Phonetics and Phonology: A Broad Overview
Professor Shakuntala Mahanta
Department of Humanities and Social Science
Indian Institute of Technology Guwahati
Lecture 24
Stress

Hello, welcome to this NPTEL Massive Online Open Course, this course is on phonetics and phonology, a broad overview. So, we have talked a lot about segments, about sounds, about consonants, vowels, and rules and also the acoustics of consonants and vowels that is individual segments.

So, now, in this part of the course, we look at the phonology of units which are not exactly segments, which are more than which constitute material which is not just one sound, which constitutes more than one sound. And when we are talking about that, we talked about syllables in the last class, in the last lecture you had seen that how the syllable is the nucleus of the unit syllable and then you have onset and coda and how you have various rules of assignment of onset and coda.

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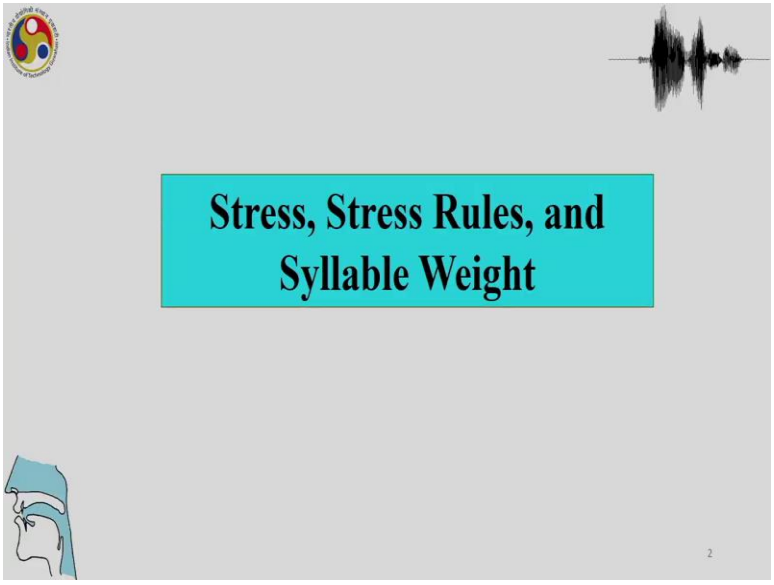

Now, today we talk about another aspect of the syllable, which is stress and stress rules and syllable weight.

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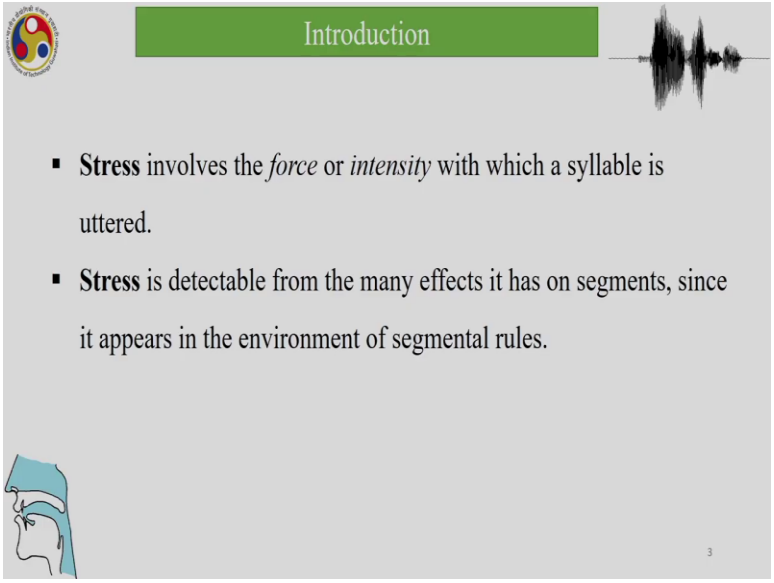

So, when we talk about stress, stress involves the force or intensity with which a syllable is uttered. So, stress is inherently about something which is in a syllable. So, stress is detectable from the many effects it has on segments, since it appears in environmental segmental rules. But it is always considered to be a part of a syllable.

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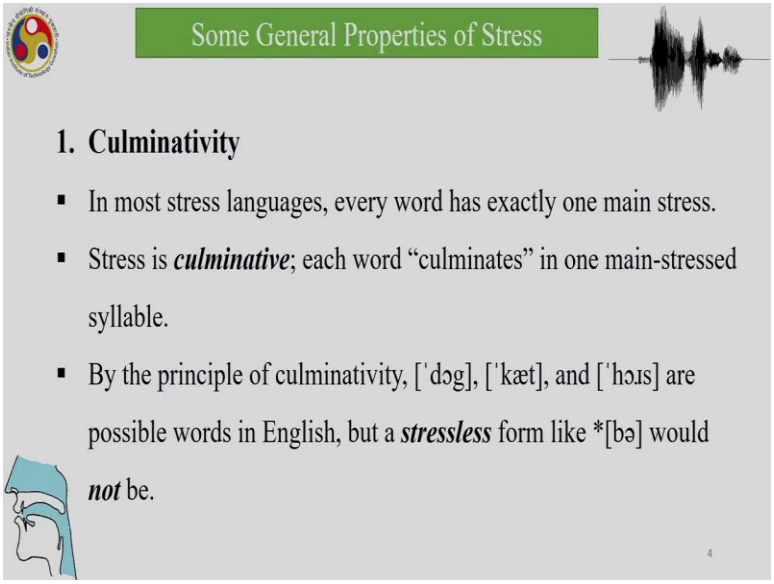

So, when we talk about stress, there are some inherent general properties of stress that we always have to keep in mind, number one is that of culminativity. So, what does culminativity mean? It means that in most stress languages, every word has exactly one main stress. So, it has to have

the property where the intensity has to culminate in one part of a word. And that is called the principle of culminativity.

And stress is culminative, in each word culminates in one main stress, syllable, which is which should could which can be called prominent, which can be called stress, which can go accented, but that stress syllable has to have the property of culminativity. So, by the principle of culminativity, for instance monosyllabic words like dog, cat and horse, are possible words in English, but a stressless form like something like ba would not be possible word in English.

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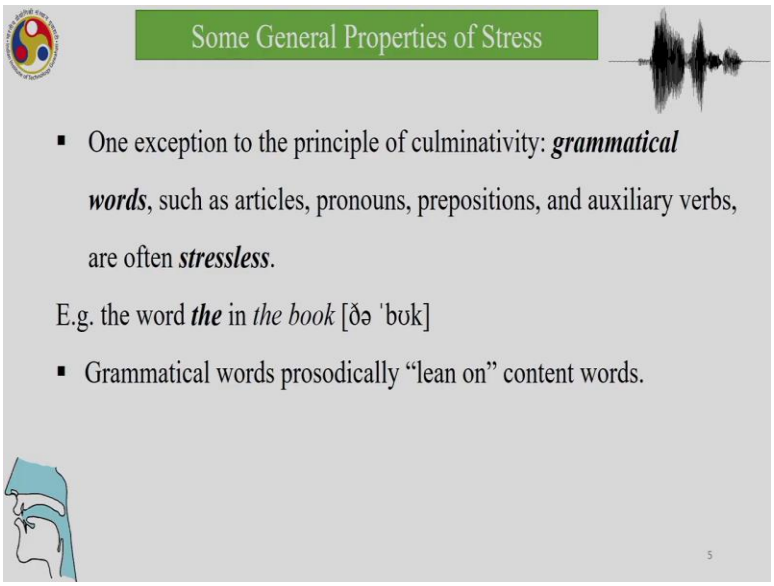

So, one exception to the principle of culminativity, like grammatical words such as articles pronouns, prepositions and auxiliary verbs are often stressless. Example, the word the in the null phrase, the book. So, grammatical words prosodically lean on content words. So, if there are grammatical words, then they almost necessarily, they will lead content words to exist in any grammatically meaningful form.

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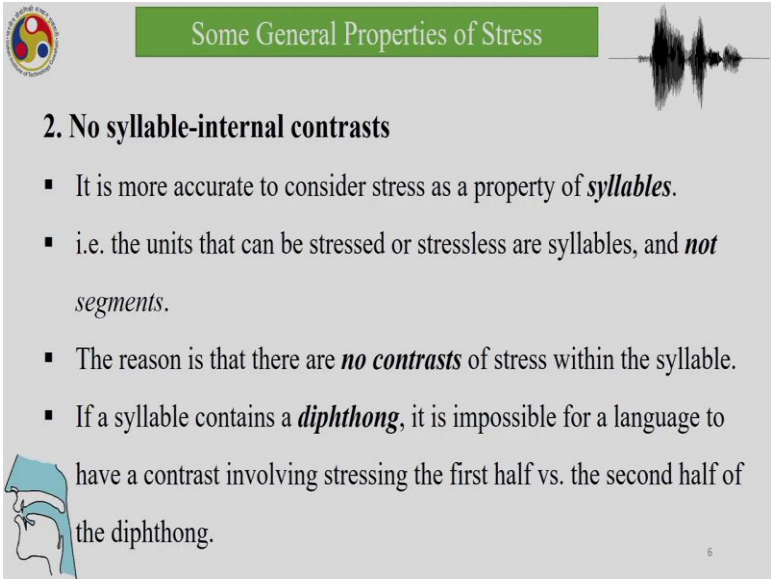

So, the other properties include that, as we just said, the stress is a property of syllables, that is units that can be stress or stressless are syllables and they are not segments. And the reason is that there are no contrasts or stress within the syllable. And if a syllable contains a diphthong, it is impossible for a language to have a contrast involving stressing the first half versus the second half of diphthong.

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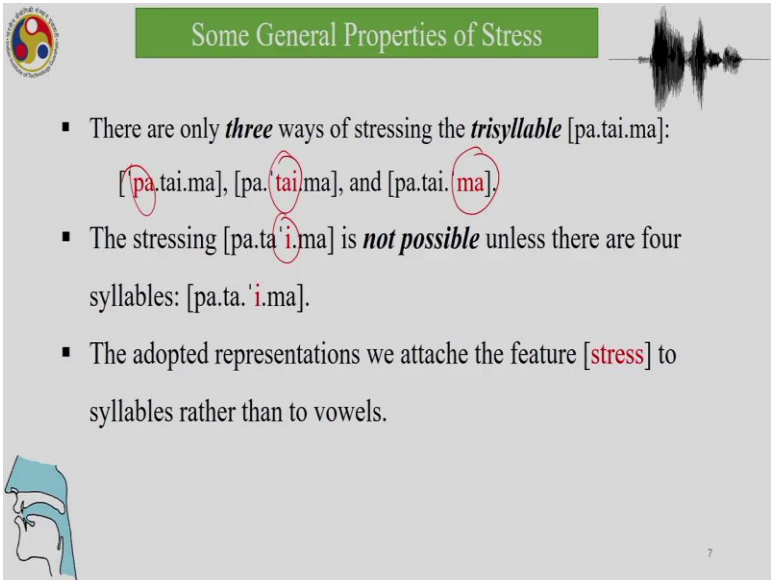

So, we have examples here, there are only three ways of stressing, the trisyllable, we have here is pa.tai.ma, where obviously because three syllables, these are the three possibilities that we have.

So, we either have stress on the initial syllable or stress on the middle syllable stress on the end syllable. And stressing pataima is not possible unless you have four syllables, pa-ta-i-ma. So, the issue is, if this has to be stressed, then, this will be a syllable on its own. And the adopted representations, we attach the feature stress to syllables rather than to vowels. So, that is what we meant by saying that stress is inherently a part of syllables, it is not a part of segments.

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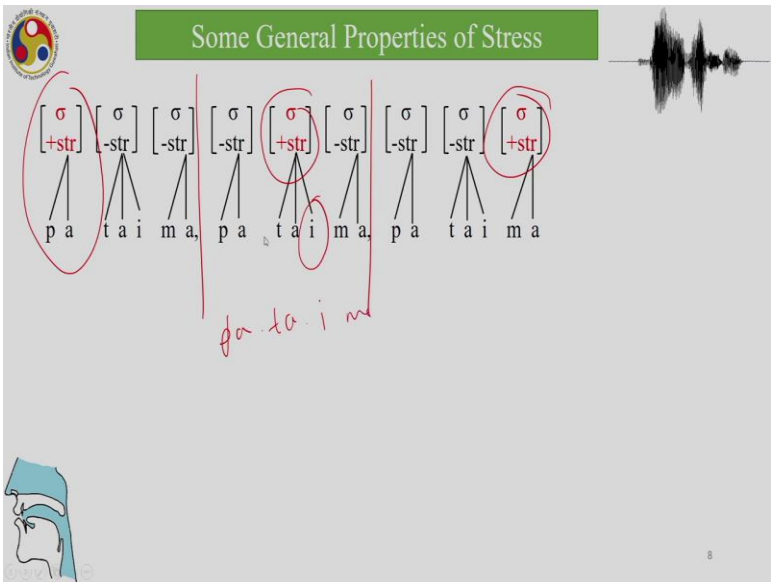

So stress, therefore, if we have stress on this and then in this if we have stress on tai, then this is to be the stress syllable and this is to be the stress syllable if it stresses here. So, it is a property of a syllable. And if at all the stress is on this vowel, then this will become a four syllable word pa-ta-i-ma.

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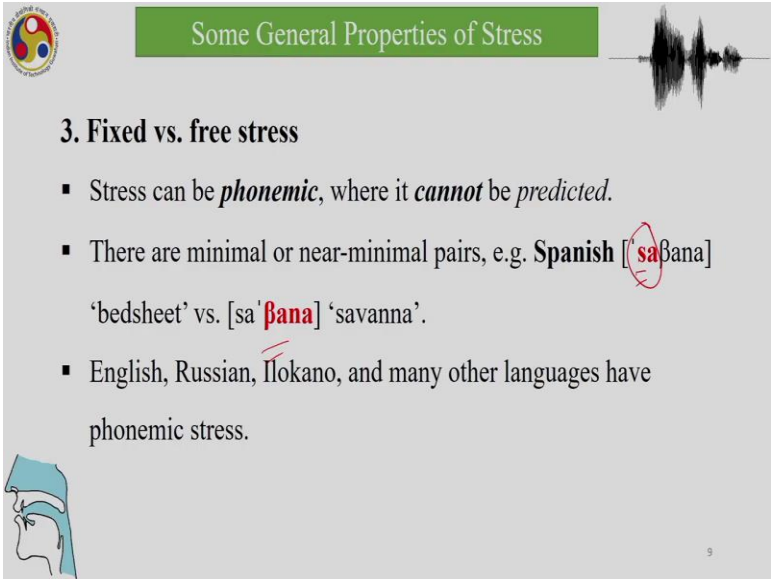

Now, other general properties that constitute stress in a language is the property of fixed versus free stress. So, stress can be phonemic where it cannot be predicted and there are minimal or near minimal pairs example Spanish sabana versus savanna versus sa where we have the stress here or ba if we have the stress here.

So, we have a minimal pair almost where with exactly the same constituents, phonemes which compose the word, but then the stress is on different locations in the word. And that is why stress is phonemic So, which means that stress cannot be just anywhere in Spanish, the stress is to some extent determined by the word. English, Russian, Ilokano and many other languages have phonemic stress.

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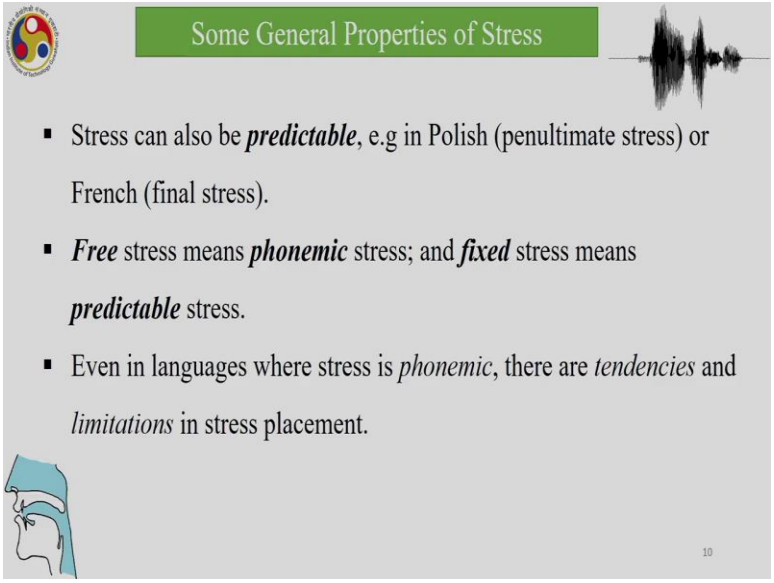

And stress can also be predictable in languages, for instance, language like Polish, which always has been penultimate stress or French which has final stress. And free stress means phonemic stress and fixed stress means predictable stress. So, phonemic stress in language phonemic stress, there will be a large component of large amount of words in the language where stress will not be predetermined and stress will be based on some aspect of the word.

For instance, in English, we have a noun verb pairs where stress is different based on if it is initial then it is a noun, if it is in the second part of the word, then it is a verb. So, we have those noun verb pairs in English and we saw the Spanish examples. And in those languages we have phonemic stress, but there are lots of languages where stress is predictable and it will always be in one particular position. So, even in languages where stress is phonemic, there are tendencies and limitations and stress placement.

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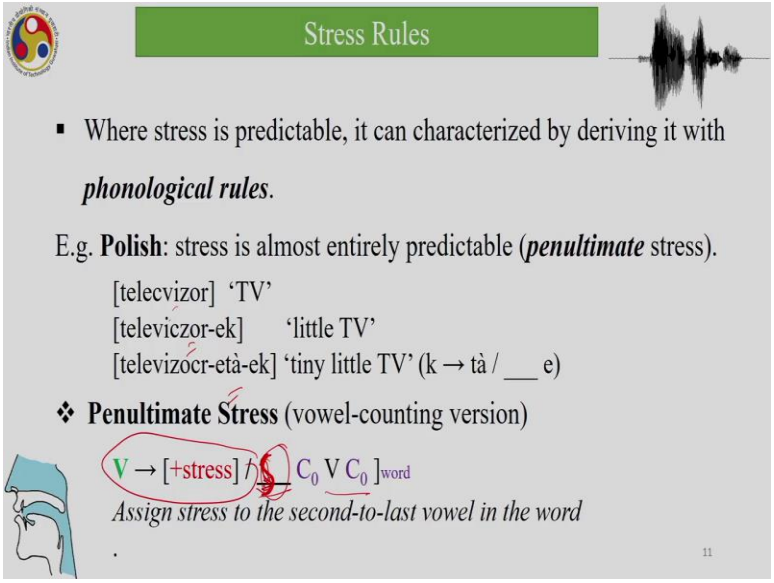

And so where stress is predictable, we can characterise it by deriving it with phonological rules. So, Polish stress is almost entirely predictable, so Polish stresses is penultimate. So, as a result, whenever you have more morphemes added to a word, then the position of the stressed syllable will change, it will always be on the penultimate syllable.

So, penultimate stress. And here, it is here and it is always penultimate if it is. So, we have penultimate stress, we have vowel counting. So, if we have a vowel counting version, then if the stress vowel will be the one which is in the penultimate position. So, this is the final, the penultimate stress is always here. This is our stress position. And what is this language, this is polish, assign stress to the second to last vowel in the word.

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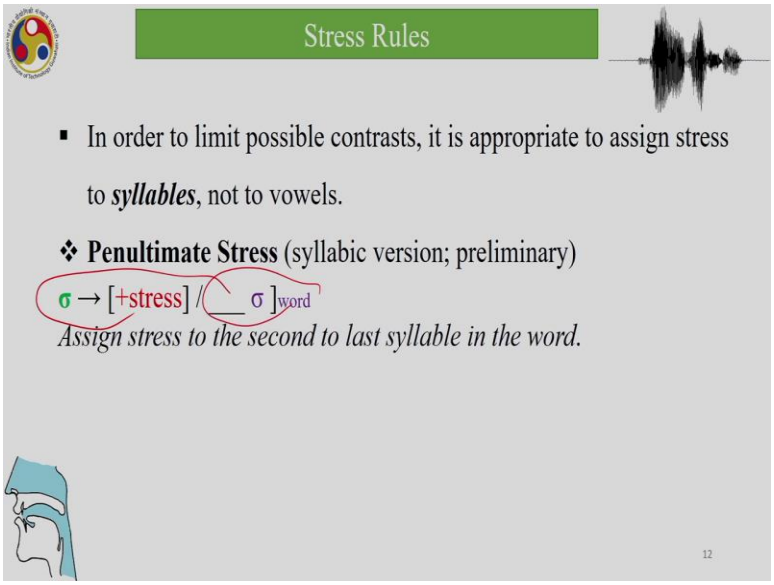

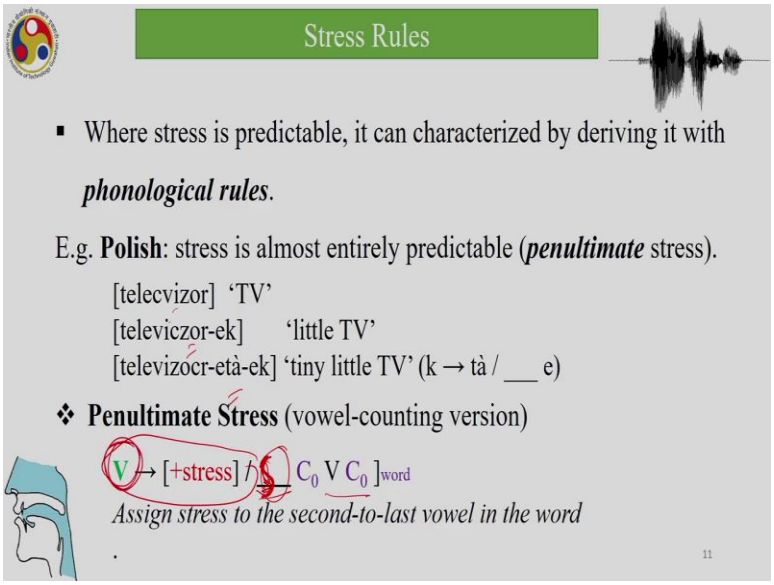

So, in order to limit contrast, it is appropriate to assign stress to syllables not to vowels and therefore penultimate stress, whereas, here we said that it is a property of the vowel here as you can see we are saying that the property of syllable, syllable has plus stress, if it is before a word final position. So, assign stress to the second to last syllable in the word.

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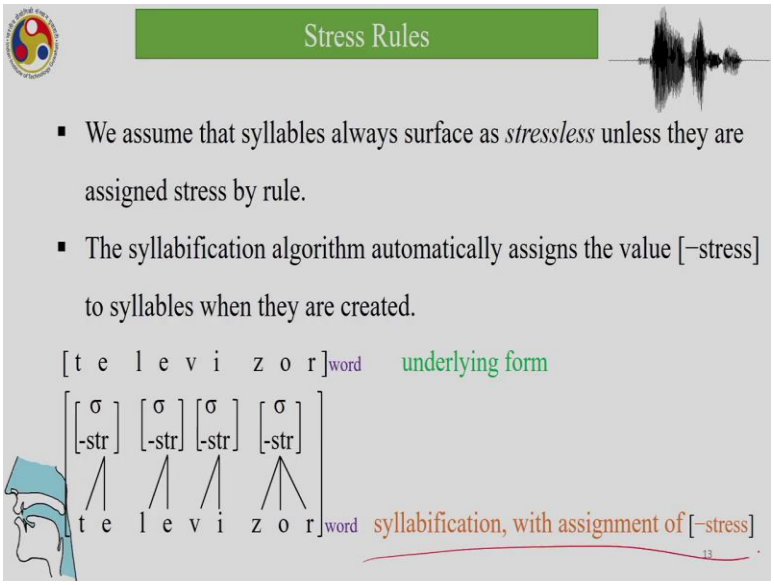

We assume that syllables always surface as a stressless unless they assigned stress by rule. So, as we come to the derivation, it is assumed that it is not stressed. And once the rules start applying then the rules of stress will apply to language and so they do not come to the derivation already bearing the stress but stress is a result of phonological rules.

The syllabification algorithm automatically assigns the value minus stress to syllables when they are created. So, as we just said, when you have to come to derivation in the underlying form then there is no stress and then we have the stress rules applying. So, this is the underlying form and then we have the stress rules applying and so we have televizor syllabification with this as we see here no stress.

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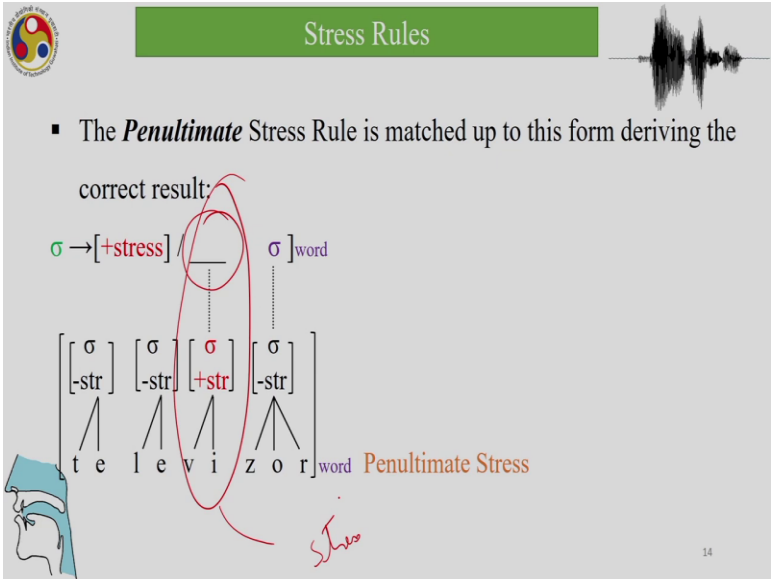

And then the penultimate stress rule is matched up to this form. So, then the stress rule says there is an underlying form, the stress has to be assigned which is the stressed syllable, what is the stressed syllable going to be. So, the phonological rules of Polish will say, assign stress to the penultimate syllables. Hence, we have your stress syllable here as a result of the phonological rule application.

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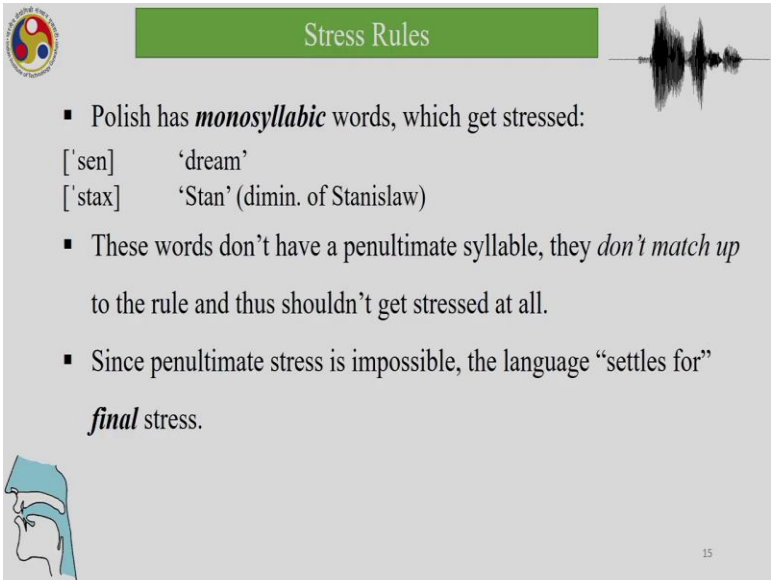

So, Polish has monosyllabic words which get stressed, and these words do not have a penultimate syllable, obviously because they are monosyllabic and they do not match up to the

rule and that should not get stressed at all. So, since penultimate stress is impossible, the language settles for final stress.

So, in this language, in Polish, if the penultimate syllable is not available and when is it not available when they are words which do not satisfy the condition of having a penultimate position, you will not have a penultimate position if there is only one syllable in the word, that is, a monosyllabic, then the algorithm settles for something whatever syllable is available there, the only syllable available is the one which will be stressed.

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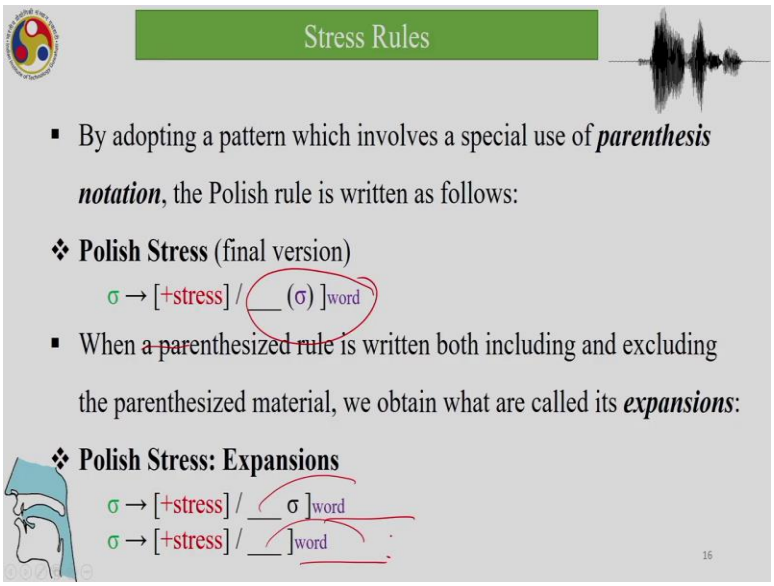

By adopting a pattern which involves a special use of parenthesis notation, the Polish rule is written as follows. So, which means with this parenthesis notation, one or more positions can be made subject to that rules of stress assignment. So, syllable is plus stress when it is before a word boundary, the syllable for the one. And when you parenthesis word rules written, both including and excluding the parenthesized material, we obtain what we call its expansions.

So, Polish expansions, so, this is the penultimate position and this is the final position and we have an expansion in the sense that if the penultimate rule cannot apply then we have an expansion of the rule to apply in the places where when ultimate rule cannot apply.

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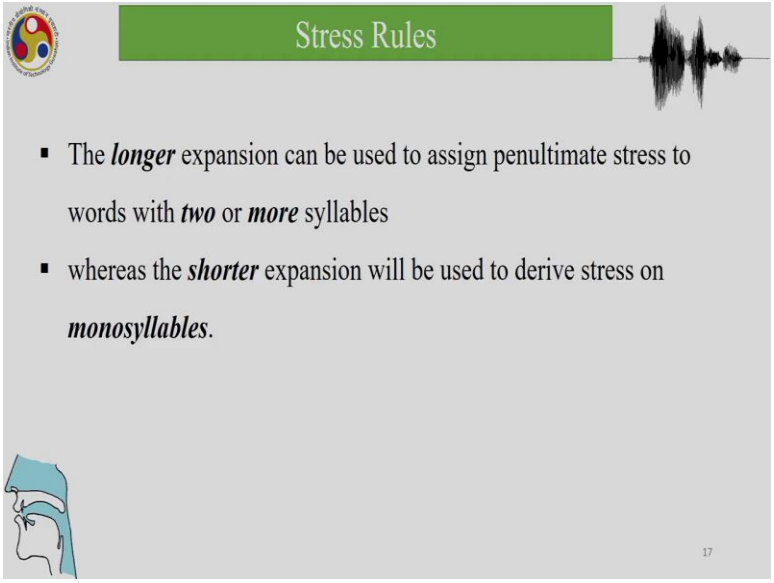

The longer expansion can be used to assign penultimate stress to words with two or more syllables, and whereas the shorter expansion we use to derive stress on monosyllables. So these are called two expansions

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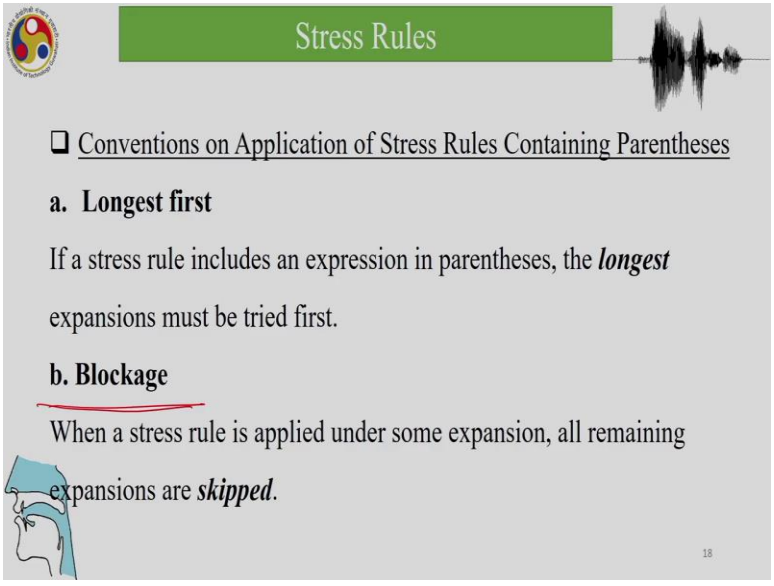

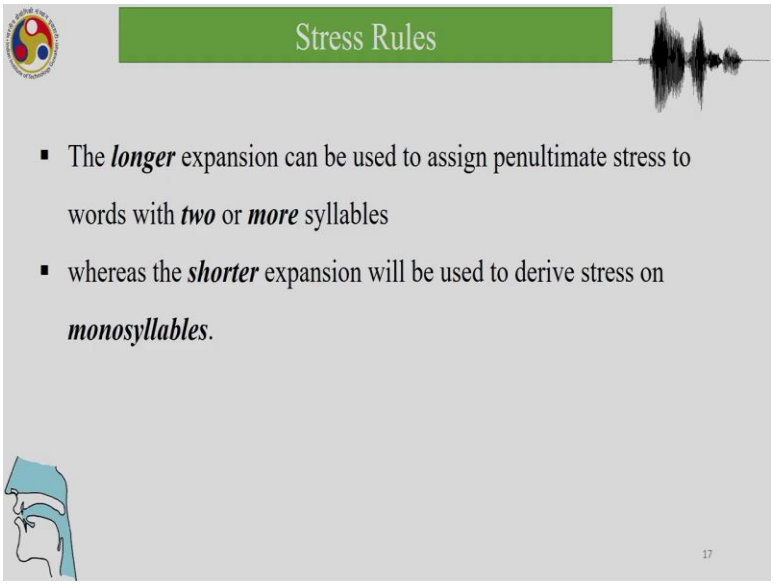

And conventions on application of stress rules containing parenthesis. The longest first. If a stress rule includes an expression in parenthesis, the longest expansions must be tried first. So, as a result, when a stress rule is applied under some expansion, all remaining expansions are skipped.

And the longest, which means it was, I have to also mention blockage part. So, there is the longest first so if the stress rule has an expression parenthesis then the longest expansion must be tried first. And if the longest is whereas the shorter expansion we used to derive stress on monosyllables. So, as we said before, when the penultimate stress expansion is not possible, then the shorter expansion of the word final will be applied to monosyllables.

And longest and blockage which we want to explain. When a stress rule is applied under some expansion, all remaining expansions are skipped. And when it is applied, at the time of application of one expansion, the other expansions are skipped. So, they did not apply at the same time.

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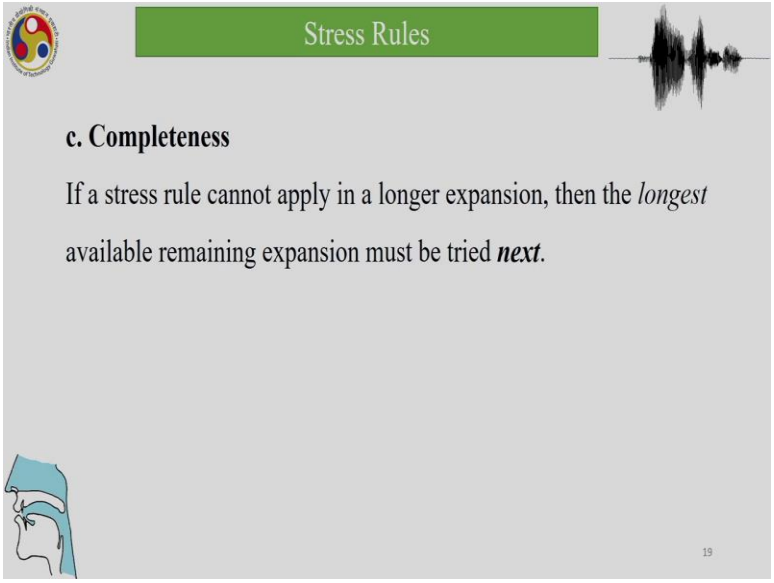

If completeness, if a stress rule cannot apply in a longer expansion, then the longest available remaining expansion must be tried next.

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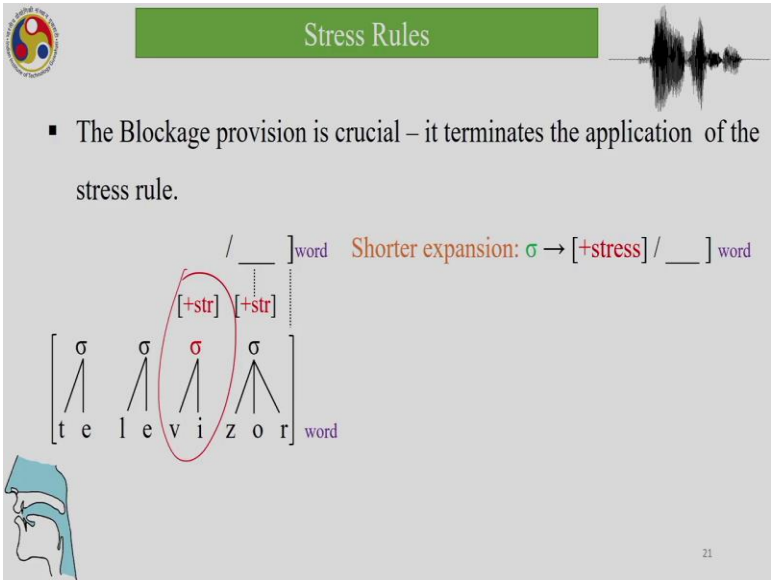

So, in the Polish case, the first expansion is longest and therefore must be tried first. So, we have longest expansion which says that it is a penultimate syllable, and then we have the blockage provision which terminates the application of the stress rule. So, the blockage dominates the application of the stress rule, the penultimate rule applies. So, we have a stress on the penultimate syllable in televizor.

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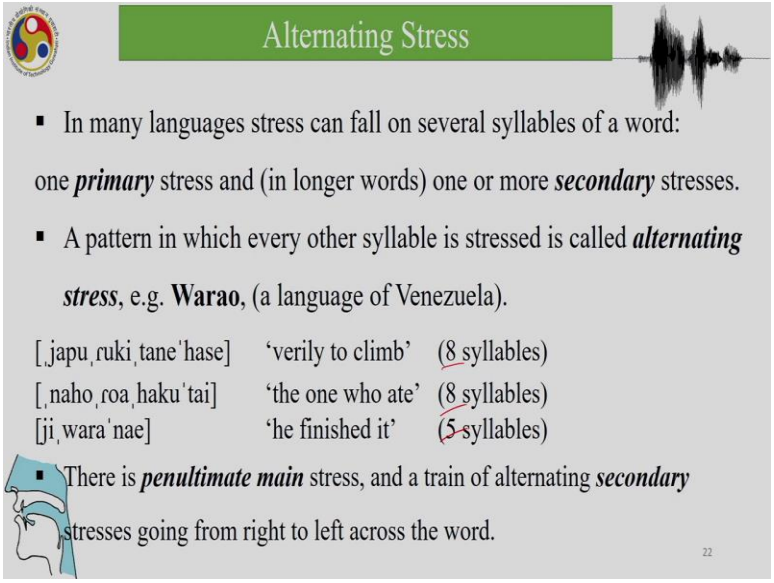

In many languages, stress can fall on several syllables of a word, one primary stress any longer words or one or more secondary stresses. And a pattern in which every other syllable is stressed is called alternating stress example, the example of Warao, a language of Venezuela. So, we have eight syllables, eight syllables and five syllables. So, if a language is alternating stress and we will try to skip one syllable and then assign stress to the other syllable. And that process will go on till it meets its end.

And so we have long syllable words from Warao, where we have three examples two with eight syllables each and the last one is five syllables. So, what happens in Warao? Warao has penultimate main stress and a train of alternating secondary stresses going from right to left across the word. So, stress assignment happens from the right edge.

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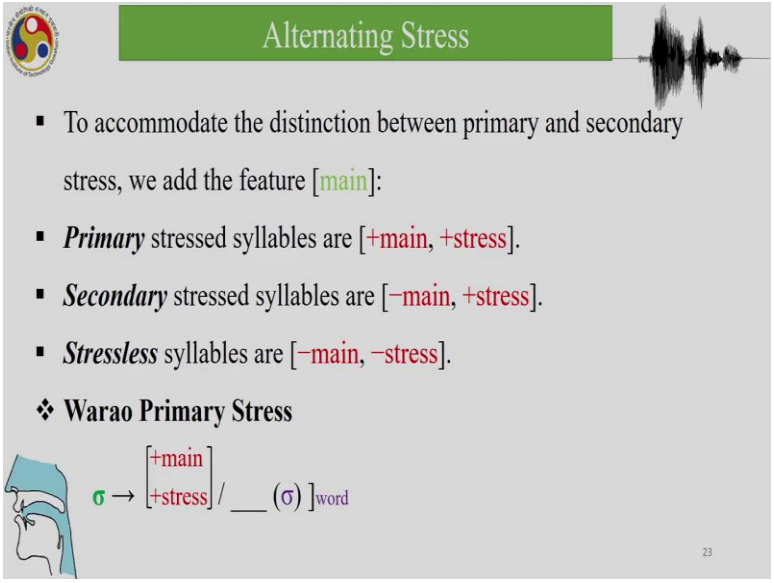

To accommodate the distinction between primary and secondary stress we add the feature main. So, primary stress syllables are plus main and plus stress and secondary stress syllables are minus main and plus stress. So, they do not have the main stress, but they do indeed have some stress and stressless syllables are both minus main and minus stress. Warao primary stress, so you assign primary, that is main stress, primary stress to the penultimate syllable.

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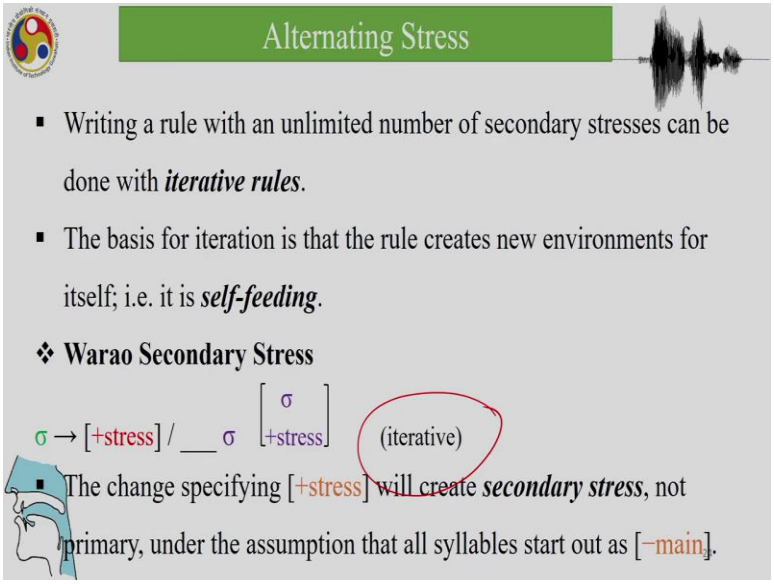

And after writing a rule with an unlimited number of secondary stresses, after that writing a rule with unlimited number of secondary stresses can be done with iterative rules. So, the basis for

iteration is that the rule creates new environments for itself that is, it is self-feeding. So, that is a property of iterative rules. And so what happens in Warao secondary stress, we have the property of iterative, keep on applying the secondary stress to the alternate syllables. Writing a rule with an unlimited number of secondary stresses can be done with iterative rules. The basis for iteration is that the rule creates new environments for itself, that is, it is self-feeding.

So, we have Warao secondary stress here, where the syllable becomes stress if it is before the penultimate position. And if it is in alternating positions. So, the change specifying plus stress will create secondary stress not primary under the assumption that all syllables start out as main. So, after syllabification, after the stress rule, we will consider that as which has already happened. And after that, the rules of applying secondary stress will apply. So, they will not apply simultaneously or they will not cancel each other out.

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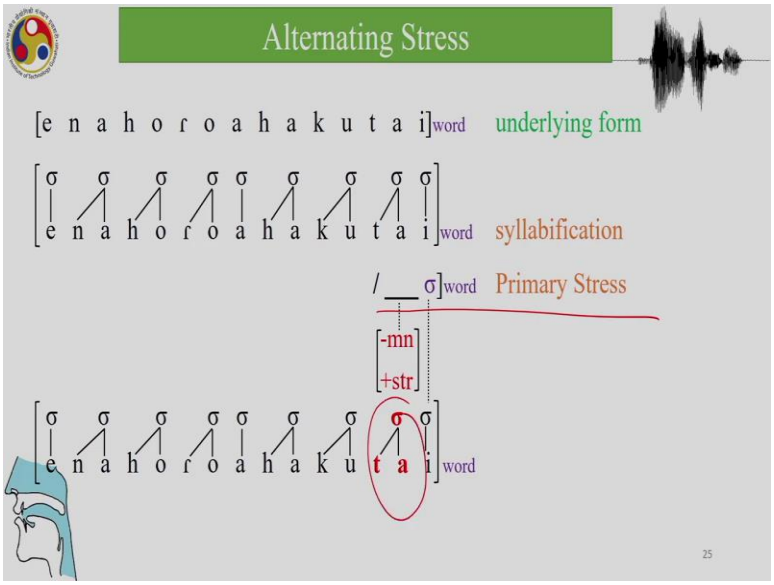

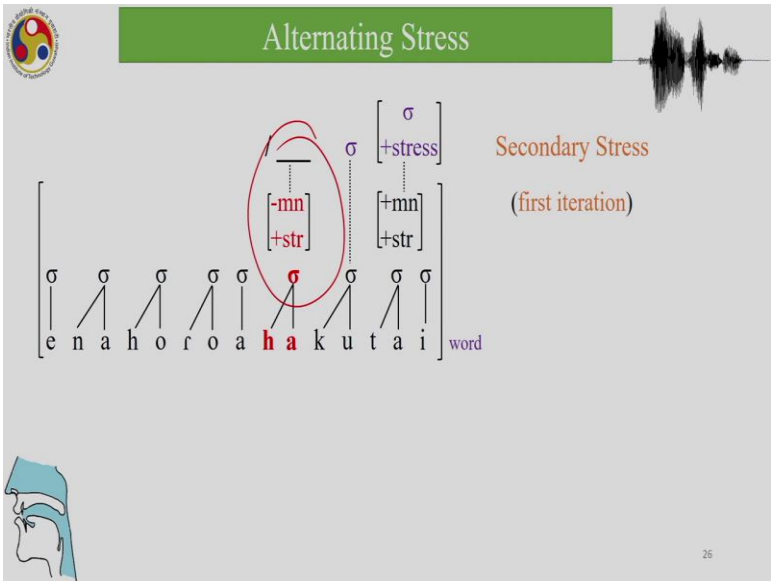

So, we have the underlying form here and the syllabification. So, as we just said, primary stress will be assigned to the penultimate syllable fine. Now, we have now main stress, the primary stress so that rule is done. Now we have to keep finding our alternating stress positions. So we already have one, we leave out ku which is stress less and proceed to the stress before ku, which is minus main stress or does not even have stress.

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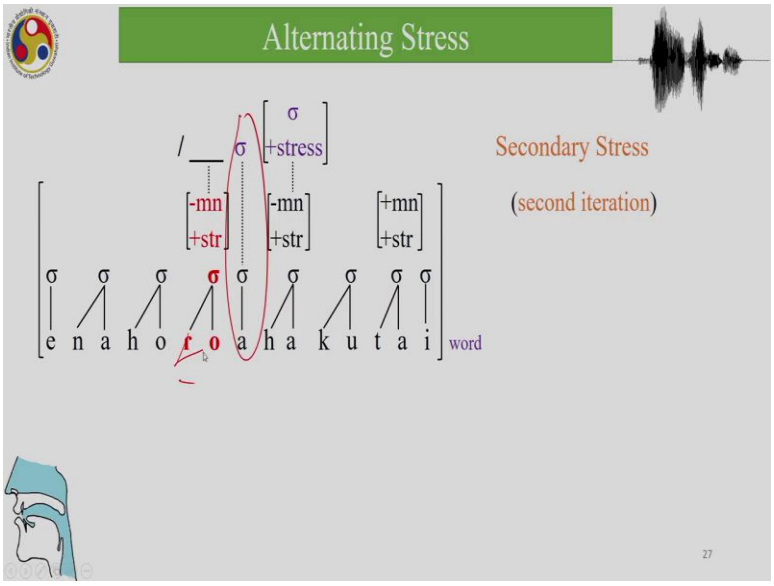

And then again we skip this a and then we have rho and minus and therefore again secondary stress assigned there. And finally, we leave out another syllable and reach the seven syllable,

where again stress is assigned, because it is assigned from the right edge to the left edge. And the syllable is left out.

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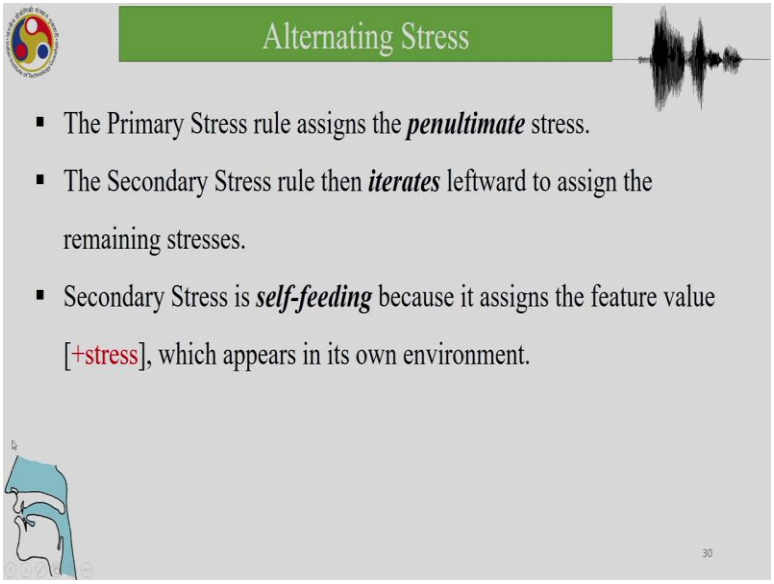

So, the primary stress rule assigns the penultimate stress and the secondary stress rule then iterates leftward to assign the remaining stresses. So, secondary stress is self-feeding because it assigns a feature value plus feature value plus stress, which appears in its own environment. Its own environment is that it has to look for a minus stress, it has to feed the environment that is already so minus stress, the main stress has been assigned and then the next step is to assign these iterative secondary stresses. And then it will keep on feeding till it meets the end, where there are no alternating minus stress syllables. At the last attempt to apply again secondary stress no stress can be assigned.

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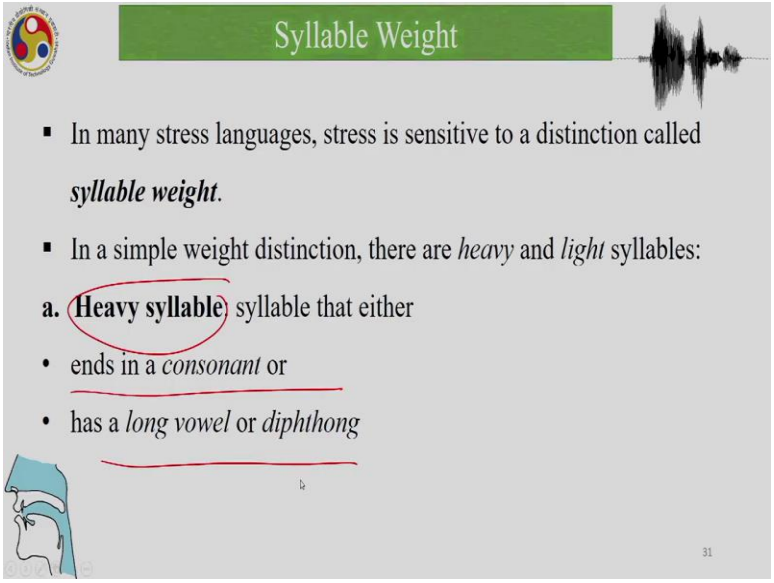

In many stress languages, stress is sensitive to the distinction called syllable weight. Another important aspect of stress is that of syllable weight. So, in a simple weight distinction there are heavy and light vowels. And what are heavy and light syllables? What is a heavy syllable? It either ends in a consonant or has a long vowel or diphthong.

Those candidates are ideal for being heavy in the sense that they will attract stress by virtue of being containing more material than on the right edge of the syllable that is one more consonant. So, if you have two consonants in the onset, that normally does not lead to weight. So, light syllable is a syllable that ends in a short vowel.

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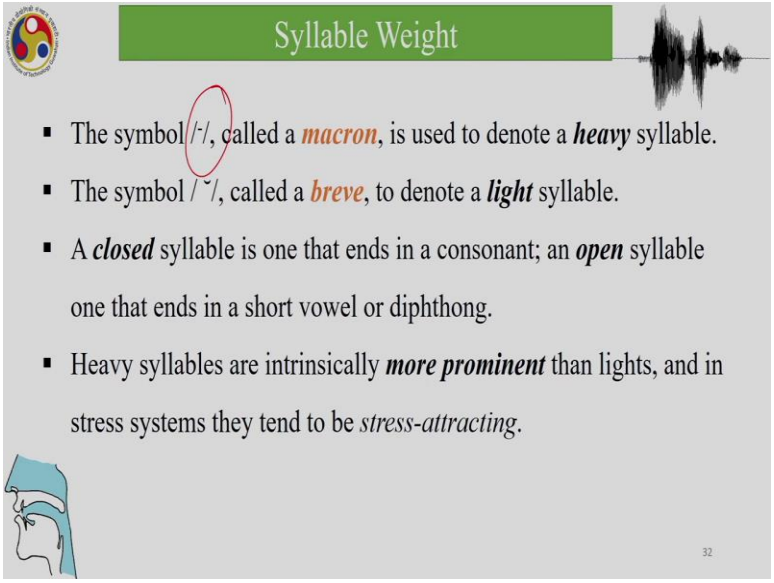

So, this syllable is called the macron, is used to denote a heavy syllable, and this syllable called breve is used to denote light syllable. A closed syllable is one that ends up in a consonant, an open syllable is one that ends in a short vowel or the diphthong. And heavy syllables are intrinsically more prominent than light. And in stress systems, they tend to be stress attracting.

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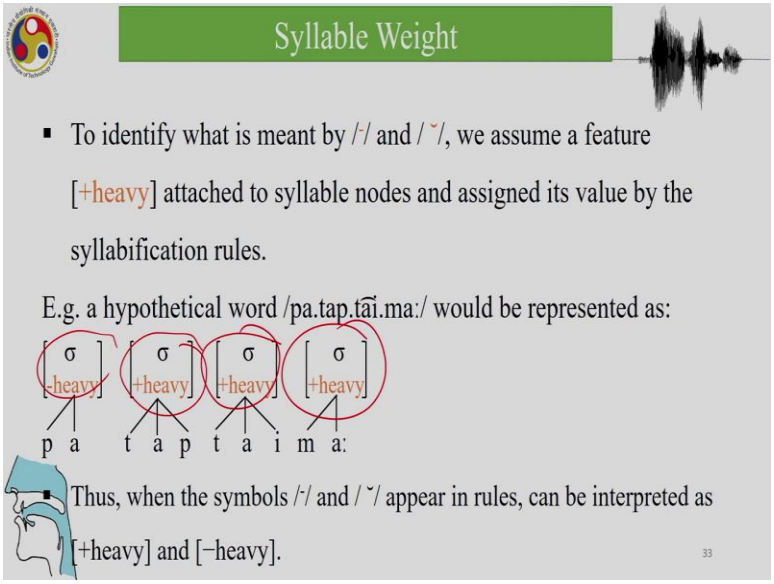

And to identify what is meant by the breve and a macron. We assume a feature plus heavy attached to syllable nodes and assign its value by the syllabification rules. And a closed syllable is one that ends in a consonant, an open syllable is one that ends in a vowel or diphthong. And

heavy syllables are intrinsically more prominent than light and in stress systems, they tend to be stress attracting.

So, recall what I just said that plus heavy syllable, a feature plus heavy attach to syllable nodes and assign its value by syllabification rules. So, syllable weight, hypothetical word pa-tap-tai-ma would be represented as minus heavy, plus heavy, plus heavy and plus heavy. Thus, when symbols macron and breve appear in rules, can be interpreted as plus heavy and minus heavy.

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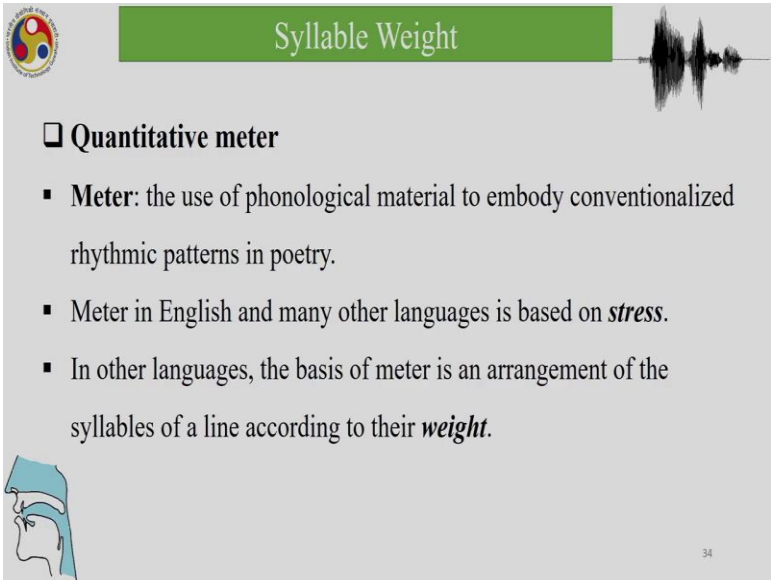

Quantitative meter, so a meter, the use of knowledge phonological material to embody cognitive embody conventionalized rhythmic patterns in poetry. Meter in English and many other language is based on stress. So, in other languages basis, a meter is an arrangement of the syllables of a line according to their weight.

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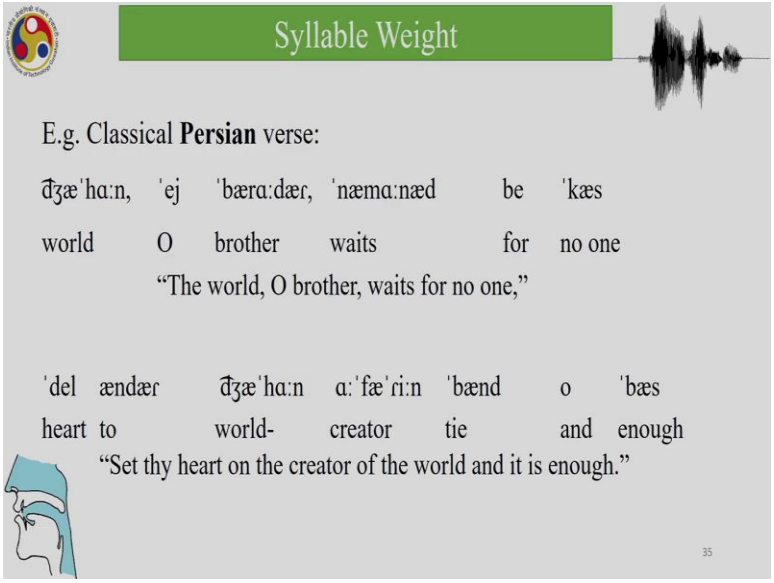

So, classical Persian verse, 'the world, O brother, waits for none'. And then we have another example, 'set thy heart on the creator of the world and it is enough'.

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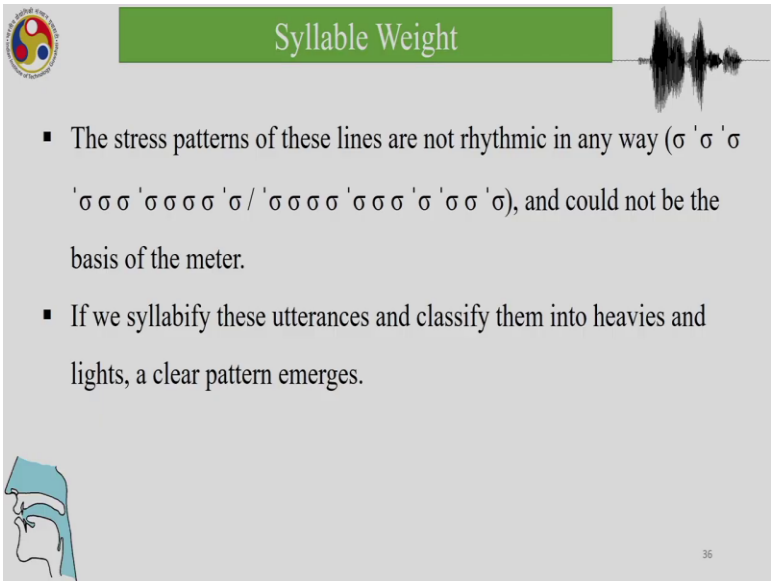

The stress patterns of these lines are not rhythmic in a way and could not be the basis of meter. So, we do not see rhythmic pattern here or neither do you see rhythmic pattern here, we do not see any rhythmicity in longer words.

So, if we do not have stress in longer words, then meter, what do you mean by meter is not applicable. If we syllabify these utterances and classify them into heavies and lights and a clear pattern emerges.

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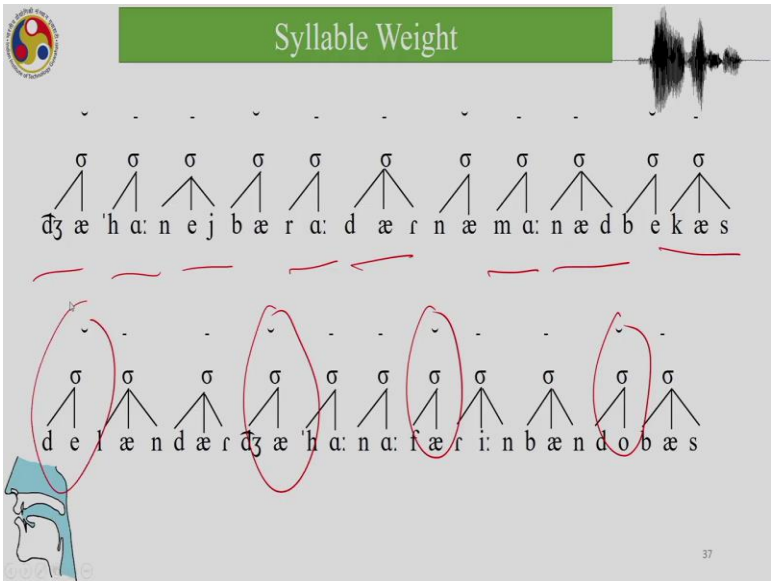

So, when we mark them as heavy and light, so these become heavy and these are the light ones.

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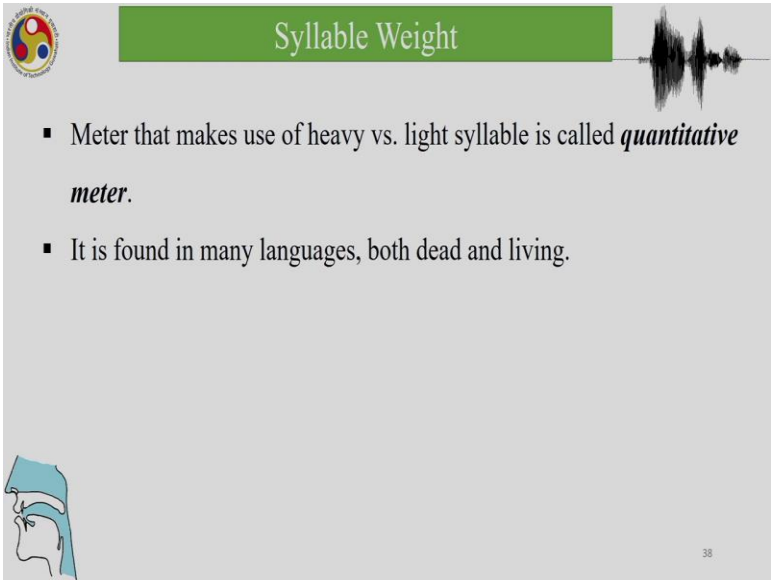

Meter that makes use of heavy versus light syllable is called quantitative meter. It is found in many languages both dead and living, and a lot of languages which are archaic languages which are not used anymore also had quantitative meter. So, this is quite common in languages.

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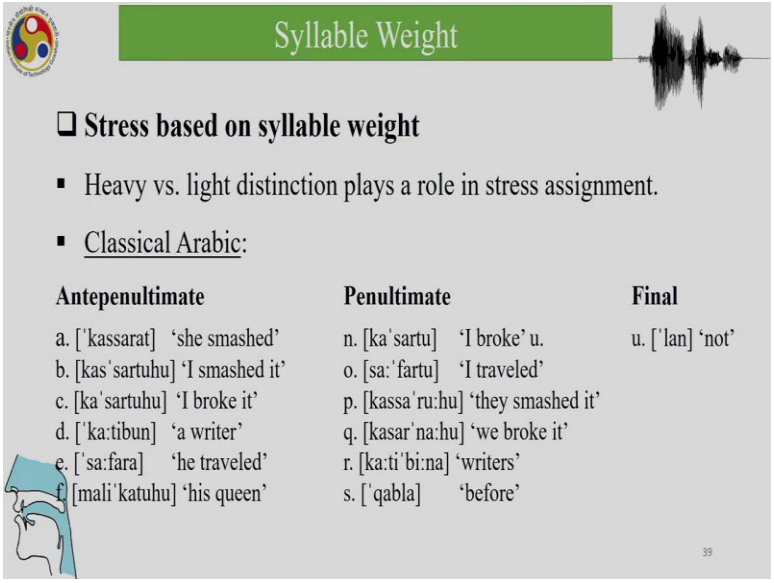

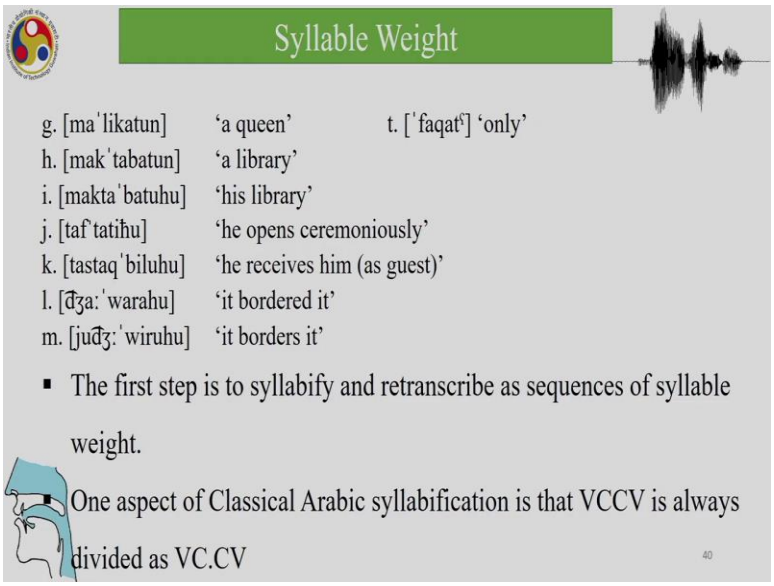

And then stress based on syllable weight. Heavy versus light distinction plays a role in stress assignment. So, we have classical Arabic with anti-penultimate, penultimate and final. And then we have all these examples of malikatun and tun and tabatun and makta batuhu. So, we do not have iterative stress here, but we may have something to do with syllable weight. And the first step is to syllabify and re-transcribe as sequences of syllable weight. One aspect of classical Arabic syllabification is that VC CV is always divided as VC CV.

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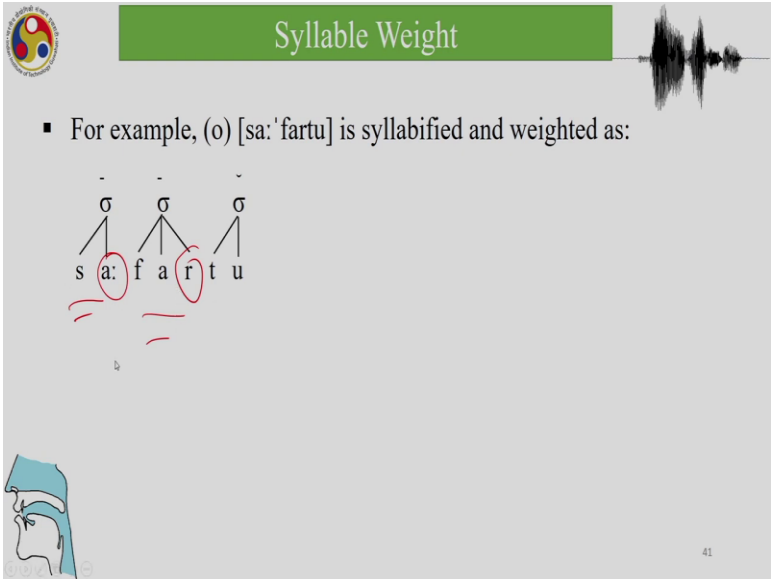

For examples, safartu is syllabified and weighted as sa-far-tu, where this is the heavy syllable, because a long vowel, it is heavy syllable, because a final consonant. And whereas this one is breve and this one is a macron because they have heavy syllables.

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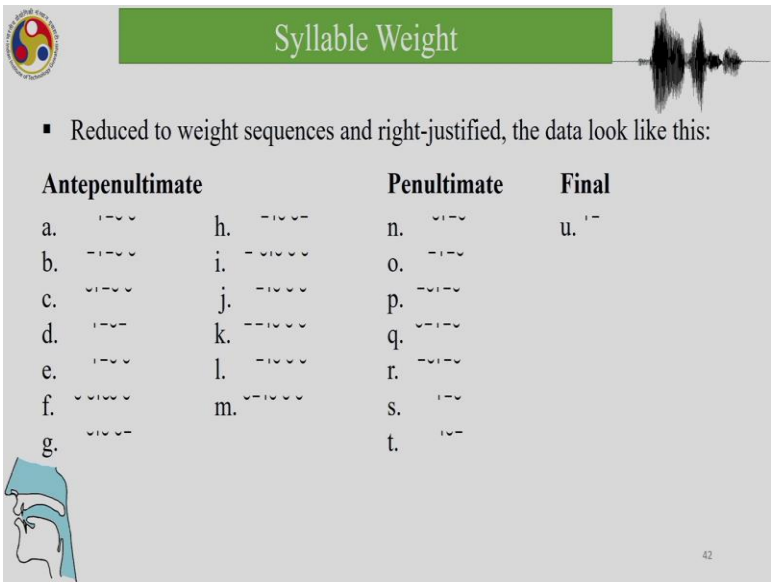

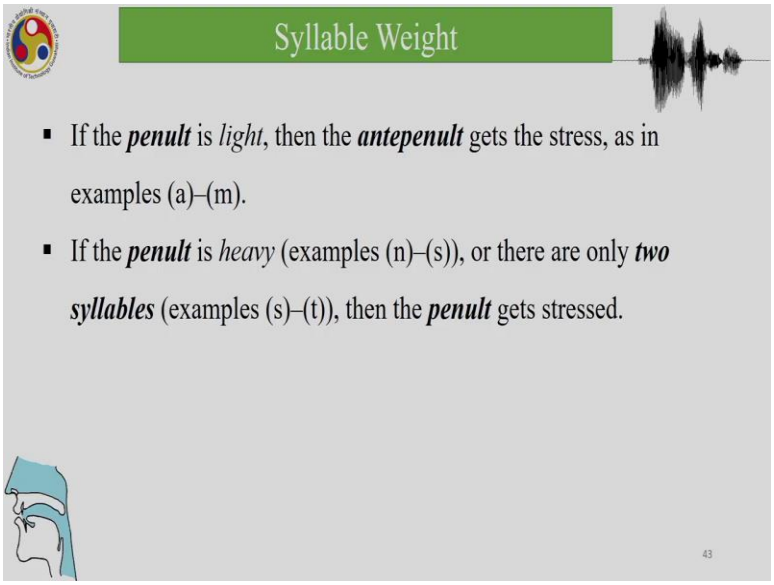

So, reduced to weight sequences and right justified the data looks like this. And this is where you see that the stress syllable is in one position and the stressless vowels is in another position. If penult is light, then the antepenult gets a stress as an example a to m. And if the penult is heavy or there are only two penult syllables, then the penult gets stress.

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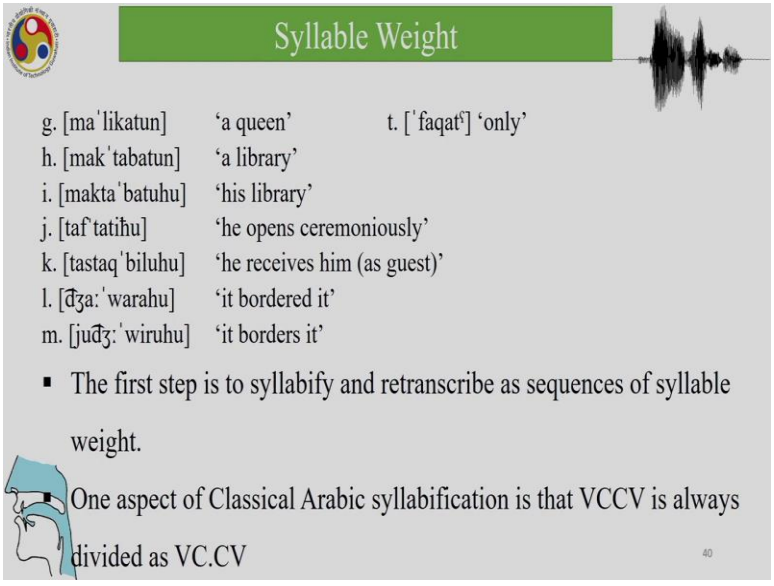

So, going back to our diagrams there and data here. So, the data shows that there is no interactivity like we saw before or there is no way to understand from the data here after we syllabify then we have to look at the constituents of the syllabus as to what qualifies them for stress.

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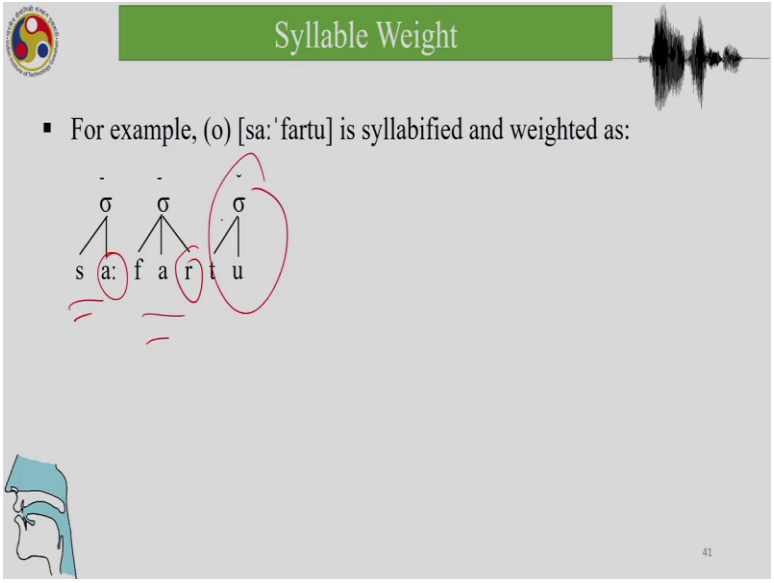

So, when we have syllabified and waited like this, when we have two heavy syllables next to each other macron and one breve. So, what happens?

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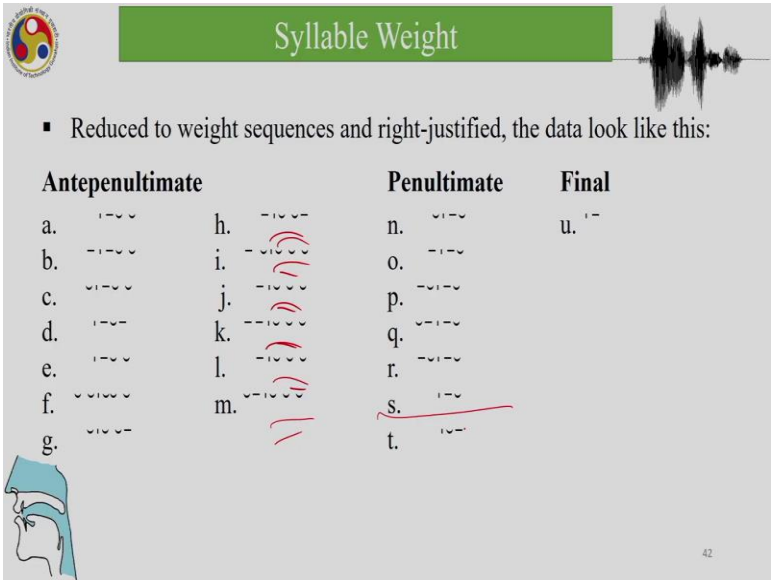

So we can see that reduced weight sequences. So if we say that the stresses are being attracted by the weight sequences, and it is on from the right side then a lot of the data becomes easier to understand because a lot of places where you see the macrons are the places where you have heavy syllables.

If the penult is light, then the antipenult gets stress as examples a to m. So in all these cases, the penult gets the stress.

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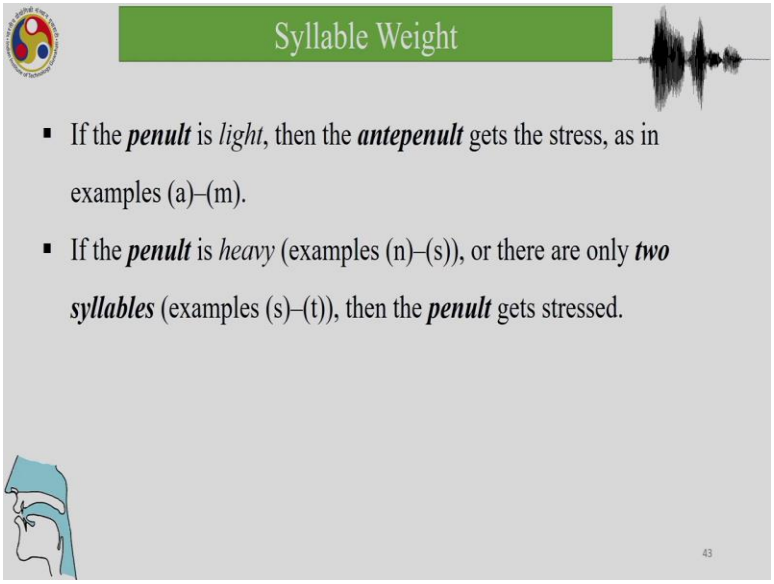

If the penult is heavy or they are only two syllables, examples s to t, then the penult gets stressed. If the penult is heavy and the only two syllables. So, if the penult is heavy and if they are two syllables then.

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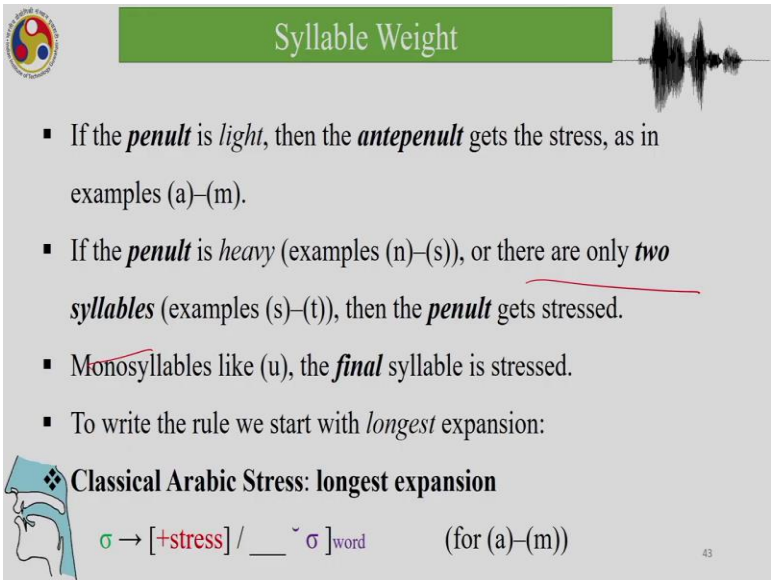

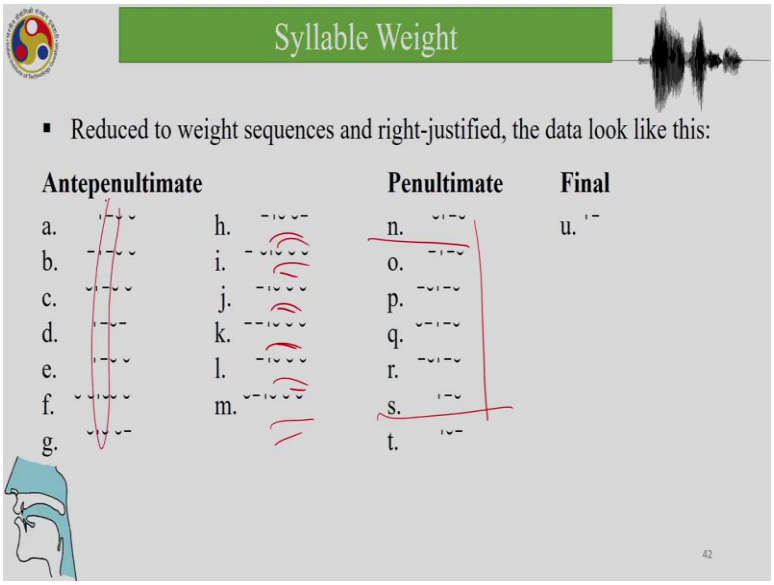

So, after having looked at classical Arabic stress, we have to go back to the penult. So, if the penult is light, then the antipenult gets stressed as an example, a to m. If the penult is heavy, there are only two syllables and n to s. So n to s, the penult is heavy there are only two syllables and if the antipenult gets stressed as in then the antipenult gets stress as an examples a to m.

So, in all these cases, not the penult, it is the antipenult which gets the stress. The penult is light. So, if the penult is heavy, there are only two syllables then the penult get stress. And if the penult is heavy, the penult gets stress, like the antepenult gets the stress. And monosyllables like u, the final syllable is stressed.

And to write the rules we start with the longest expansion, classical Arabic stress. Longest expansion is that the syllable stress will get stress in the position if the antepenult, that the antepenult gets stress as in the examples we saw if the penult is light, the antepenult gets stressed as in the examples a to m.

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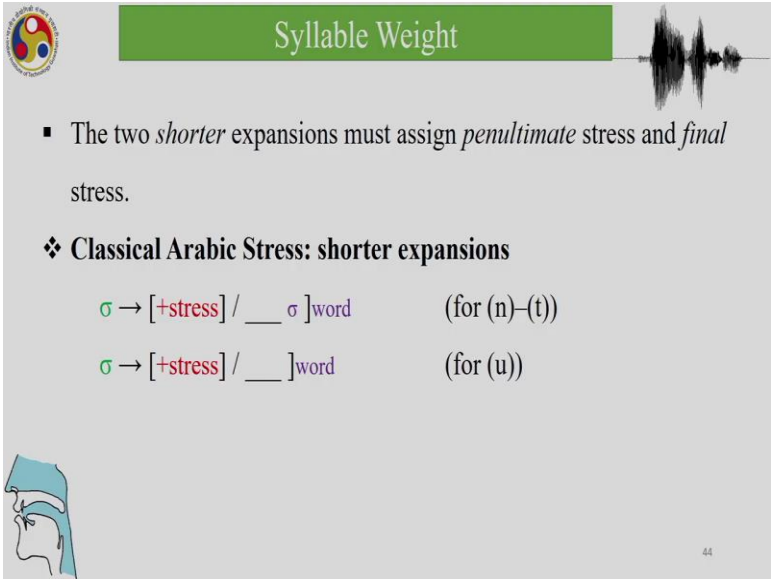

And if the penult is heavy, the shorter expansion, it must assign an ultimate stress and final stress. So, classical Arabic stress, shorter expansions, if the penult is heavy then it gets the stress.

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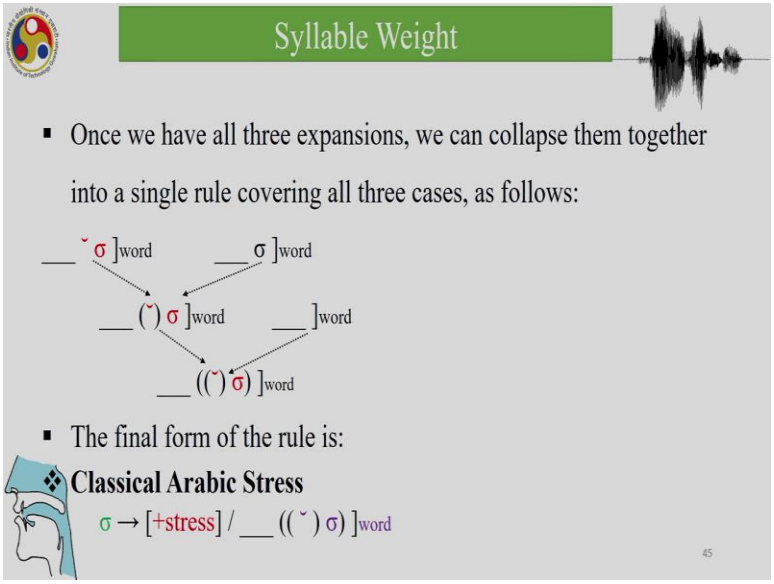

So, once we have all three expansions, we can collapse them together into a single rule covering all cases as follows. So, if the penult is light, then the antepenult gets stress, and the penult is heavy in the penult is stress.

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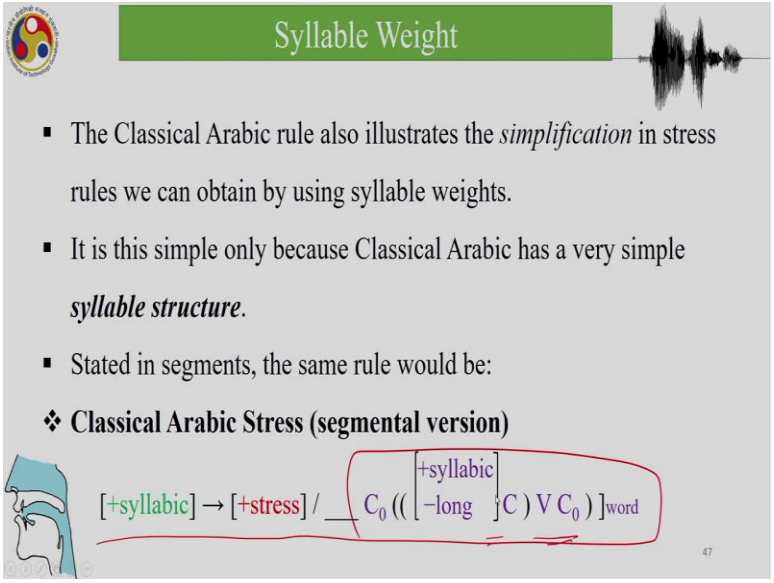

And the final form of all these properties can be looked at again. So, this is the original rule that we had seen initially. So, plus syllabic goes to plus stress. If it is plus syllabic and minus long and then if it is a penultimate position or antepenultimate position, if it is not long or if it does not have weight then it will not get stress, but if it is heavy, it will get stressed. So that was how we started talking about Arabic stress with all these examples as you can also see here.

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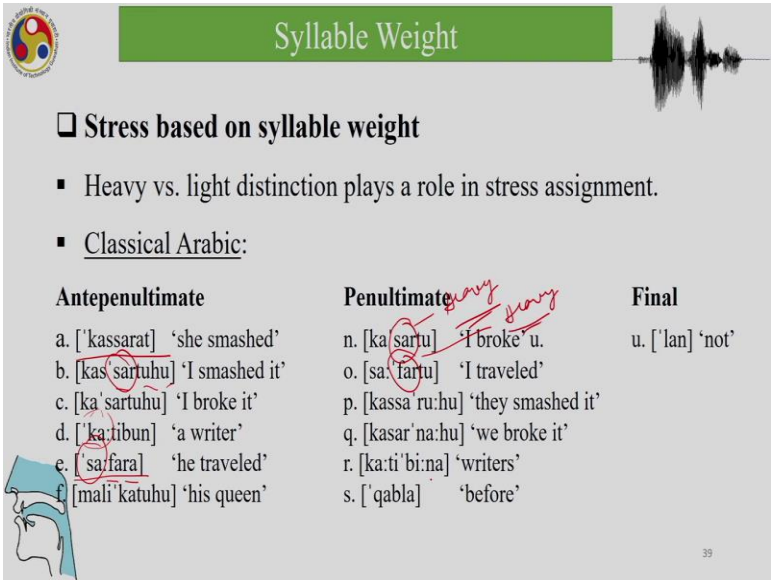

So, that is the Persian example and so these are the classical Arabic examples, we wanted to look at the examples again before we again look at the rule. So, we have this one with a stress on the

initial syllable and then we have this one, we have a final antepenult and antepenultimate. So, we have antepenult in kas sartuhu and then again in kas sartuhu. And we have stress here again in antepenult in ka tibun and we have we have stress in antepenult here.

So, whenever we have stress in antepenult in an example like this, then we see the light syllables there. And also, whenever we have a heavy, as in kas sartuhu, we can see the heavy syllable here. So, these are the examples which we need to see and these are the rules that are being tried to be expressed as one rule.

So sa fartu and kas sarthu are the cases where you see that the penultimate gets a stress because of being heavy.

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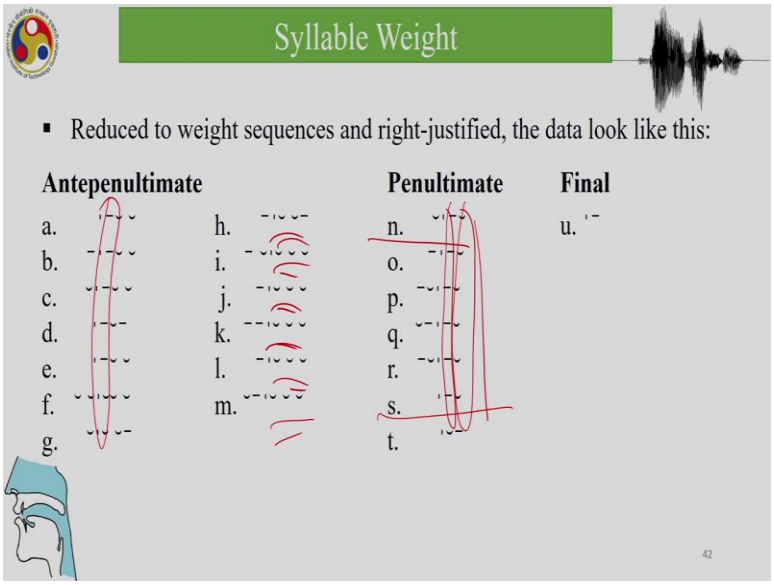

So again, coming back to our notations where we have the macron and breve showing that in the penultimate position in all these cases the macron gets the stress because the penult gets a stress because the final syllable is light.

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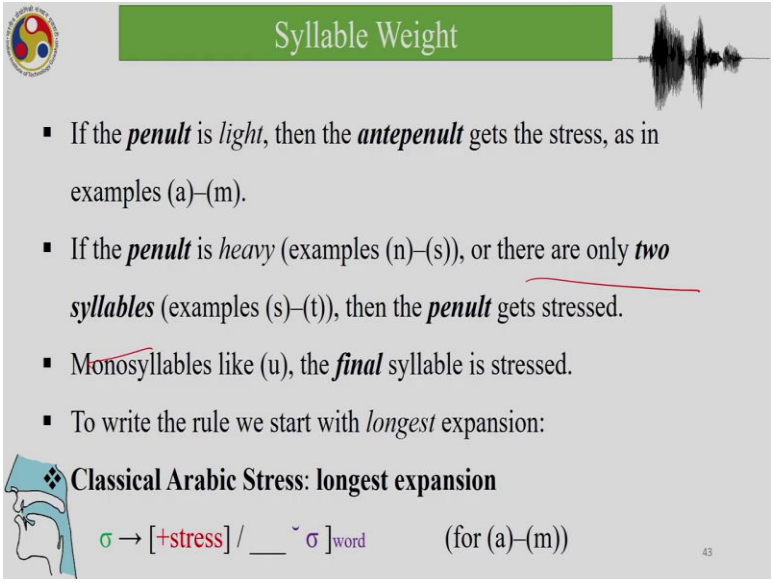

So, the penult is light, the antepenult gets the stress. And if the penult is heavy there are only two syllables, then the penult gets the stress and monosyllables like u, the final syllable is stressed.

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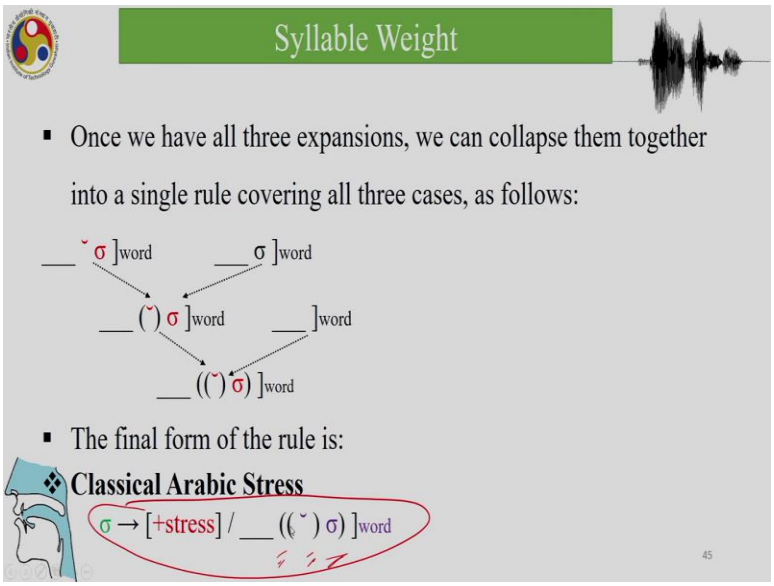

And these three rules of stressing the antepenult, penult and final is expressed in one form, in the final form and like this, which means that a syllable gets stressed in classical Arabic, if it is final then the final monosyllables like u then it is final syllable, then it gets the stress as in here. And the penult gets the stress if it is heavy and then the antepenult gets the stress if the penult is light. So, all these three rules are being expressed here.

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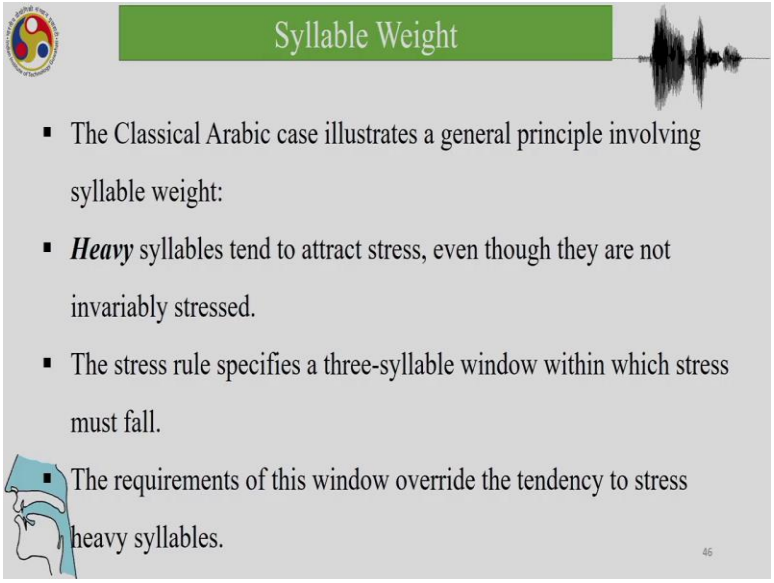

So, classical Arabic case illustrates a general principle involving syllables weight. Heavy syllables tend to attract stress even though they are not invariably stressed. And the stress rule specifies a three syllable window within which stress must fall, the requirements of this window to override the tendency to stress heavy syllables. And the classical Arabic rule also illustrates the simplification in stress we can obtain by using syllable weights.

So, whenever we talk about a syllable weight, stress always comes into the picture, because of the way the stress is stressed, if there is weight then there are stress rules, which lead to our consideration of that syllable as having weight.

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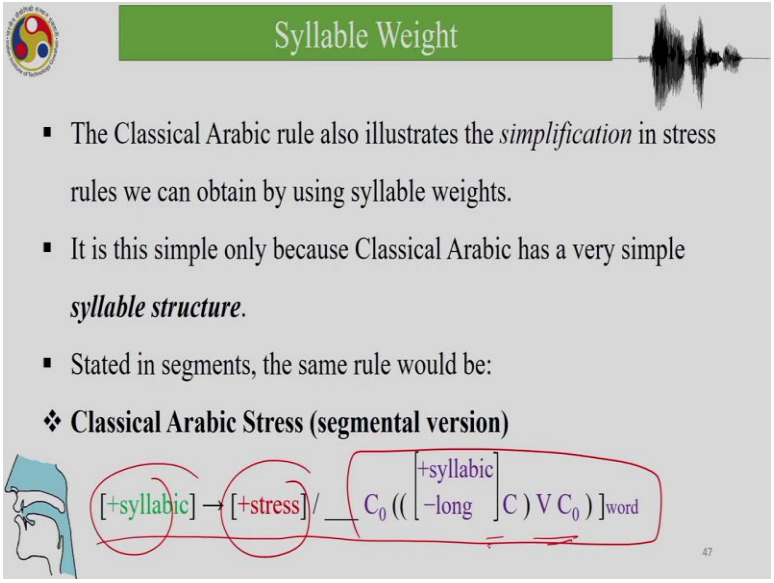

So, it is this simple only because classical Arabic has a very simple syllable structure. Stated in segments, the rule would be like this. So this is the bigger longer version of the rule, plus syllabic becomes plus stress, if it is the final syllable, if it is the only syllable in the word then that one or it is the penult. If it is heavy or it could be the antepenult, if the penult is light.

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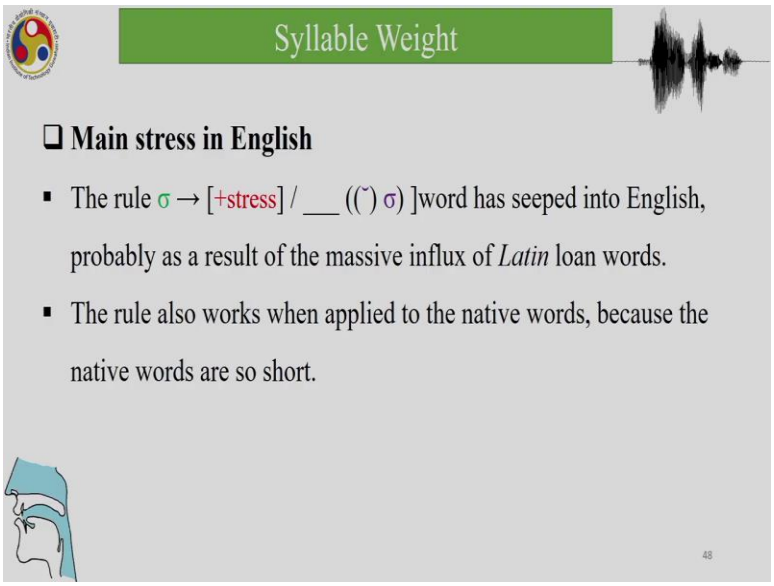

So, the rule where the syllable gets stressed, the syllable goes to plus stress, if in these three within these three bracketed positions, the word has seeped into English as well. So, probably as

a result of massive influx of loan words from Latin. The rule also works when applied to the native words because the native words are so short.

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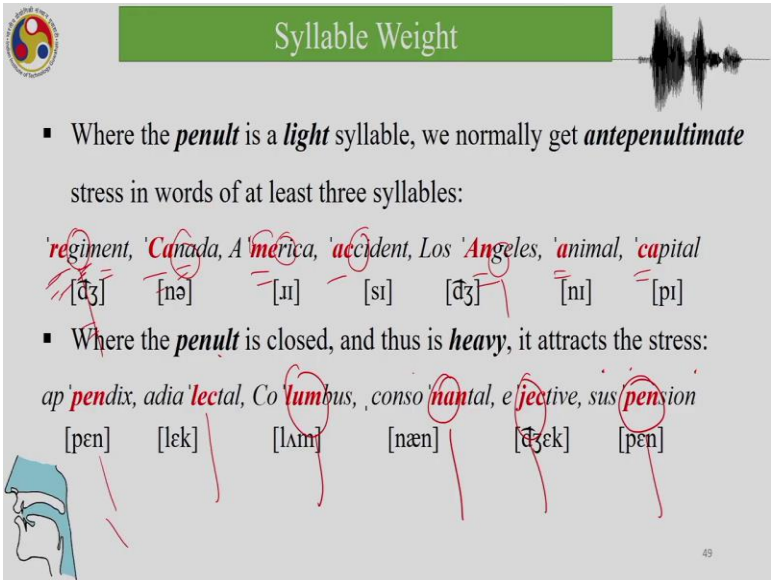

Where the penult is a light syllable we normally get antepenultimate stress in words of at least three syllables. So, this is English and you can see that in English in this word it is regiment or Canada or America or accident or Los Angeles or animal or capital. So, where the penult is light, which is the penult, this is the penult here. So, this is the final, this is the penult, this is the antepenult. If the penult is light, if this is light then the antepenult gets a stress.

So, similarly in all these cases where the penult is light then here again penult is light. Then the preceding one, preceding syllable which is marked in red bear the stress. So, again, this is light and again this is light. So, p is light, ni is light, gi is light, c is light, ir is light, na light, and ja is light.

So, the light syllables as we know are the CV syllables. And whenever there is a light penult then the antepenult gets the stress and inwards of at least three syllables. Where the penalty is closed is heavy, so where the penult is closed. Let us look at the penult close examples, then it attracts stress.

So, as you can recall, this is pretty much like classical Arabic. So, as in suspension or adjective or consonantal, and Columbus and dialectal and appendix, which I am, of course, exaggerating the stressed syllable. So, appendix or dialectal or Columbus or consonant or adjective or

suspension. So similar to Arabic then, if the penult is heavy it attracts stress, if the penult is light the antepenult gets stress.

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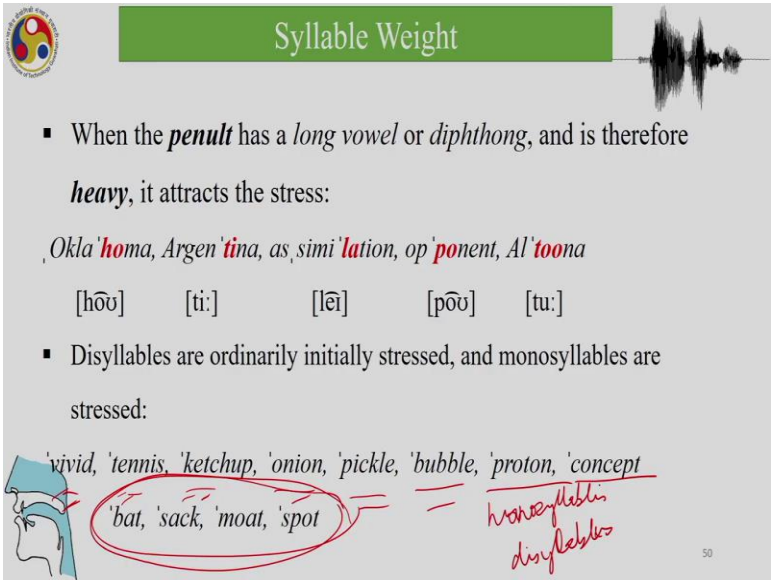

When the penult is the long vowel or diphthong and is therefore heavy it attracts the stress. So we have Oklahoma and Argentina and simulation and opponent and Altoona. And disyllables are ordinarily initially and monosyllables are also stressed. So, we have a vivid and tennis and ketchup and onion and pickle and bubble and proton, concept. And of course, these are monosyllables such as bat, sack, moat, spot. So, they are all stressed.

And now we have come to the end of our discussion on syllable weight and we have seen how English sort of is similar to classical Arabic. If it is monosyllables, then the only vowel will get the stress. We are talking about content words not function words, function words will still not have stress because it will need another content word to lean on, if you remember from the initial part of this lecture. And then disyllables are ordinarily initially stressed and monosyllables also stressed.

So, both monosyllables and disyllables you can just assume, but there are other stress rules in English, these are the most common ones. Generally, if this a disyllable, it is always the first syllable, it is like concept or proton or bubble or pickle or onions or ketchup or tennis or vivid.

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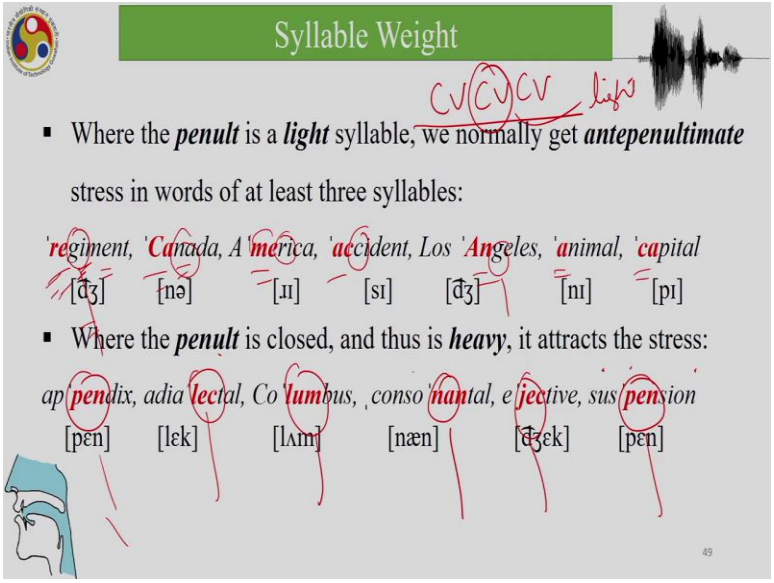

When we have three syllables then we have a bit more of a complexity. What is the complexity? If the penalty is a light syllable we get antepenultimate stress in words of at least three syllables so three syllables. If we have CVCVCV in English, just like classical Arabic we have a bit more of a complexity. If the penult is a light syllable, this one if it is light, the one which is next to the final syllable, if it is light, then the antepenult will get the stress in words. So, at least three syllables or also four syllables. So, we have capital and animal and Los Angeles and accident and America and Canada and regiment.

And again when by the penult is closed and does is heavy, it attracts the stress. And these are all your examples like suspension and ejective and consonantal and Columbus and dialectal and appendix. So, these are your stress rules in English that if there are two syllables, if it is disyllabic word the initial always stress. The complexities emerge when they are longer syllables, if the penult is light syllable then, the stress is on the antepenult. If the penult is heavy as in these examples, they always stress. And we saw this was similar to classical Arabic where also if the penult is light syllable the antepenult gets the stress, if the penult is closed and heavy it attracts the stress.

So, now we come to the end of this lecture on stress where we showed that stress rules of phonological rules and in English, and when an underlying form comes to the derivation it comes without the stress or stress rules are applied as a result of the application of phonological rules.

Thank you for your attention. We will look at more aspects of suprasegmental phonology in the next few classes and before we wrap up this course. Thank you for your attention again.