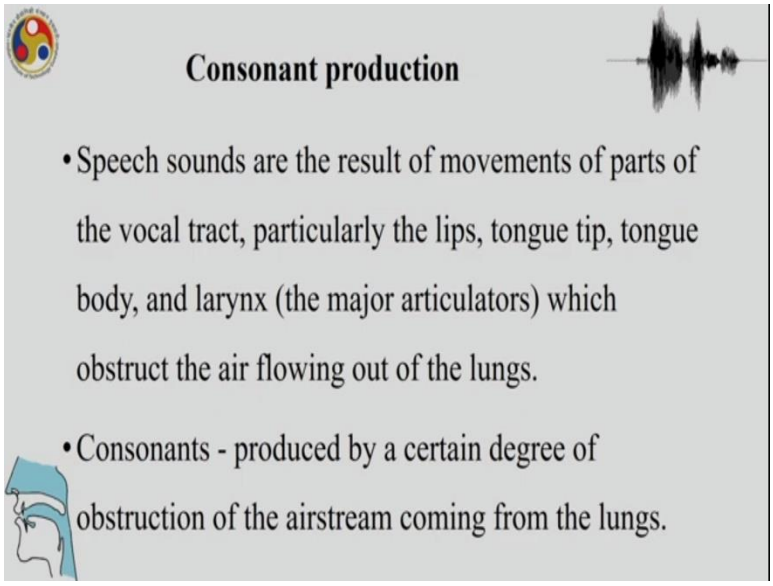

In place of articulation, what are the places which play a role in the production of sounds? So these are the lips, the tongue tip, the tongue body and the tongue has various parts within it. So the tongue is the tongue tip, the tongue blade, the tongue body- all these parts of the tongue play different roles while producing speech and the larynx is another articulator which plays a very important role and which obstruct the air flowing out of the lungs.

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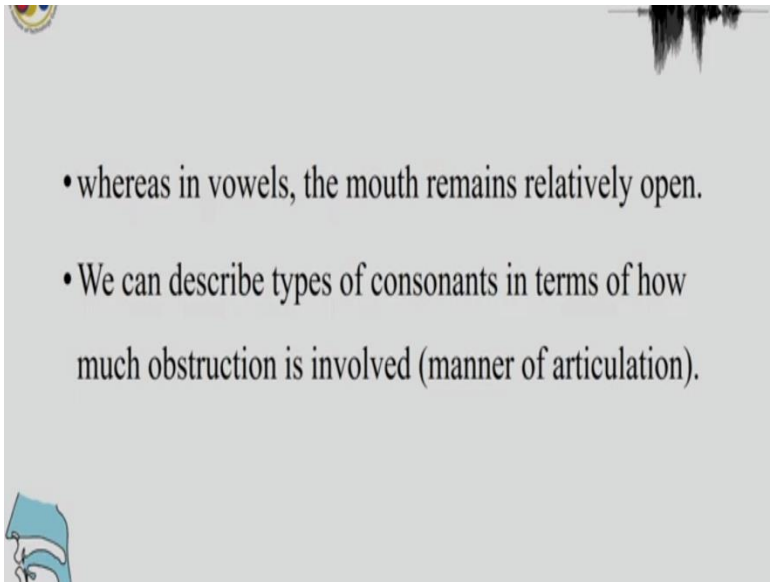

Whereas vowels are different because they are always relatively open. We can describe types of consonants in terms of how much obstruction is involved.

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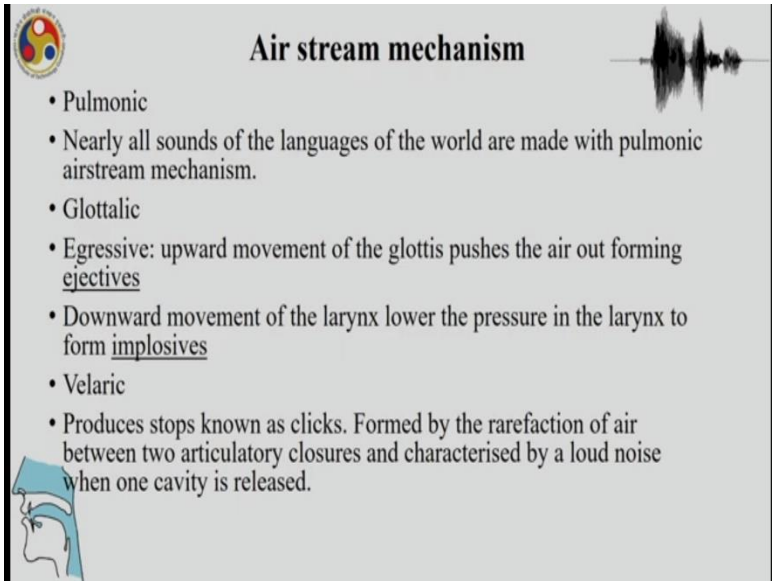

Nearly all sounds of the languages of the world are produced through the pulmonic airstream which means the air is pushed out of the lungs.

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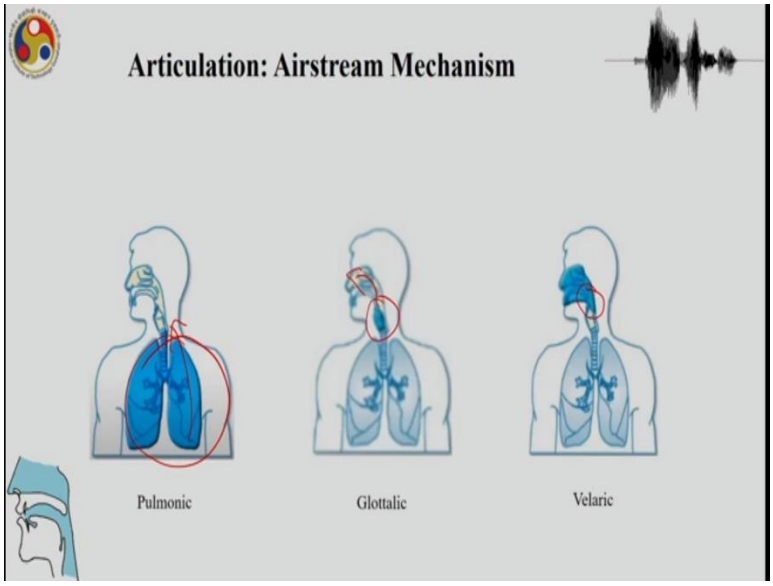

This is the pulmonic airstream where the air is pushed out of the lungs. Sometimes we may have glottalic airstream, air is pushed out of the epiglottis and then sometimes we might have the velaric airstream from the velic region and these are where clicks are produced, the velaric airstream, the air trapped within the articulator stair and released that produce a sound called click.

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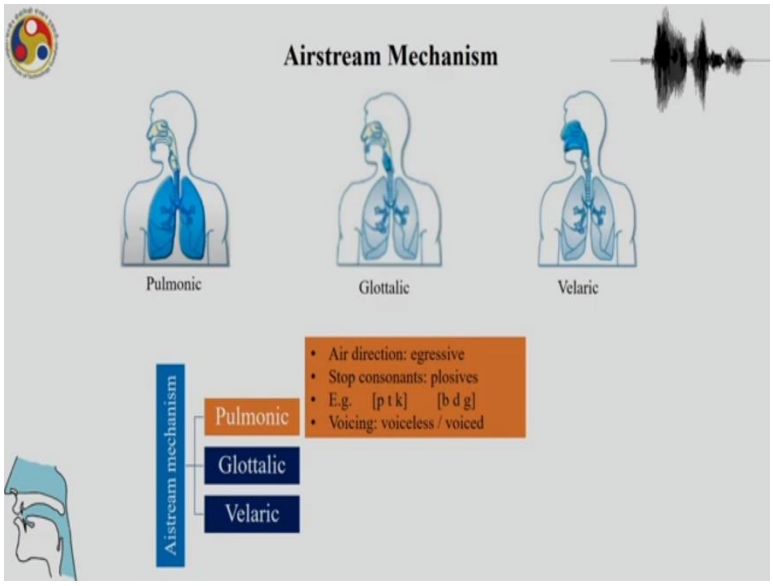

So we have already discussed these things. Pulmonic can use implosives, ejectives and the velaric airstream can produce clicks, etc.

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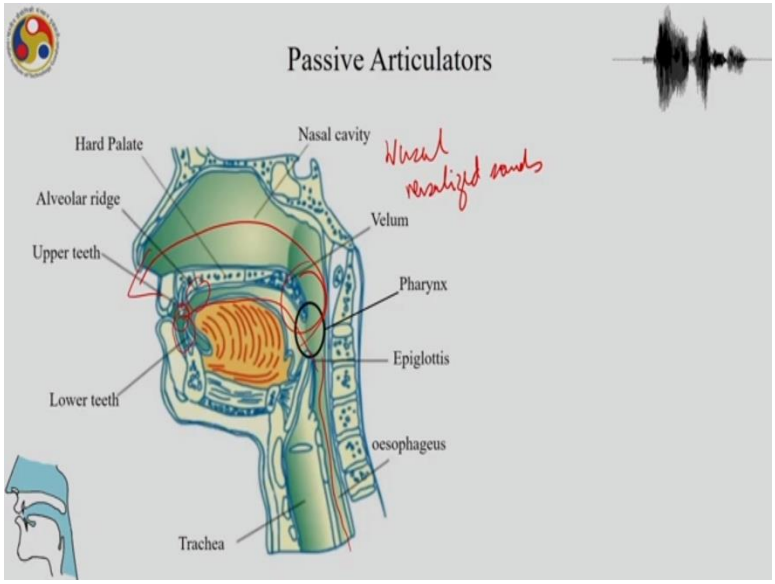

So this is the vocal tract and we can see that there is a passage through which air will pass out from the lungs for the production of specifically speech sounds and this air is then modified by the vocal tract. So, various places within this vocal tract will modulate the sound. So the air which goes through the vocal tract may be modified at the teeth region. It may be modified here, these are called dental sounds, upper teeth, lower teeth and then this gum the area behind the upper teeth, which is in the shape of a ridge is which plays a very important role in the production of very many sounds, called the alveolar ridge.

And then we have the hard palate which you will feel with your tongue, if you take it backwards, you will feel the hard palate, of course, the nasal cavity is not a part of this oral tract, its nasal cavity which is accessed for the production of sounds when the velum, this velum part is lowered then air can move out through the nasal cavity producing nasalized nasal sounds. And then we have the pharyngeal region, the epiglottis which actually shuts off the passage through which our food passes and then we have the oesophagus and we also have the trachea.

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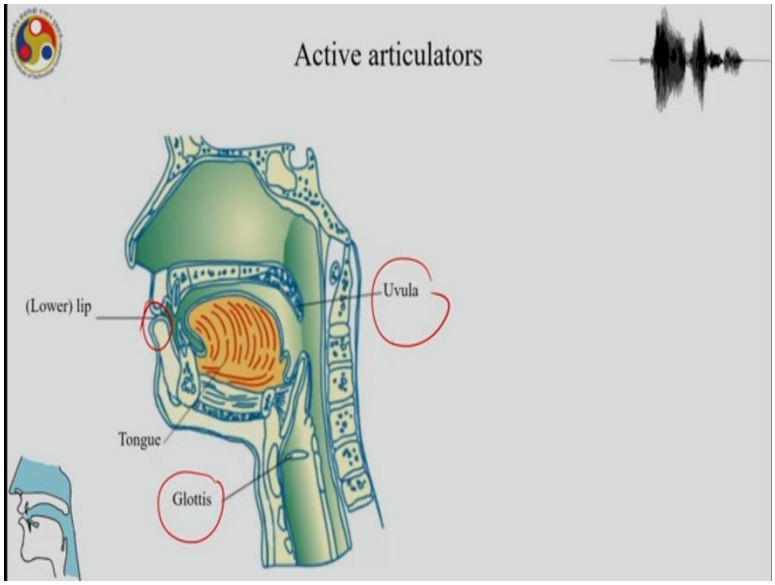

So it is important to remember that some of these articulators can move and these are the lips which also produce very specific sounds, the tongue can move and can produce specific sounds which are the result of the obstruction that the tongue creates inside the vocal cavity and then the glottis and the uvula. So the glottis consists of the vocal folds which can vibrate and give very distinct quality to sounds or can produce sounds in the glottal because of the glottalic airstream and then there are uvular sounds which are produced. The uvula is the fleshy part towards the end where the palate ends, the fleshy hanging part is called the uvula.

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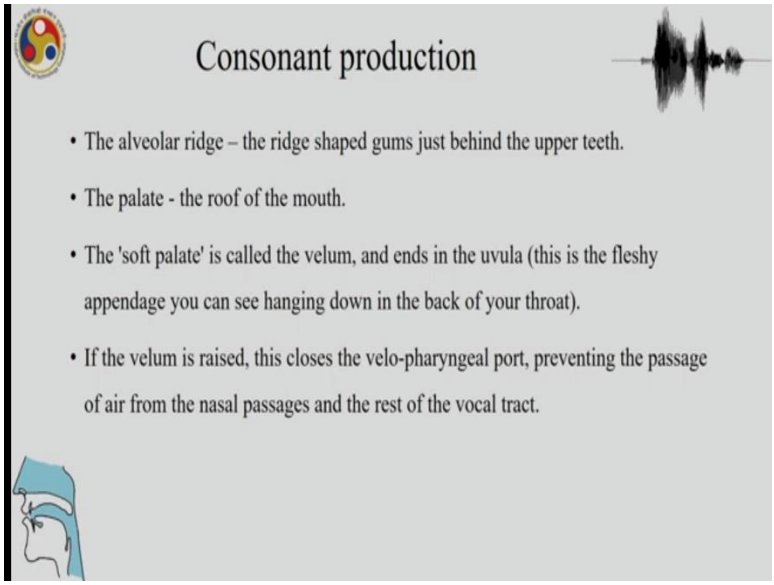

So these are your descriptions of the various parts of the vocal tract that we discussed so far and important things to remember here is that the alveolar ridge plays a very crucial role in the production of sounds, the palate is important, the soft palate of the velum which ends in the uvula and if the velum is raised, this closes the wheel of pharyngeal port preventing the passage of air from the oral to the nasal cavity. However, if it is lowered, so a lot depends on the lowering or the raising of the velum. Again, these are the parts that we just discussed.

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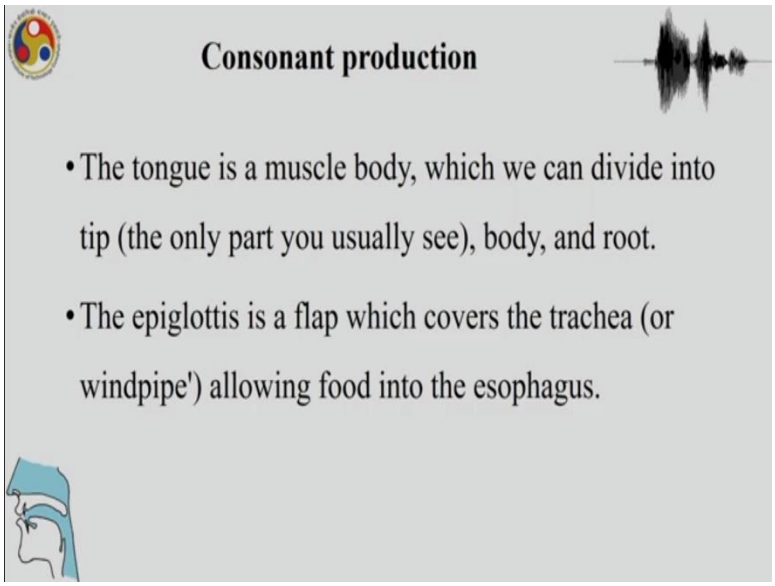

The tongue is a sort of muscular body which we can divide into the tip, the body, root and in the epiglottis, the role of the epiglottis is to cover the trachea allowing the food through the oesophagus.

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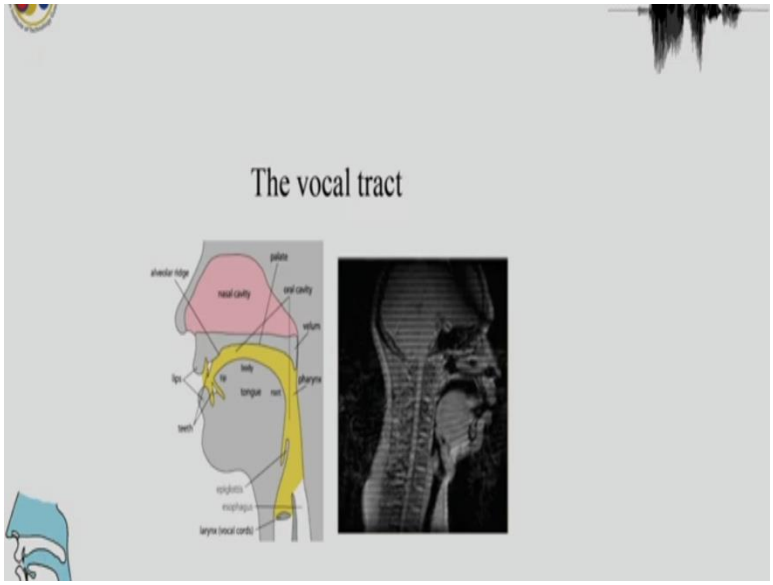

This is another view. This is an x-ray which shows the cavities of the oral cavity and the nasal cavity. So these are the 2 cavities which are used for the production of sounds.

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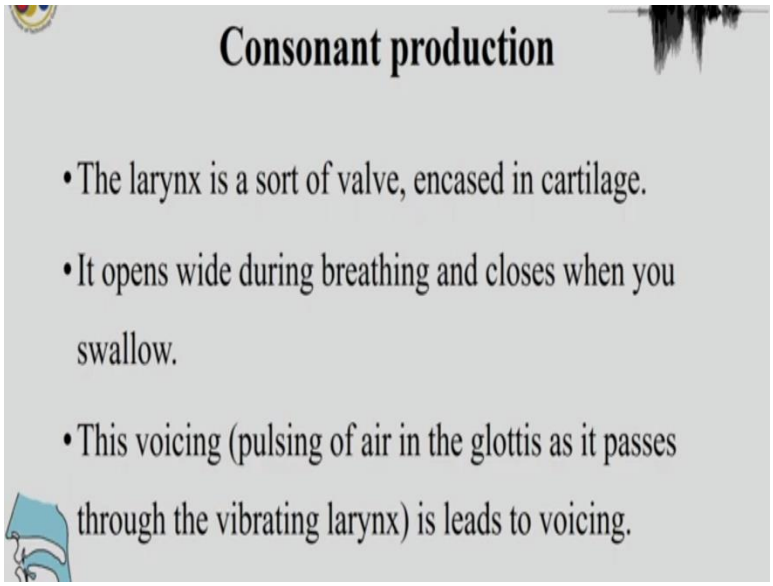

So the larynx is extremely important for humans in the production of speech sounds. It is a sort of a valve. It is encased in cartilage and then it opens wide during breathing and closes when you swallow.

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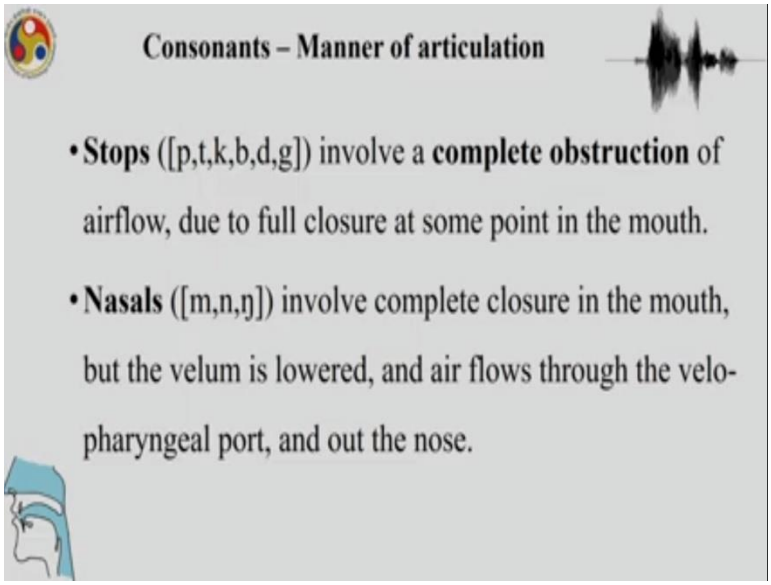

So, coming now to manner of articulation. Stops involve complete obstruction and sudden release of the air. Those are the 2 important parts of the production of stop sounds. So there should be full closure for the production of stop sounds. Nasals also involve complete closure in the oral cavity, but the air release is through the nasal cavity.

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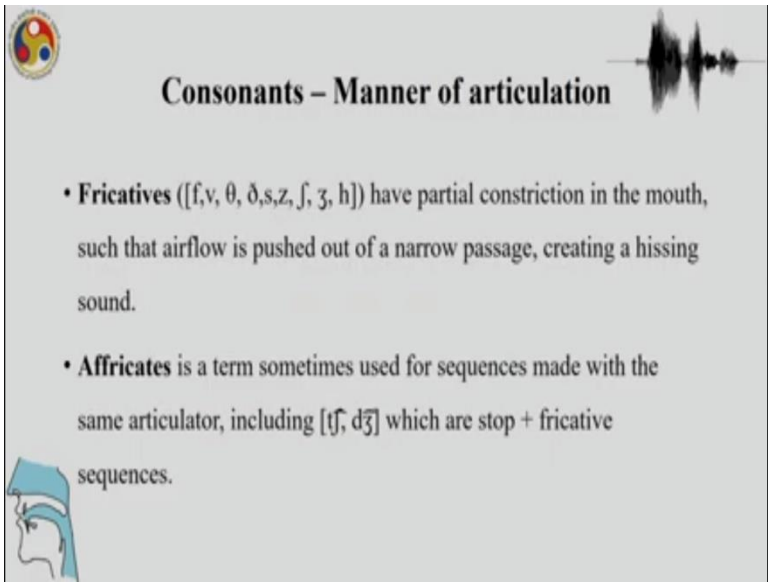

Fricatives have partial constriction and slow release and the air is pushed out through a narrow passage slowly unlike that of stops. So very often because of narrow passage, we have a hissing

sound when we have fricatives and an affricate is a term used for sequences made with the same articulator.

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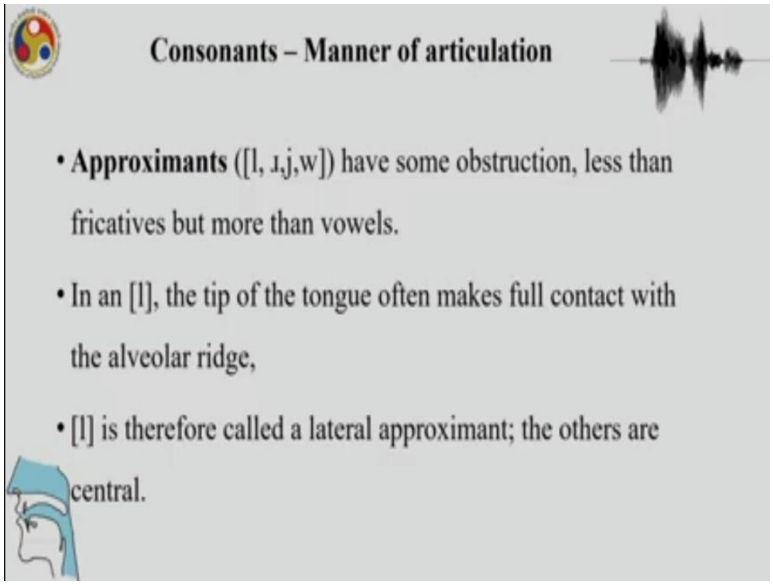

And then, approximants have the least obstruction lesser than fricatives, but more than vowels. So then we have these, these are approximants in English. For instance, la, ra, ya, wa. In l, the tip of the tongue makes full contact with the alveolar ridge, but the air is released on both sides of the tongue.

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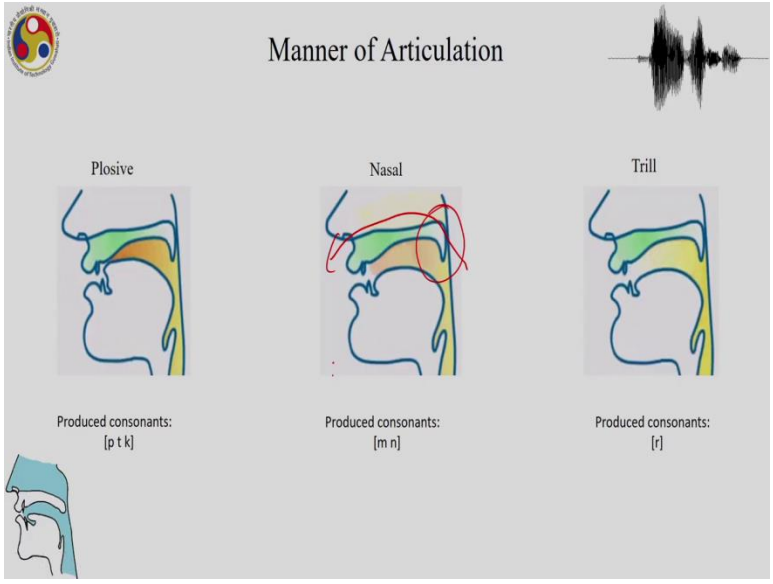

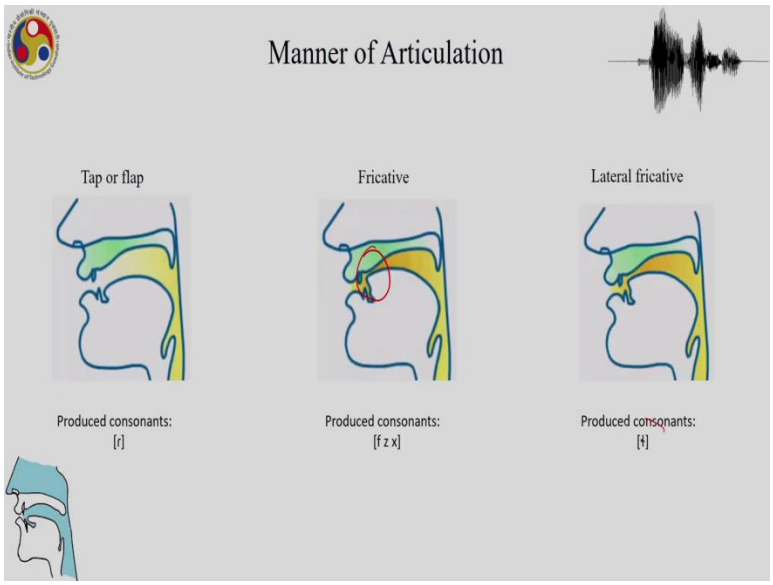

So let us now have a look at the manner of articulation. Here what you can visualize is the production of, for instance ta and da, for instance. So as ta and da are being produced, there is complete obstruction and then the air is released and then unlike the oral stop for the production of nasals now, what you can see importantly is the lowering of the velum. The velum is lowered and hence, the air can be, once the velum is lowered, the air can pass through the nasal cavity. For the production of trill like sounds so there you can see that you have very short periods of obstructions for production of trills like dra.

So with slower beating, we have tap or flap. We will discuss these differences between trills, taps and flaps when you are discussing sounds of the world's languages in greater detail. So, unlike the stop before, the production of which we had to make a complete obstruction. For the production of fricative for instance, you can see that it is partial, is partial obstruction here when you are producing suppose a fricative sound like za or sa, you can see that obstruction is partial. We will discuss lateral fricatives later when we discuss sounds of the world's languages.

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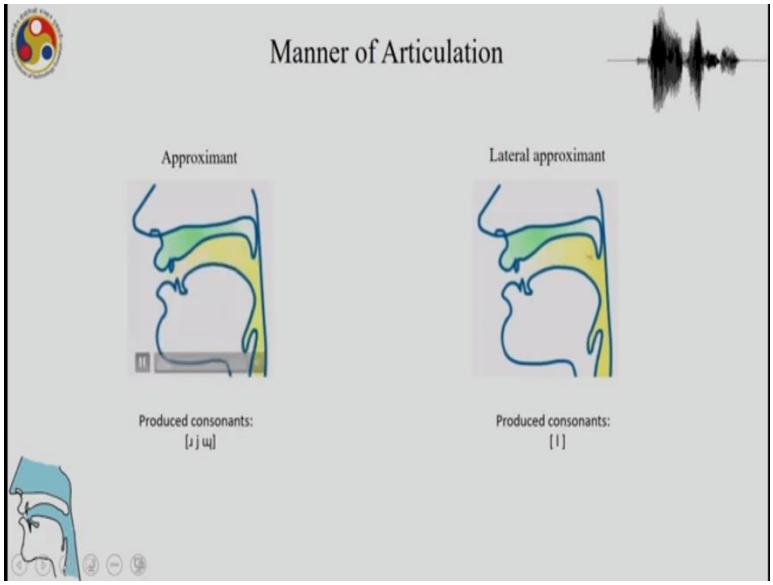

Now the least obstruction as we said is when we have approximants. So here we have ra, ya, wa and then we have la.

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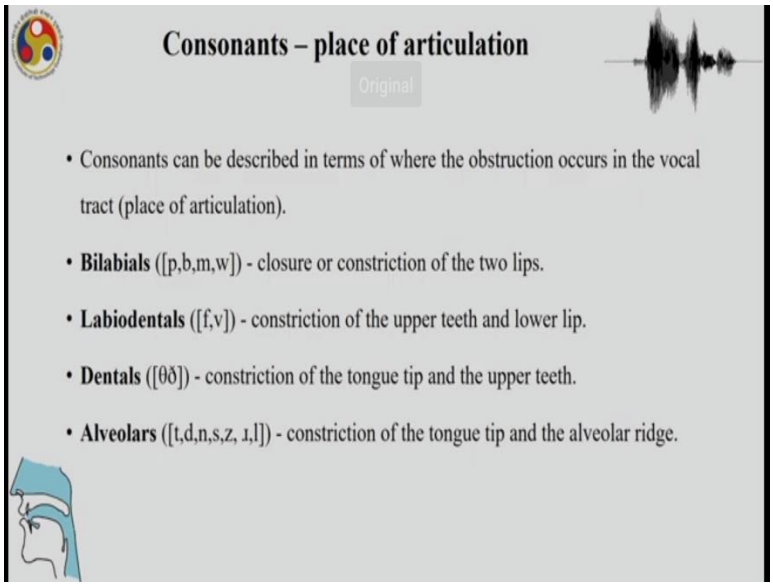

So that was to show you through video descriptions as to how these sounds are produced. And we are going to discuss more of these sounds when we discuss the sounds of the world's languages. Coming now to the place of articulation, so when the lips are involved then we have bilabials, when both the teeth and the lower lip are involved in the production of the consonants

so where you have a constriction of the upper teeth with the lower lip, then we have labiodentals and dentals obviously involves the constriction of the tongue tip and the upper teeth.

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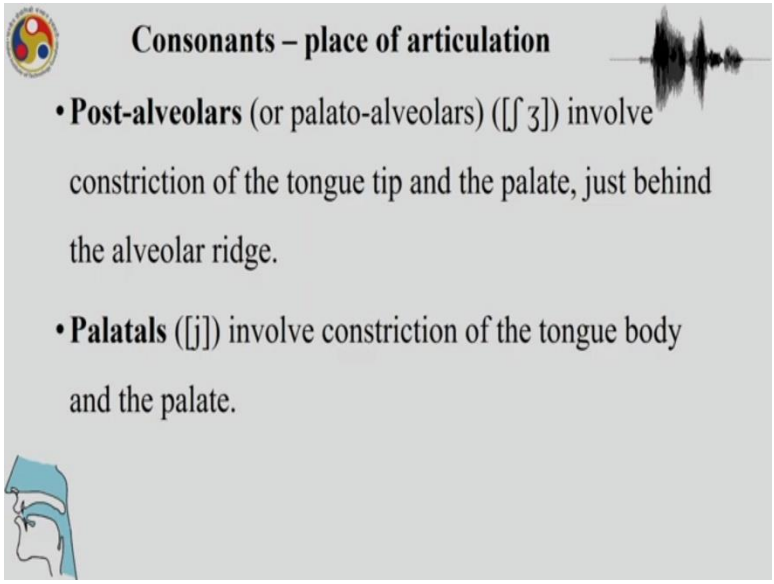

So and then there are the other types called post-alveolars like sha, ja in English, which involve constriction of tongue tip and palate and just behind the alveolar ridge. So palatals involve constriction with tongue body and the palate.

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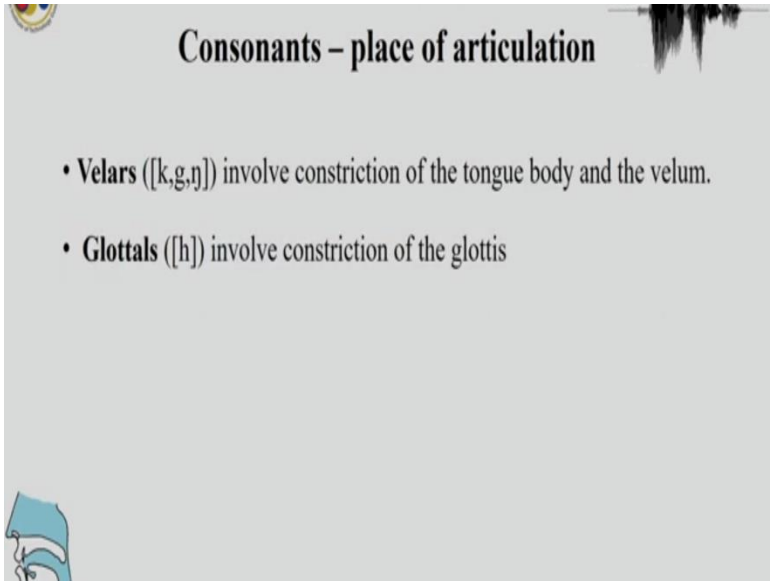

Then we have the velars where the tongue body make a constriction in the velic region, and then we have glottals which involve constriction of the vocal folds.

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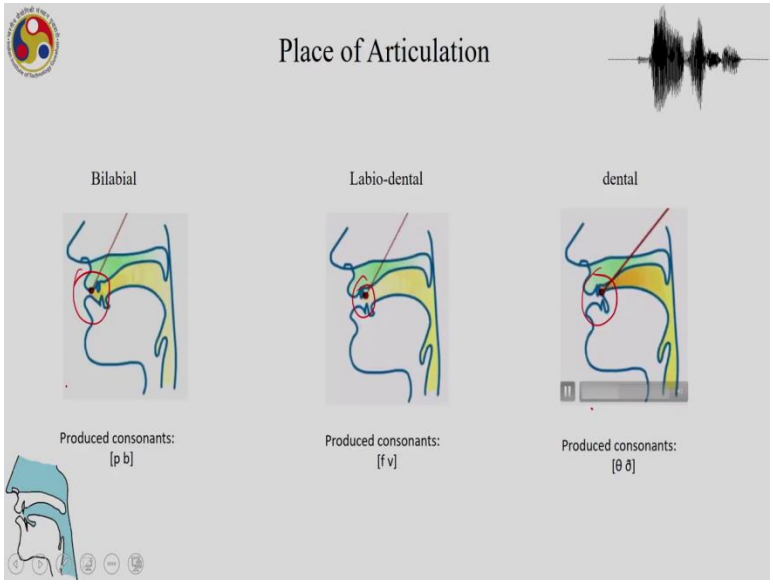

So let us look at place of articulation. So this is bilabial, this involves the constriction happening there at the lip region. Okay, now whereas this involves the lower lip and the upper teeth. The lower lip and the upper teeth, labio-dental. Then we have the tip of the tongue making a constriction at the upper teeth to produce a dental sound tha and dhta.

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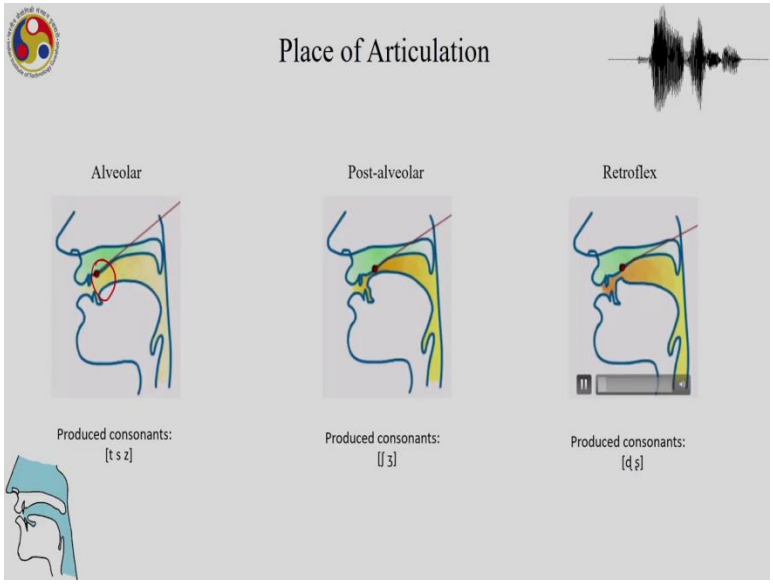

There are other places of articulation like alveolar as we discussed, here you can see the tip of the tongue makes a constriction at the gum area behind the upper teeth. Then we have a post-alveolar consonant like sha, ja, you can see that it is moving, the tongue is moving towards the

palatal region, the post-alveolar region of the palate and then we have retroflex consonants, we will discuss this later on.

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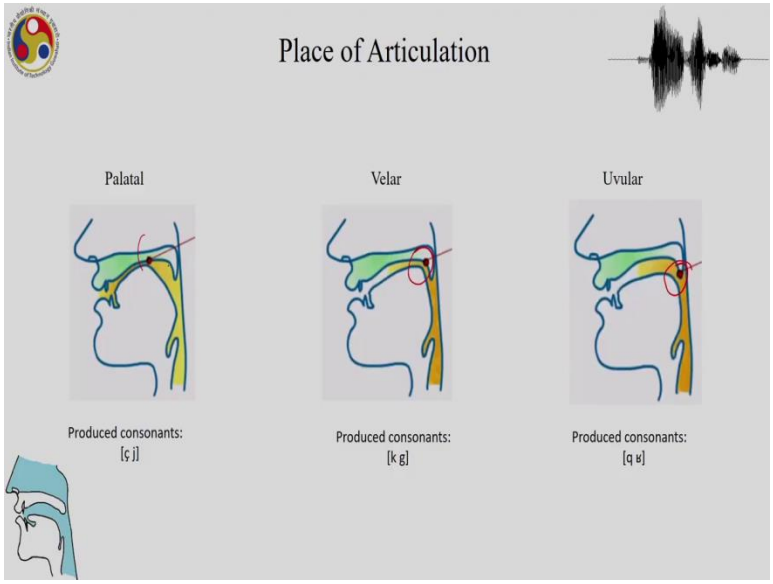

And we will move on to discuss palatal sounds, where you can see the tongue body moves towards the upper palate. The velar region where the tongue body moves towards velar region and then the uvular you can see, at the back of the tongue makes a constriction at the uvular heart. Uvular, velar, palatal.

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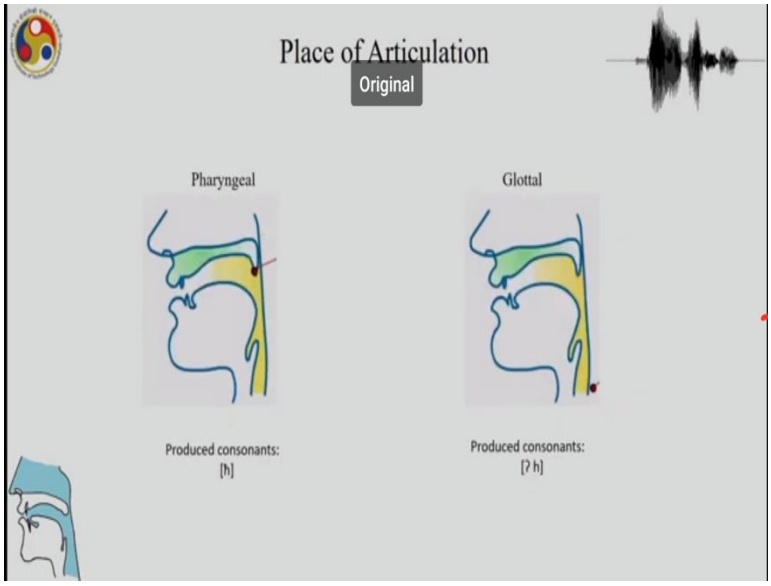

And then there are languages of the world which produces pharyngeal sounds and this is what would happen in a pharyngeal sound that the back of the tongue would make a constriction pharynx region and whereas for glottal sound which is making a constriction.

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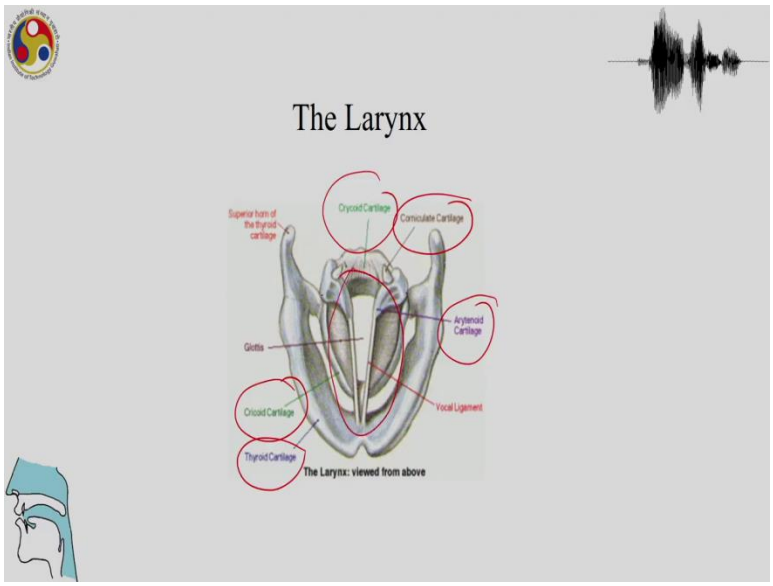

So talking about the glottis, this is the larynx which you already saw the other day. So it is encased in all these cartilages. So you have the cricoid cartilage, the thyroid cartilage, the arytenoid and other parts. What is important here? These 2 flaps which vibrate to produce most of the voice sounds that we can hear.

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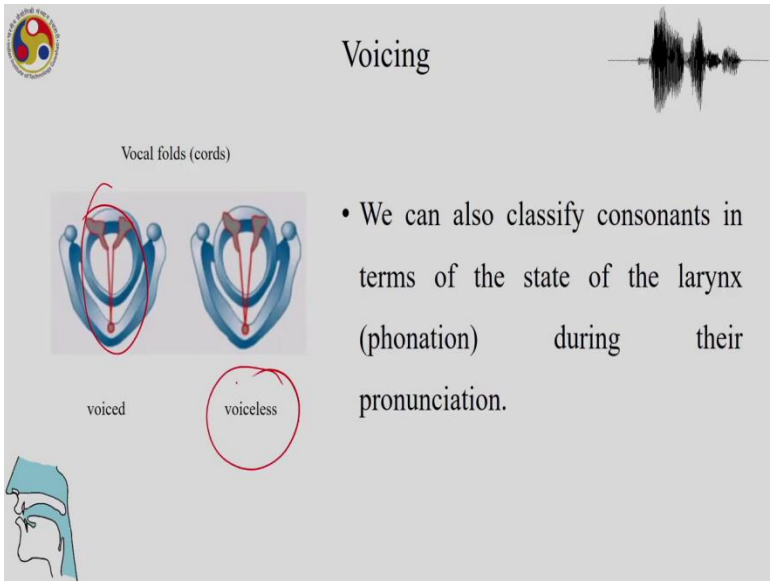

So this is what happens in the production of voice sounds. This is called the state of the larynx. Is it voicing or not? As you can see in the diagram, we have a voicing sound here. We can classify consonants in terms of stereo larynx during their production that is whether there is voicing or whether the state of the larynx is voiceless.

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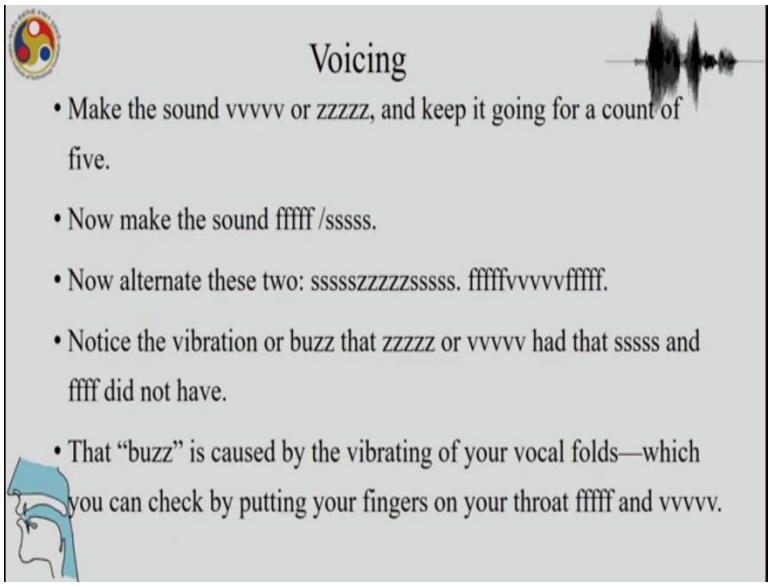

Now we have understood so far what is manner of articulation? It would be stops, fricative, approximant. You have complete closure or partial as you saw and then we have place of articulation, the place inside the vocal tract where some obstruction is made to produce a sound and that is your place of articulation. This third important characteristic of sounds is called voicing.

Now, how do you understand voicing? We often ask our students to do a test in the class. The test is to produce 2 sounds - a voice sound and a voiceless sound together. So you can try this for yourself. You can try producing a vaaa sound and a faaaa sound or a zaaa sound and a saaa sound, make it longer and put your hands right here where you can hear.

So for boys, it is easier, for men it is easier, you can put it above the Adam's apple and for women also, you can feel the vibration there and that position of your throat and whenever you are producing the voice sound like vvv or zzz, you can feel the vibration unlike when you are producing the voiceless sound likes sss or fff, you can cannot hear the voicing. So that is a test we ask our students to do in class so that they can feel the voicing for themselves.

This is important because very often beginners in phonetics and phonology find difficult to make a distinction between voice and voiceless. This is a very common among the students that I have taught over the years because every sound is produced as a syllable. So by the time you finish the voiceless part, the voice part of the vowel already starts, and that is why it is difficult if you are a beginner to distinguish between voiced and voiceless sound. This experiment that we just did helps you to see for yourself where there is vibration of the vocal folds and where you do not have the vibration.

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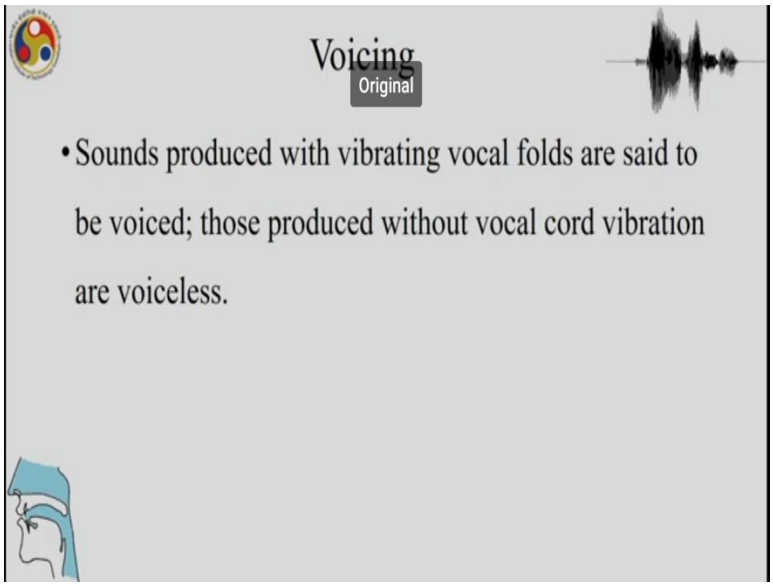

So sounds produced with the vibrating vocal cords are said to be voiced and those produced without vocal cord vibration are voiceless.

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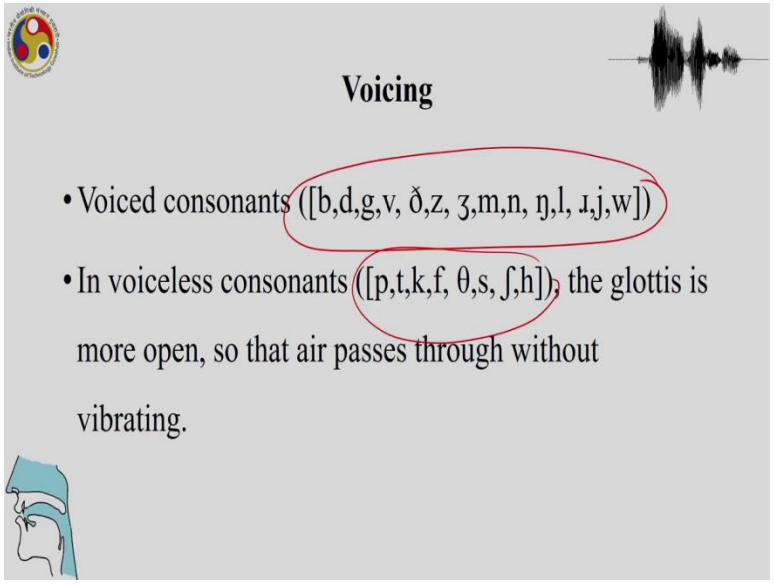

So in English, for instance, all these consonants are voiced: ba da ga va za ja zha ma na ng la ra ya va - all these consonants are voiced and we have a fewer voiceless consonants: pa ta ka fa sa and sha and ha. During the production of these voiceless consonants, the glottis is open spread and air passes through the glottis without any vibration.

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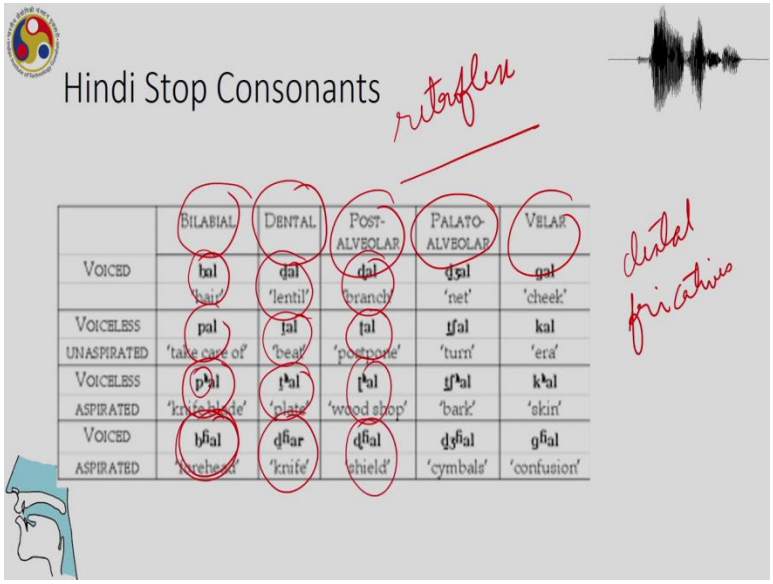

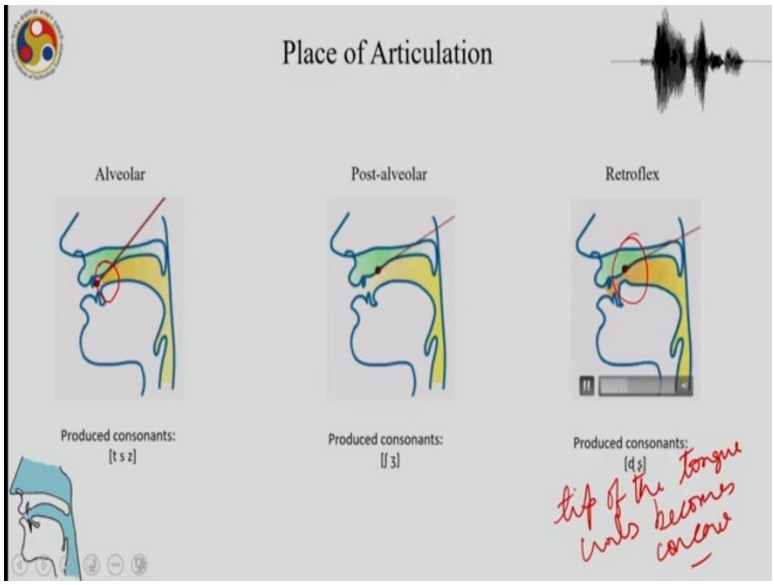

There are various languages of the world which have different voicing, have different manner of articulation and for instance, I would like to draw your attention to Hindi stop consonants. Now let us look at these Hindi stop consonants. So unlike what we saw in English where we have the dental fricatives and we did not have any dental stops. Now in language like Hindi for instance, we would find dental stops, we would find post-alveolar stops, we would find palato-alveolar stops, we would find velar stops.

So after bilabial in English for instance, the dental part is not there. Now apart from having all these places of articulation, another important characteristic of sounds in a language like Hindi would be that the 2 important things to see here. One is that Hindi has a type of consonant call retroflex consonants. The other important thing is to look at this contrast.

So in Hindi now, look at the bilabial or dental sounds. You have contrast across all these positions. So we have not just a voiced and voiceless aspirated. We have the voiceless unaspirated, the voiceless aspirated as well as voiced aspirated. So we have like bal, pal, phal, bhal so we know from our previous class that aspiration is the production of extra release, extra air in the release of a sound or sometimes also the closure.

So those are different but these are produced at the time of the release of the consonant of a voiceless aspirated sound. Now Hindi and many Indian languages are unique for production of voiced aspirates. So this is produced, so in the production of which the vocal folds are vibrating,

not just the vocal folds are vibrating, there is brassiness in the Phonation in the state of the larynx.

So we have voice aspirated, voiceless aspirated, voiceless unaspirated and voiced and this also is seen now in dental place of articulation. You have the voice, voiceless, you have the voiceless aspirated and you have voiced aspirated. Again, in the post-alveolar part, you have dal, tal, thal and dhal.

Now, this is where it becomes interesting because these sounds are produced by what is called the retroflexion. Now, what is retroreflexion? Let us go back to one of the previous slides. So this is a retroflexion. What is unique about this? Movement is that you can see that the tongue curls, so the tip of the tongue curls or becomes concave to produce an articulation like that of retroflex.

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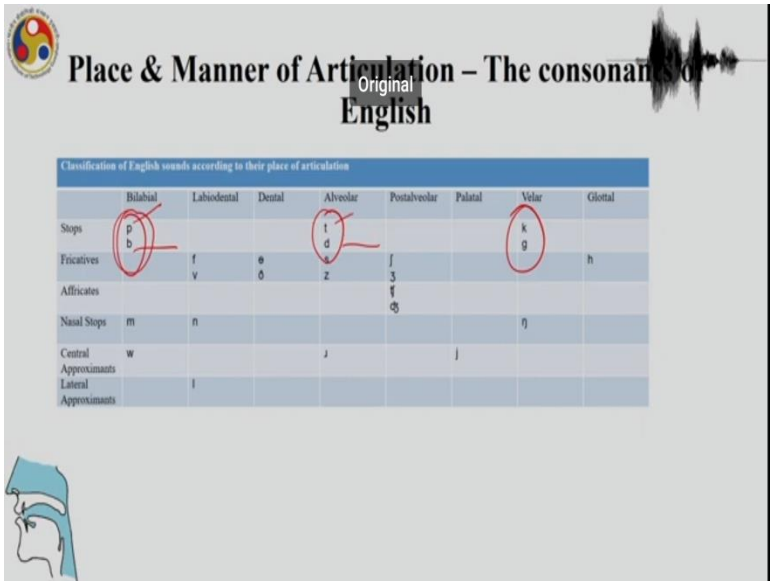

So now let us look at the English consonant chart and we will see that in English, we have bilabial, we have labiodental but we have stops only which are bilabial, alveolar and velar but in a language like Hindi, we saw that we can have bilabial, dental, post-alveolar and velar as well. So across all these places of articulation, we can have stops. So not just a voiceless and voiced counterpart, the aspirated and unaspirated counterparts as well as the voiced aspirated counterpart.

So this is how languages can differ in the production of sounds, in the manner of articulation of sounds and if you look at the English consonant inventory, then we see that many of these places are, so there will be languages which will have for instance dental stops, post-alveolar stops, will have glottal stops and will have bilabial fricatives or lateral fricatives. So there are to a certain extent, possible languages that employ the possibilities provided by a vocal tract to produce distinctive sounds.

However, some are impossible to produce and so we talked about this in the beginning of the course, articulatory ease is important, but to maintain distinctions, languages will have an inventory of consonants which will help them to have a maximum number of contrast in the production of, in maintaining lexicon, which is mostly contrastive and can have meaning differences between the words.

So that if 2 words are similar in the production then there are very many homophones in languages, but the number cannot be extremely large. Then that will be difficulty in maintaining the contrast. So continuing our discussion on consonants and how we can see that different languages will make use of different places of articulation.

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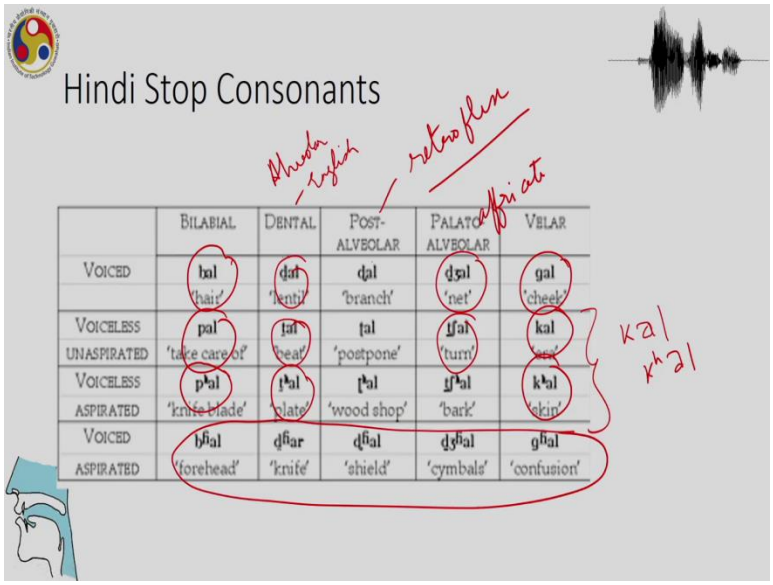

	Bilabial	Dental	Post-alveolar	Palato-alveolar	Velar
Voiced	bal 'hair'	d̪al 'lentil'	ɖal 'branch'	ʤal 'net'	gal 'cheek'
Voiceless unaspirated	pal 'take care of'	t̪al 'heat'	ʈal 'postpone'	ʧal 'turn'	kal 'era'
Voiceless aspirated	pʰal 'knife blade'	t̪ʰal 'plate'	ʈʰal 'wood shop'	ʧʰal 'bark'	kʰal 'skin'
Voiced aspirated	bʱal 'forehead'	d̪ʱar 'knife'	ɖʱal 'shield'	ʤʱal 'cymbals'	gʱal 'confusion'

So we just now saw some Hindi examples where we saw that Hindi has dental stops and Hindi has post-alveolar retroflex stops, has palato-alveolar affricate, so basically all these 5 places of articulation are possible along with another complication that of retroflex in the inventory of

consonants. So Hindi is well known for these distinctions, this four-way distinction along the line of dental and post-alveolar and palato-alveolar and where all these sounds can be retroflex.

So where the post-alveolar series are all retroflex here and then we have this dental series and where the voice dental stop, then there is a voiceless dental stop, there is a voiceless aspirated dental stop and then there is the voiced aspirate of breathy stop and which are all dental. Similarly, in the post-alveolar series also, you will find that we have voiced, voiceless corresponding voiceless aspirate and the voiced aspirate of breathy and distinction is not just with regard to post-alveolar, they are also retroflex.

And then whereas these are dentals, these are post-alveolars as well as retroflex and then it is also possible in Hindi to have these affricates. So as we know affricates are a sort of combination of 2 types of 2 manner of articulation so you would have a stop and a fricative and note that along with being a little alveolar in Hindi, they can also be retroflex.

So we have voice, voiceless unaspirated, voiceless aspirated and voiced aspirate and then finally the velar where you have the commonly seen voiced velar stop, the voiceless velar stop, the voiceless aspirated velar stop and then the voiced aspirated breathy velar stop. So you have and of course, what we see in English, the voiced versus voiceless, unaspirated voiceless, aspirated voice aspirated all the 4 possibilities are present in Hindi.

So you can see the four-way contrast here along the line of voice, voiceless unaspirated, voiceless aspirated and voiced aspirated. So along this line, this 4 contrasts are made and then along the line of place of articulation so we have bilabial to dental to post-alveolar, palato-alveolar, velar. Then we have these affricates and also along with this being dental, these are retroflex.

Later, when we will study the sounds of the world's languages diversity in the world's languages, we will see how Hindi retroflex could be more apical rather than subapical. So we will learn about those distinctions later. So at the moment, it is important to see that in the stop inventory of Hindi more distinctions are used because of the possibility of having dental sounds and having stop sounds at all these possible levels of contrast.

So of course, there are much more complications that can be seen in languages of the world. This inventory is different from English because primarily because Hindi has a contrast between

voiceless unaspirated and voiceless aspirated whereas in English, this is allophonic. There is no contrast between the voiceless unaspirated and the voiceless aspirated. So that is a contrast which is there in Hindi, which is absent in English.

The other contrast which are absent in English are the dental sounds instead in English we have alveolar in English and in English again, the retroflex sounds are not there. So in Hindi though, there is a contrast available between voiced, voiceless unaspirated, voiceless aspirated, voice aspirated for the retroflex stops. So this series is pretty unique to South Asian languages and also seen in Hindi, also seen in other languages like Sindhi, etc. So retroflexion and voice aspirates, which are again characteristics of South Asian languages.

So one group of South Asian languages is the Indo-Aryan group of language so you would say that the voiced aspirates are common. So these are features of some groups of languages and not other groups of language and that is why we do not see that in English and also another common contrast that we saw here is the velar one, which is also in English has the velar stop, the voice velar stop and the voiceless velar stop. So this contrast is available in English.

However, the contrast which is not available in English is this one that we see here, kal versus khal, so which is contrastive and mean 2 different words in this language. Finally, we also have the voiced aspirate here. So which I again mentioned just now and I would again like to emphasize these voice aspirates are commonly seen in South Asian languages and therefore this is not there in English.

So this was a small comparison of the differences which may be there in languages. We saw that some contrasts which are not there in English maybe there is a contrastive in another language. So we saw an Assamese example a while ago and now we see these Hindi examples where we see the contrast between the voiceless unaspirated and voiceless aspirated and this is seen throughout the inventory at all places of articulation.

And the other thing that we saw here is that languages may have so whereas English may have alveolar and Hindi has dental and these 2 are commonly seen in the languages of the world, both the alveolar place of articulation, dental place of articulation. In our later sections, we will see how dental and alveolar gestures could be different, so both could exploit different places of the

tongue while making the articulation so while one can be laminal, the other can be apical and we will look at those differences as we go along in this course.

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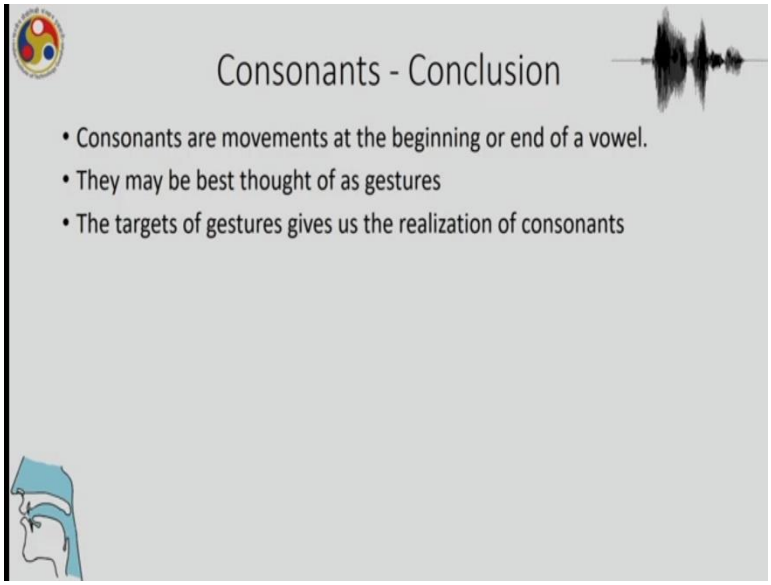

So we come to the end of this lecture on consonants and giving a broad overview of consonants, place of articulation, manner of articulation and voicing the 3 most important characteristics and in the next section after we study acoustic phonetics, we will also study how they can be many more differences in the language of the world and many more different quite a few other places of articulation and airstream mechanisms, which can be possible to be used in the language of the world and coming now to the conclusion. Consonants are movements at the beginning or end of a vowel because consonants by themselves do not occur, there has to be a vowel.

So the vowels are sort of the main parts of a word and then the consonants are can be sort of gestures which move from neutral state to another position. So that is one way of looking at consonants. Of course, we have to remember all the other stages are there in the production of consonants that you have obstruction, that you have released stage, etc.

But if you think about the obstruction and the release so you can see that it happens as certain gestures moving from neutral state to another because there is always a vowel which has to be articulated as well along with the consonant. So the targets of these gestures give us the realization of consonants. So we will talk more about gestures, about targets and gestures in the section where we are going to talk about diversity in the languages of the world.

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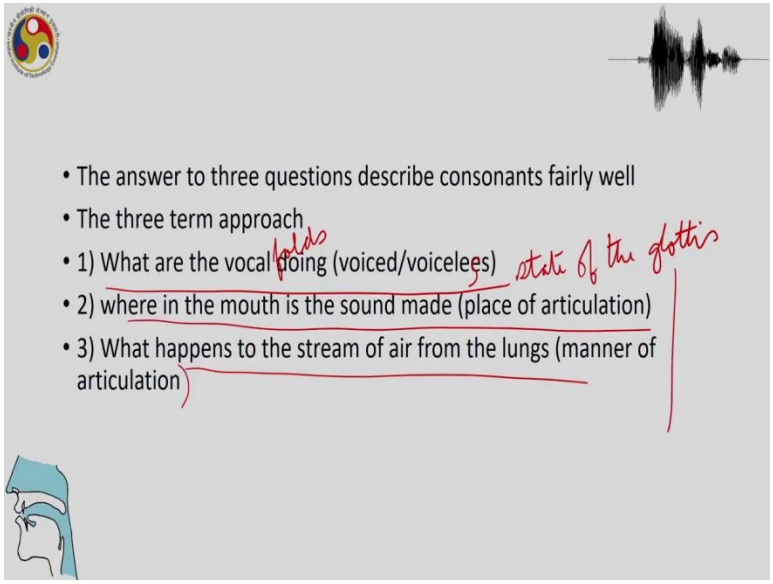

So, the answer to these 3 questions give you description of consonants. So what were the vocal folds doing during the production of the consonant so which means what is the state of the glottis. So essentially this will tell you whether the consonant was voiced or voiceless. Secondly, where in the mouth is the sound made? It is the place of articulation. So where was the obstruction and the place where the target and gestures, what was the target of the gesture?

So you could also think about that in terms of gestural phonology and then also what happens to the stream of air from the lungs which means to manner of articulation. So was it released like as in a stop or in a fricative or affricate or nasal or approximant, etc. So how was the stream of air released? So where was the obstruction? How was it released and what is the state of the glottis? So these 3 things give you a preliminary idea about how we would understand the articulation of consonants.

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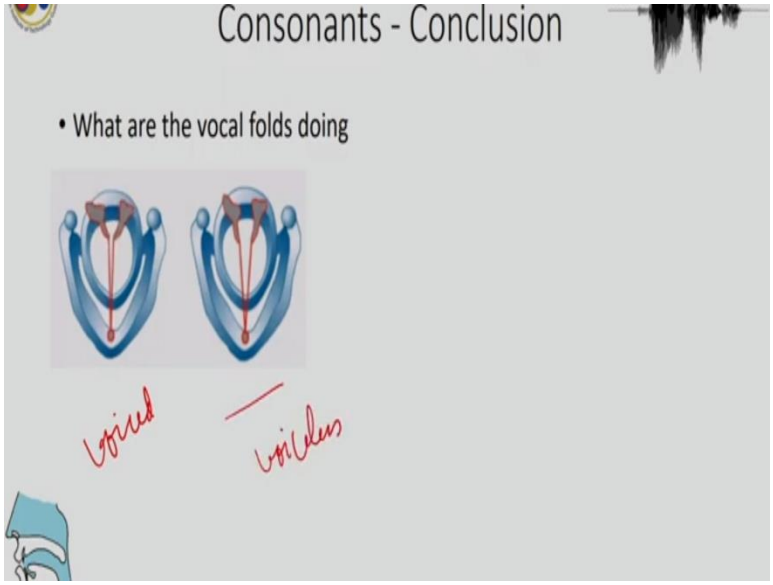

So what were the vocal folds doing? They must be vibrating like this. Then you would have a voiced sound or if they were neutral like this, then you would have a voiceless sound.

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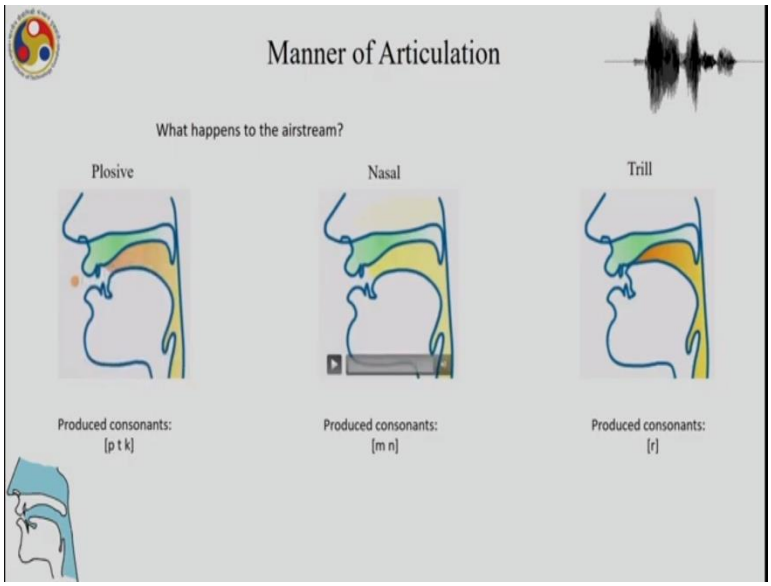

And in a plosive sound, so manner of articulation so you have a plosive, you have a nasal where the air is moving out with nasal cavity. Also while making an obstruction, there inside the vocal cavity and then you can also have a trill as in the one here. So you can see the rapid tapping of the tapping or flapping of the tongue blade there.

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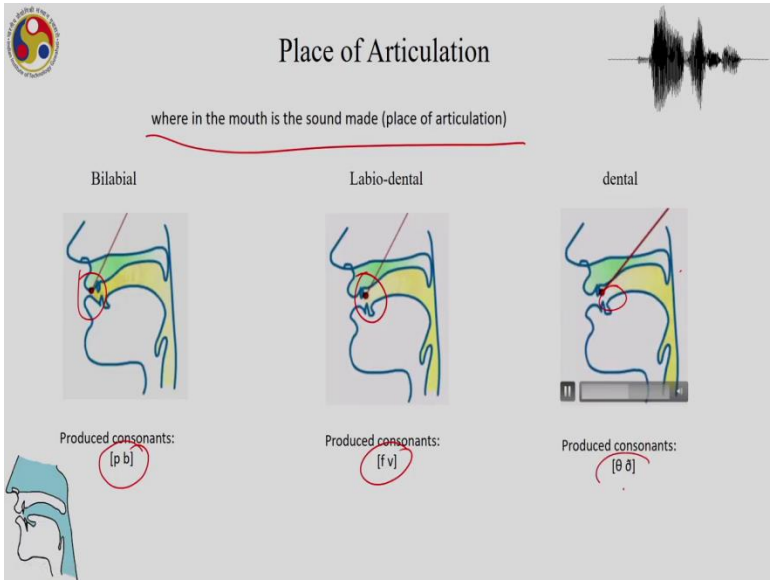

Where in the mouth, the sound is made which is the place of articulation? Where do you have the constriction? In bilabial, it is the lips. In labiodentals, it is the lower lip and upper teeth, in dental you have the tongue making an obstruction with the back of the upper teeth. So here you will have consonants like pa ba, here fa va and here the dental fricatives tha dtha.

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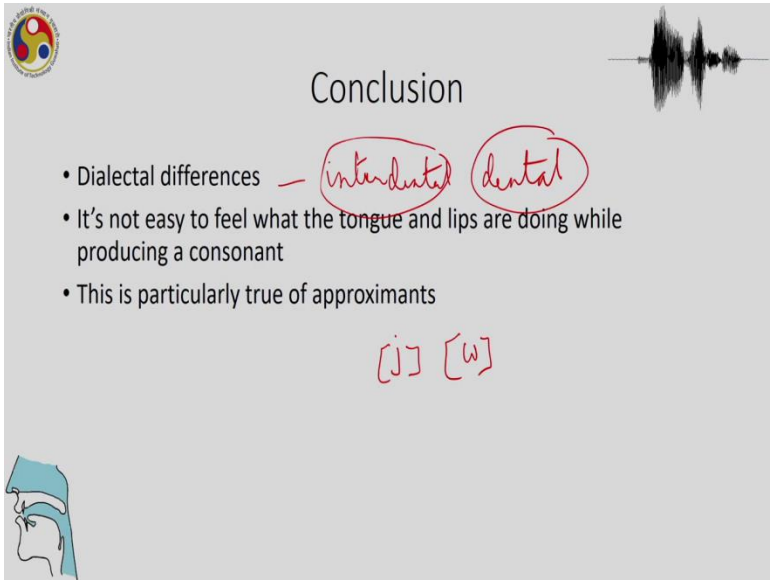

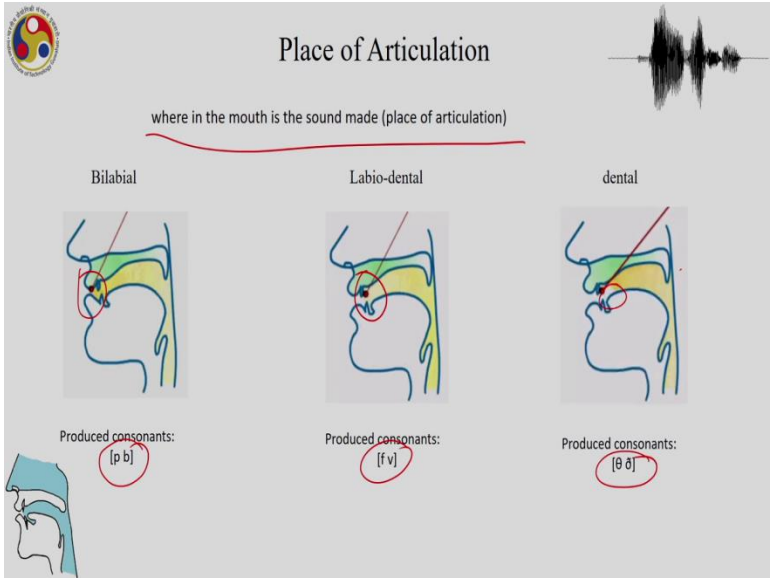

So more things that we would need to cover in the conclusion is that often what we need to remember is that there are plenty of dialectal differences when we talk about consonants. Just now we showed these 2 dental fricatives tha and dtha. So now, one dialectal difference there is the difference between interdental and dental.

So interdental is when tongue is placed between the two between the upper teeth and the lower teeth and then the release happens there. Unlike interdental, dental is when the tip of the tongue makes an obstruction on the side of the back of the upper teeth. So there is an obstruction there and which should account for the differences between interdental and dental.

It is known that British English speakers and American English speakers, some dialects of American English differ as to whether the sound produces would be interdental or dental is known that in American English you would find more interdental productions than in British English which would normally be dental. So that was with regard to the 2 fricatives, dental fricatives in English. So you have dialectal differences and that is not the only difference that you would find in terms of dialectal differences, there are many others as well.

So that is one thing that you can keep in mind and try to hear the difference if you get an opportunity. Another thing to keep in mind is that it is not easy to feel what the tongue and lips are doing while producing a consonant. So the movements are pretty fast for us to notice what we did with your tongue lips when you said something and then as a result, so when we pronounced these approximants for instance, ya and wa, we can feel that the tongue goes towards

palatal region and for wa actually there are 2 types of movements, so we can feel the lip rounding in but also the back of the tongue goes up.

So these are things that we might notice while we are producing consonants. Remember that there are dialectal differences that we are always not conscious, that we cannot consciously feel the differences while we are producing sounds. So it may not be easy to keep a tab on the productions even if we are consciously trying.

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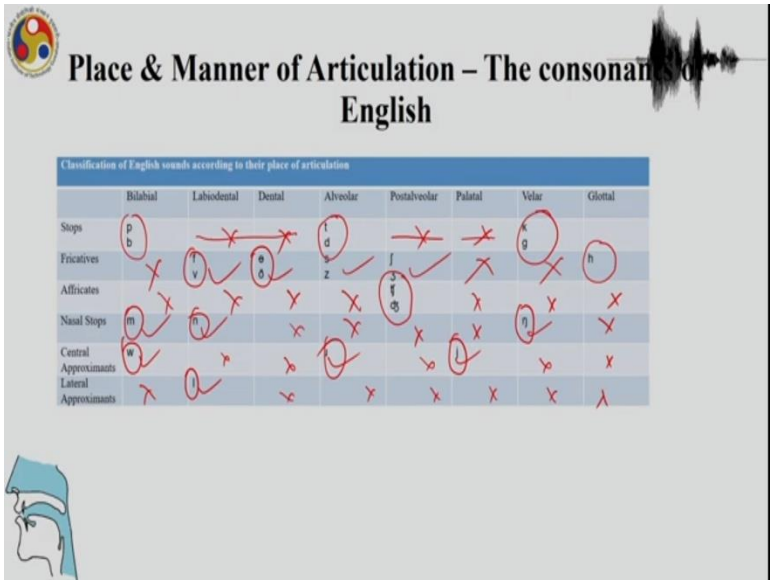

And finally to sum up, these are the consonants of English. We have already seen them- the bilabial stops and these labio-dental dental stops, as we already know we saw that this place is occupied in Hindi, not occupied in English, dental stop place, labio-dental stops not there, then we have alveolar stops, post-alveolar not there, palatal not there and velar and these 3 are actually most commonly seen in the languages of the world, that bilabial stops, alveolar stops and velar stops.

We have more fricatives in English, then we have stops. So we do not have bilabial stops, we have labiodental fricatives. We have dental fricatives, we have alveolar, we have post-alveolar, palatal not there, velar not there and this is called the glottal fricative in English. So it is called glottal fricative because air pushed out from the glottal region, but it is important to note that when the production of this voiceless sound in English, it very often takes the if you look at

spectrograms, if we look at the acoustics of how we are very often see that it takes a shape of formants of the surrounding walls.

Then coming to affricates we have far fewer affricates and this is true for almost all languages of the world. There are only 2 post alveolar affricates in English cha and ja and all the other places are not occupied. We have the nasal stops. We have the bilabial nasal, the labiodental nasal and velar stops and these stops and we have approximants va, ra, la and ya and also we do not have lateral approximants and the reason that I am crossing these places is to show that only a few of the places which are possible are occupied in English.

Now when we study diversity in the world's languages, we will see how many others are possible in the languages of the world. How common they are and what is absolutely not possible in the languages of the world. So for the time being we see that English has uses almost most places of articulation and depending on the manner of articulation, of course and English has almost all the manner of articulation as well but again, it does not have each and every manner of articulation for each and every place and similarly each and every place is not occupied, is not exploited by each and every manner of articulation.

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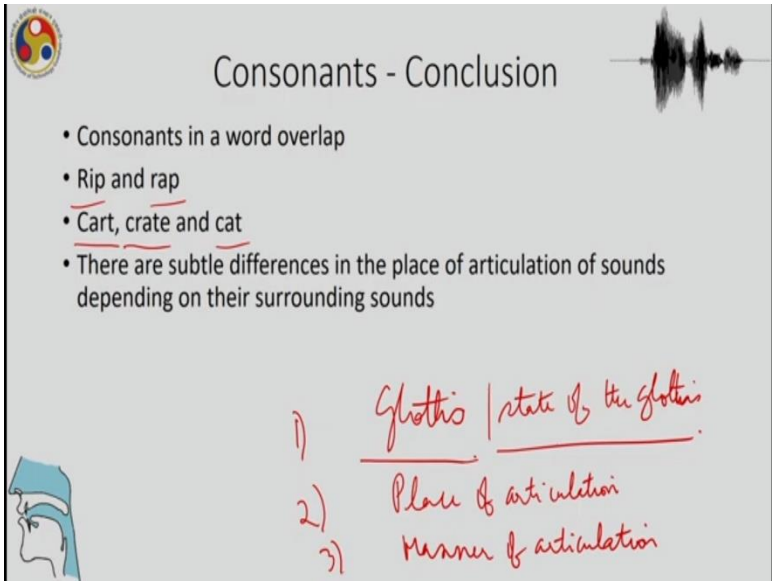

So these are the consonants in English and that brings us closer to wrapping up this part of the lecture on consonants and very important things to remember again, is that consonants in the word overlap. So and also consonants in a word are influenced by the surrounding vowels.

Hence, rip and rap will have slight differences because the following vowels are different even though they are pretty close as words.

Similarly, very similar words like cart, crate and cat, the acoustics of the sounds would be different because of the environment and because it's different vowels the consonants, etc which will influence the consonant. And we have to remember that these are differences that are environmentally affected, that is the surrounding sounds and there will be subtle differences always in the acoustics of sounds, no matter what sound it is.

So in the next class we will talk about vowels and cardinal system, etc. For the time being for now, it is important to remember that consonants involve obstruction, consonants involve modification of the air pushed out of the lungs that in the release is important, the state of the glottis is important whether the glottis was, whether it was vibrating or it was in a neutral state is important and the glottis plays far more different roles also as we will see later on what is called phonation. There again, the glottis plays an independent role and gives its own colour to different vowels and consonants.

So the resonance or the creakiness etc can be, effects, can be the colours given by the glottis two different sounds. So apart from voicing, the glottis plays other roles as well in the articulation of various sounds. So the glottis is very important. It gives the spectral shape and then it is filtered in the rest of the vocal tract, whatever is pushed out of the glottis. So the state of the glottis tells you about voicing. This is the basic thing one. Secondly, it is where you have the obstruction inside the vocal tract and then place of articulation and finally manner of articulation.

We are not saying that these 3 alone defines everything that we need to know about consonants but these are the main, the preliminary things that we need to know about consonants apart from that, there are other things, other than this nasalization, this lip rounding as we said there is the others influences, the other things done by the glottis like phonation, etc, which we are not studying now. So these are the preliminary things that we need to remember about consonants. Thank you very much for watching. Stay tuned for the next lecture which is on vowels. Thank you.