Phonetics and Phonology: A Broad Overview
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Lecture 27
Focus, Givenness

Welcome to this course on phonetics and phonology, a broad overview NPTEL MOOC course. And we are in the last unit of this course and we have been discussing tone and intonation in this unit of this course. So, let us continue with our discussion of intonation. In the last lecture, we talked about acoustic properties of intonation, how the F0 parameters, how they are manipulated in intonation and how we use the various aspects of phonetics are seen in intonation. So, in this lecture, I will concentrate more on the phonology of intonation and also talk a bit about tone.

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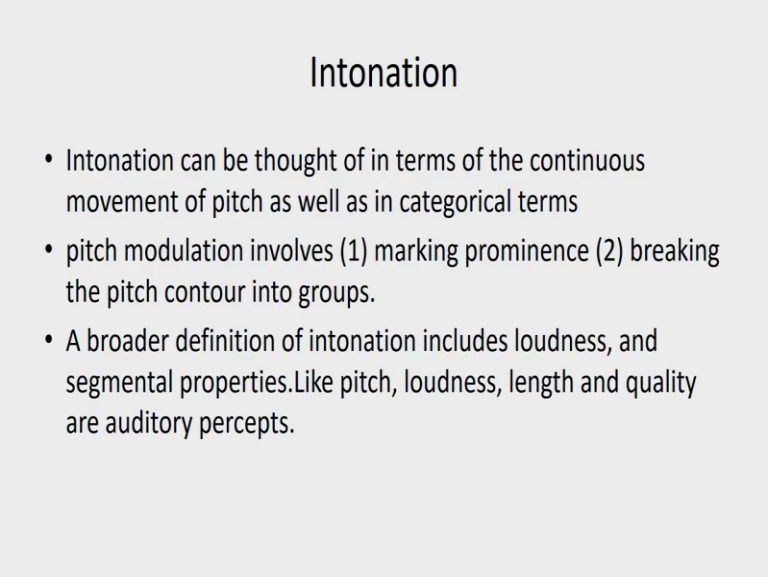

So, intonation can be thought of in terms of the continuous movement of pitch as well as in categorical terms and pitch modulation involves marking of prominence, that is parts which are more important which we had already seen in the last lecture and breaking the pitch contour into groups, which is also phrasing and we will see that shortly. A broader definition of intonation includes loudness and segmental properties like pitch and length, quality and all the other auditory precepts.

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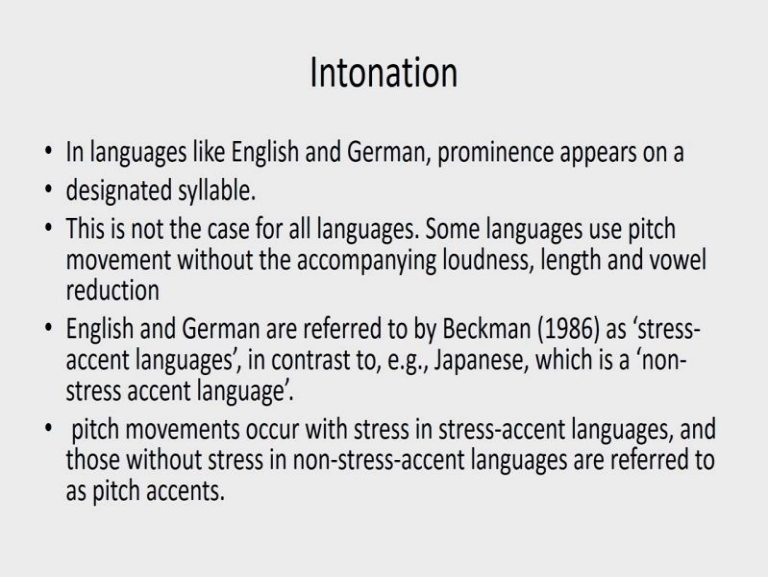

So, an intonation in languages like English and German, prominence appears on a designated syllable. So, these are languages with phonemic stress and this is not the case for all languages some languages its use pitch movement without the accompanying loudness, length and vowel reduction. And English in German are referred to by Beckman 1986 as stress accent languages in contrast to Japanese which is non-stress accent language. It is a pitch accent language.

Where pitch movements occur with stress and whereas also pitch movements occur in stress accent languages also, but it is not on a designated syllable, but in language with pitch accent pitch accent languages, we have pitch on the designated syllable and that is the difference between stress, accent, and non-stress stress accent languages.

So, this is a distinction that is commonly used to discuss how language proper stress like English in German over different from languages like Japanese, but then there are also languages like unlike English, German or even Japanese, languages which do not have stress in such a way that you had to test that the significant vowel reduction or their length sessions et cetera.

And in those languages stress is there, but it is not used in a way such that different words vary where the stress occurs. So, in those languages there is a difference in the rhythm of those languages and rhythm of English and we will not go into all those details, but it is good to keep in mind that English and German may not be typical of stress accent languages.

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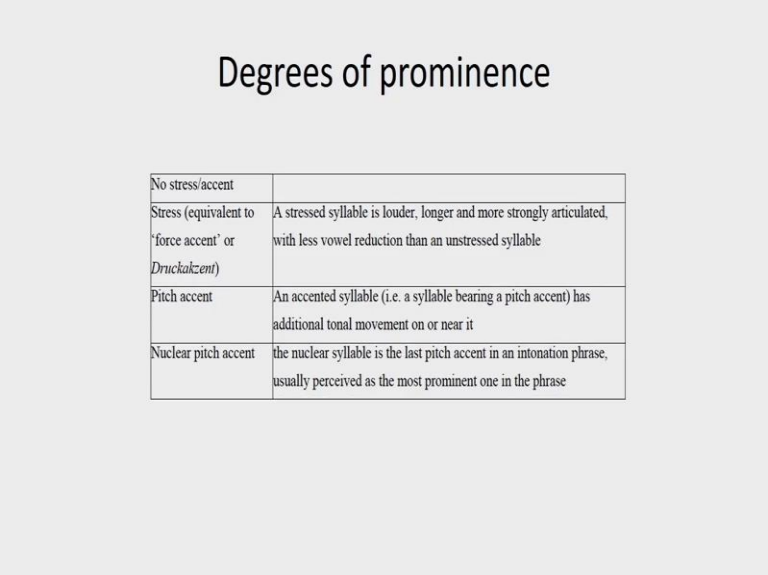

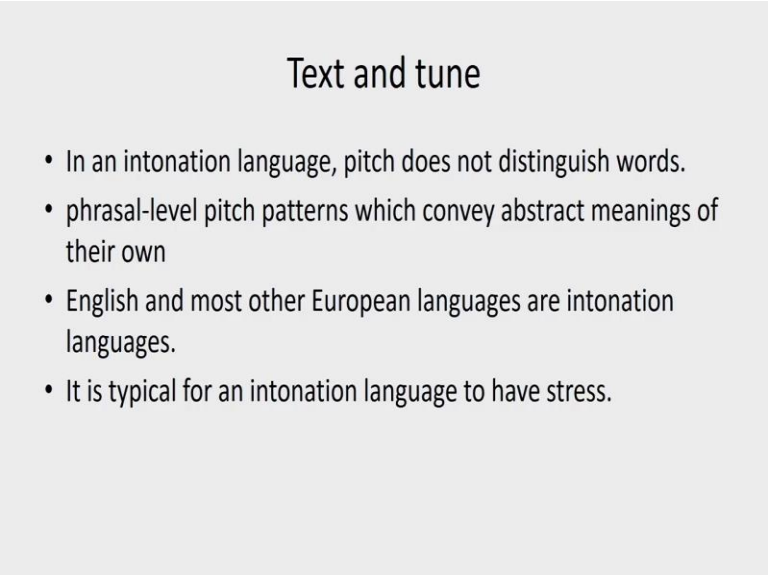

So, and then degrees of prominence even in language like English, we have stress accent in some words and in some more prominence and in some words secondary prominence. In an intonation language pitch does not distinguish words, phrase level pitch patterns, which convey abstract meanings of their own and an English in most other European languages are intonation languages, it is typical for intonation language to have stress.

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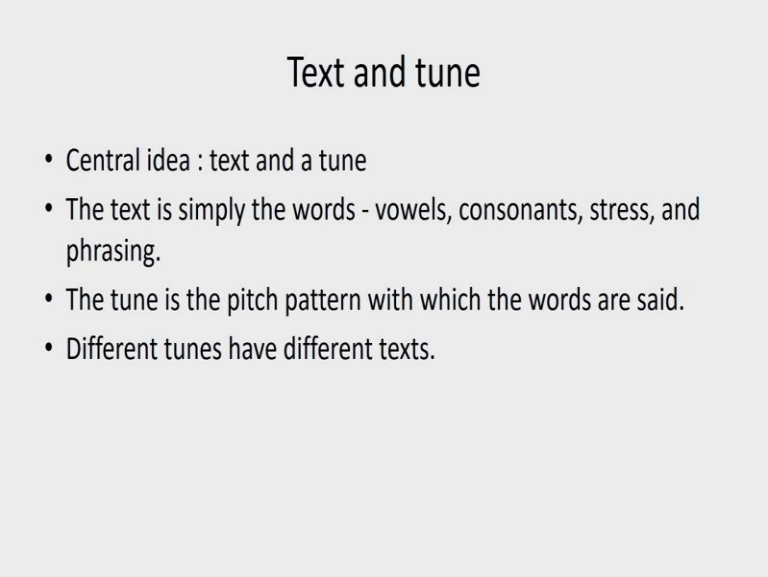

The central idea here is that there is a text and a tune. The text is simply the words the vowels consonants all the properties associated with segments and then there is a tune. So, the tune is a pitch pattern with which the words are said. So, different tunes have different text and so vice versa. So, text can also have the same text can also have different tunes.

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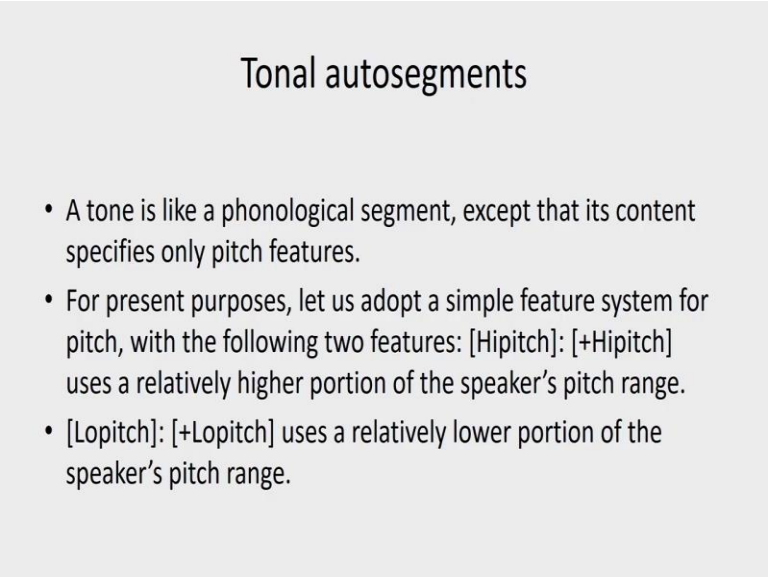

And central to the idea of intonational phonology is also the idea that the tonal or two segments tone is like if phonological segment except that is content specifies only pitch features. For present purposes, let us adopt a simple feature system for pitch and then we can do have two

features say plus high pitch or low plus high pitch or minus high pitch or plus low pitch or minus low pitch.

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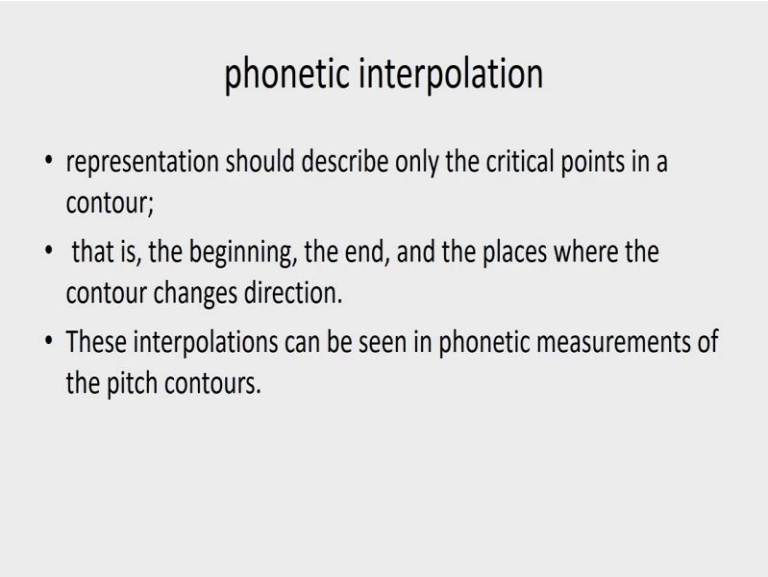

And then this is the kind of representation that is used in phonology to understand pitch in terms of binary features like high and low. So, what will show here is the idea of phonetic interpolation that is the pitch movements the most significant pitch movements are the ones which are the most important parts of an utterance and all the other parts are a part of phonetic interpolation.

So, we had seen in our last lecture that how we have what we call as micro-prosody, consonantal perturbations. And here, you see that as a result of phonetic interpolation, all those parts, where you do not have any significant pitch movements, those are linked from the one part and other parts, so that they are not considered for the understanding of the tune of the text.

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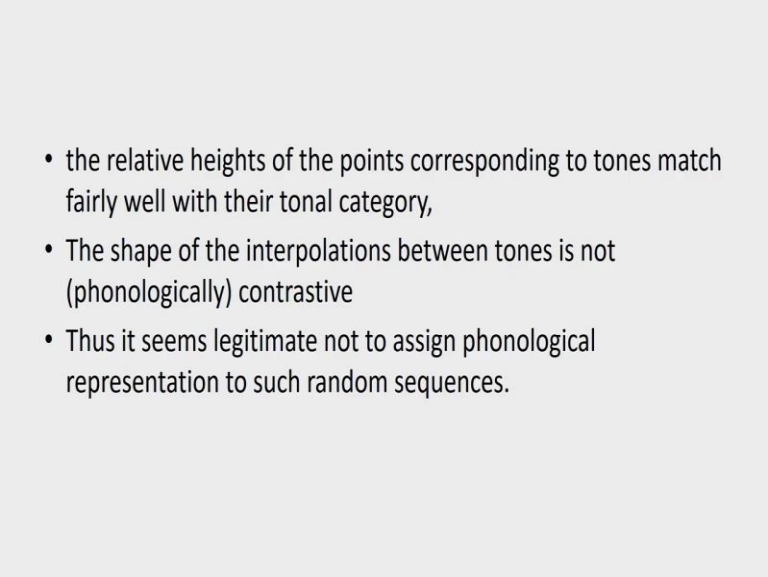

So, the relative heights of the points corresponding to tones match fairly well with tonal category. And the shape of interpolations between tones is not phonologically contrastive. So, the shape is not contrastive, neither is the difference in small heights. So, those are also not contrastive. It is just significant changes, so high and low, which are considered for an understanding of intonation. So, it seems legitimate not to assign phonology representation to random sequences.

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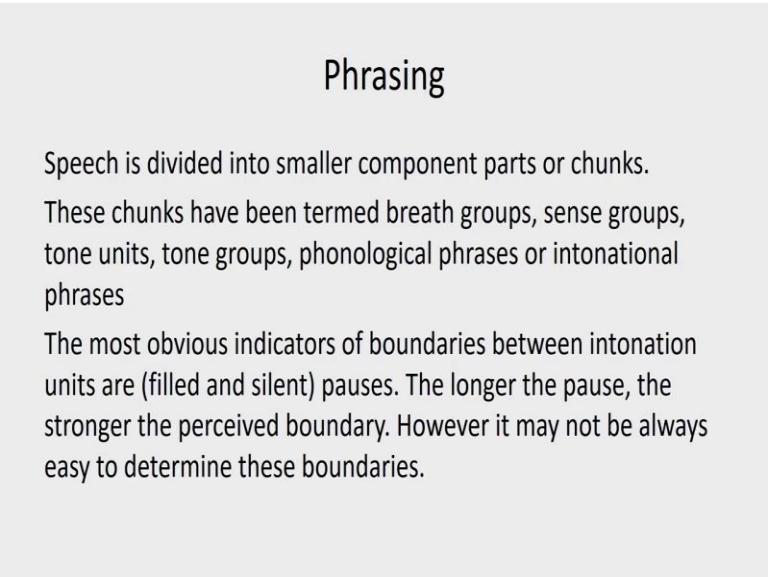

So, phrasing we had talked about how we have how speech is divided into parts and those smaller components they can also be called chunks. These chunks have been termed breath groups, sense groups, tone units, tone groups, phonological phrases or intonational phrases. And the most obvious indicators of boundaries between intonation units are pauses. So, how do we know that there are chunks that are groups because we know that because we know that there are pauses and the longer the pause the stronger the perceived boundary. However, it may always or not always be easy to determine these boundaries.

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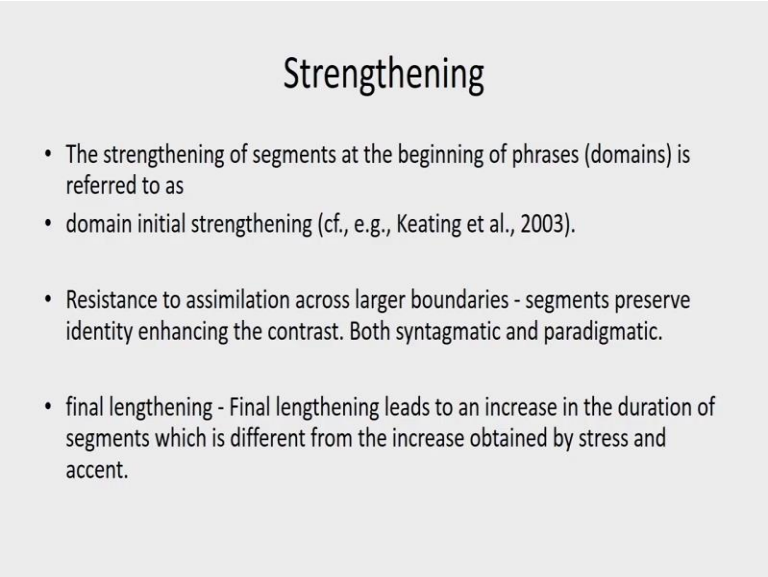

Some other aspects of prosody of this of intonation is that the strengthening of segments at the beginning of phrases it is called domain initial strengthening and it can be seen in various languages that the initial segments are always emphasised that they pronounce properly called domain initial, the strengthening or they could be lengthening et cetera.

And then, on the other hand, a resistance to assimilation across large boundaries. So, in larger boundaries, they as phonological assimilation processes may be prevented. So, segments preserve identity enhancing the contrast. So, and this happens both at a syntagmatic level and a paradigmatic level.

So, in a sentence or in domains across sentences this can happen. And then there is final lengthening, final lengthening is also a feature of intonation across languages. Final lengthening

leads to an increase in the duration of segments which is different from the increase obtained by stress and accent.

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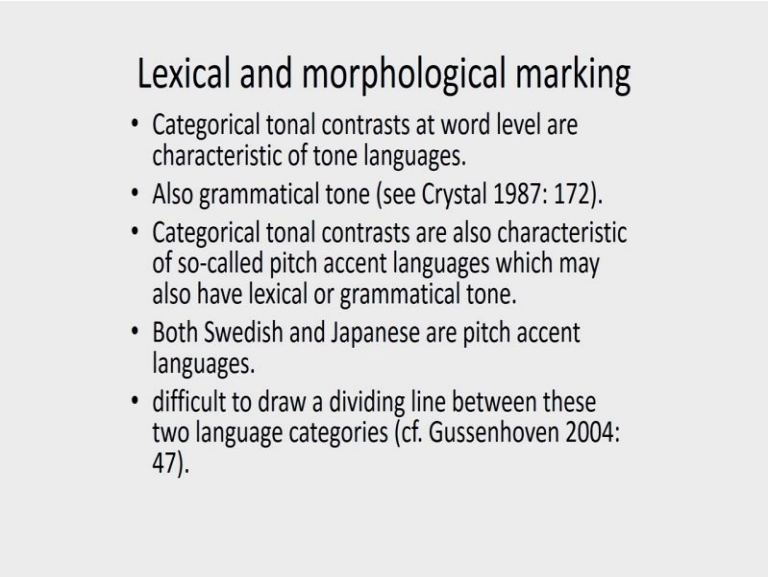

And then, there is the other property, the property of tone that we have not talked about so much. Categorical tonal contrasts at word level, a characteristic of tone languages and also there is a feature of grammatical tone, which you do not see in languages like Mandarin Chinese. So, grammatical tone refers to tones which indicate some grammatical property like tense or aspect et cetera.

And also categorical tonal contrast, also characteristic of so called pitch accent languages, which we have already talked about and which may also have lexical or grammatical tone, both Swedish and Japanese are pitch accent languages, but it is difficult to draw dividing line between these two categories.

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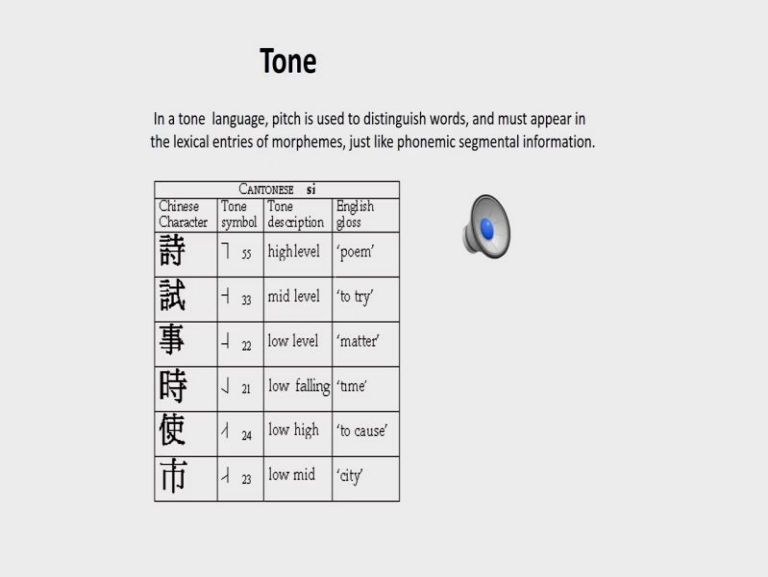

So, let us play tone from Cantonese, we can see that here the example given, we are 6 levels and we will play the different tones of all the segmental combination mark and then we will see, we will hear that one is high level one is mid level, one is low level one is low falling, low high or low mid.

So, and then, what is tone again? In a tone language, pitch is used in such a way that lexical entries of morphemes bear tone and they indicate different meanings and could be just like segmental information. So, here we play Cantonese tone (pronouncing Cantonese). So, that was a Cantonese tone and for (pronouncing Cantonese) sorry, it is on (pronouncing Cantonese).

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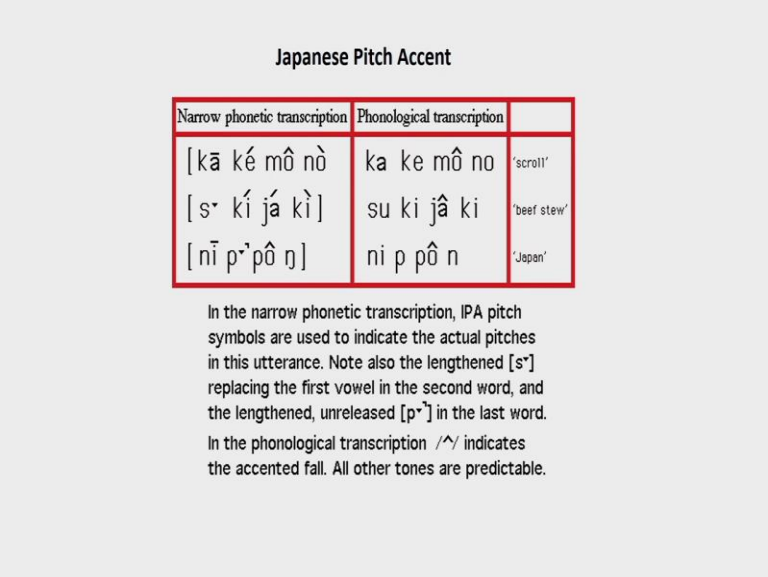

And now talking about Japanese pitch accent again. So, we see three Japanese words here meaning three different things scroll, beef, stew and Japan. And then we can see that in the third Mora we have pitch accent.

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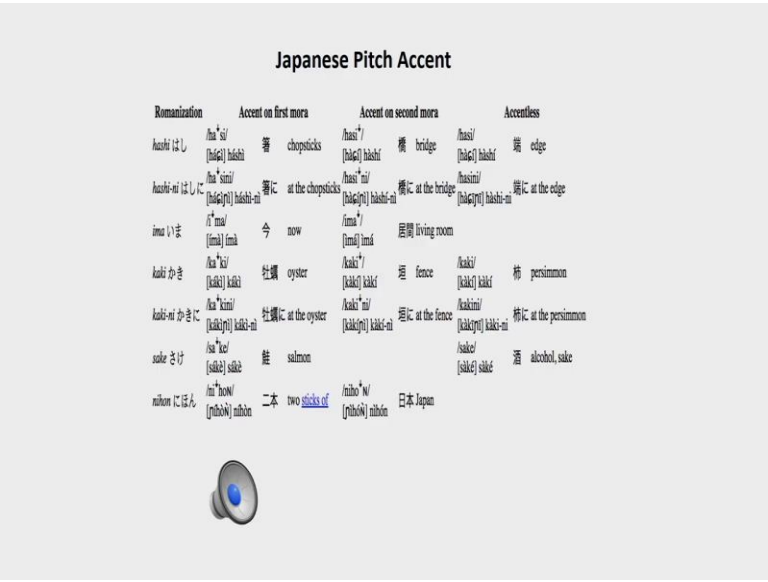

So, we play actually, this is from Wikipedia, we have two nice examples of (pronouncing Japanese) and where in one we have accent in the first mora and the second, we accent the second mora, I will just play this clip from Wikipedia.

These examples are meant to demonstrate Japanese pitch accent. Example one (pronouncing Japanese) meaning chopsticks with an accent on the first mora, (pronouncing Japanese) meaning bridge with an accent on the second mora, (pronouncing Japanese) meaning the edge was no pitch accent compare (pronouncing Japanese).

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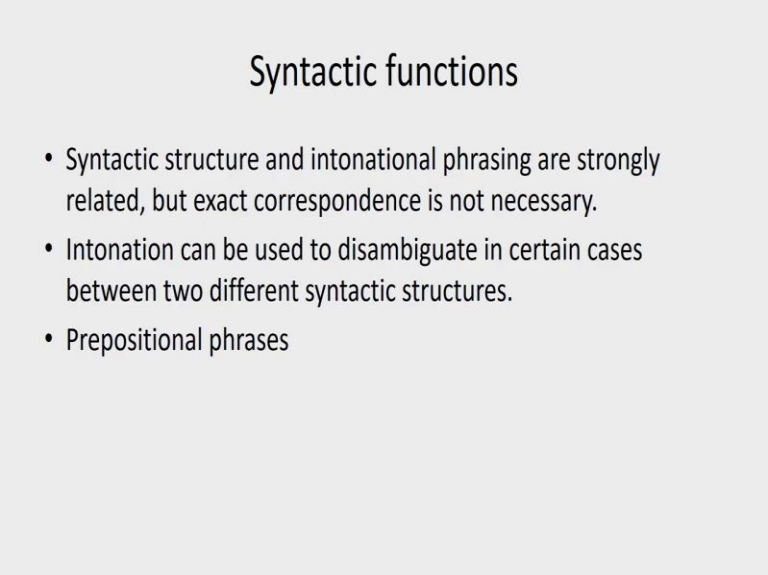

And syntactic functions. So, syntactic structure and intonational phrasing are strongly related. But exact correspondence is not considered necessary, and intonation can be used to disambiguate in certain cases between two different syntactic structures. And also in prepositional phrases, it is used for disambiguation.

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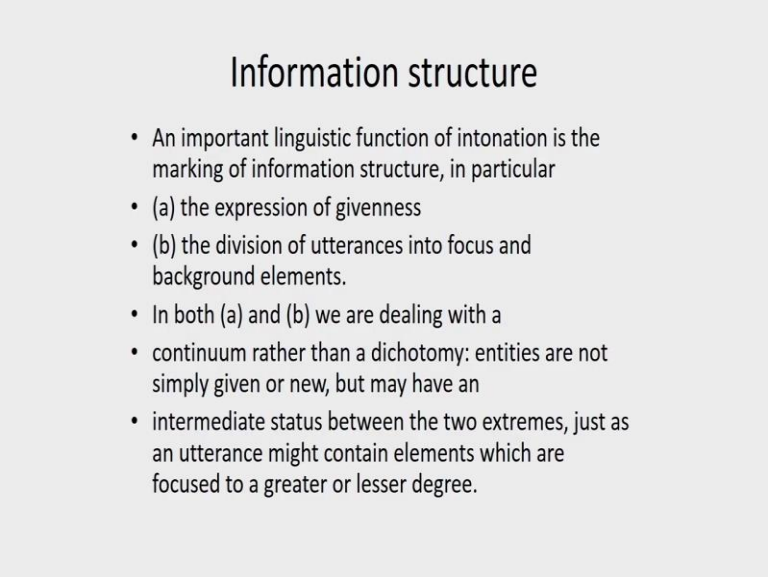

And another important part when he talks about syntactic structure and intonation is information structure. And an important linguistic function of intonation is the marking of information structure in particular and to want to express givenness, second to show division of utterances into focus and background elements and it is also sort of a continuum rather than a dichotomy. Because as entities are simply not given or new and so to say the something is given or something is new and also they may be intermediate levels between the two extremes.

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So, here is an example of givenness and suppose, just to give you an example of give ness. What did John drink? John drank coffee. So, in information structure, this would be your new information, which will give you a focus and then this is given all information and background this presupposition as it is called in information structure and may not be, so what we mean to say is that these parts the other given all background presupposition et cetera could also be focused and not just new information which is focus. But it is generally assumed that the one which is the new information carries the focus.

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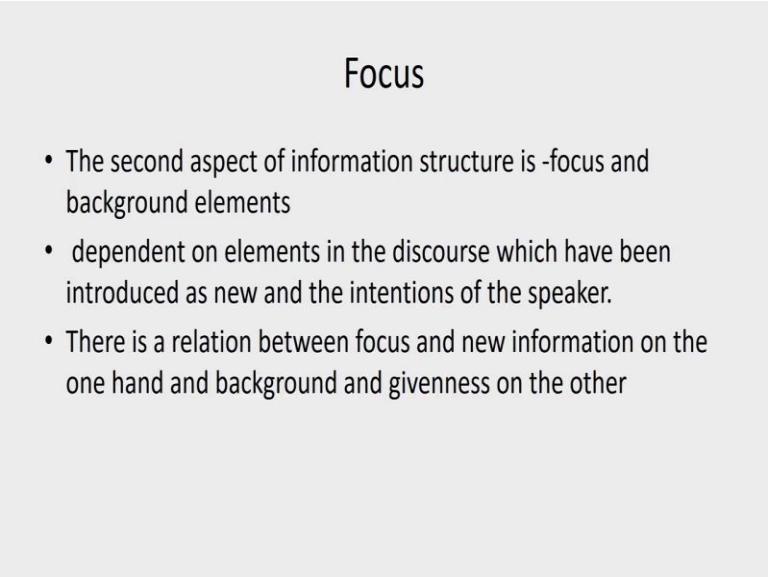

And then the second aspect of information structure is, as we said, focus and background elements, dependent on elements in a discourse, which have been introduced as new and intentions of the speaker. And there is a relation between focus and new information on one hand and background and givenness and on the other. But they are not always exclusive, mutually exclusive.

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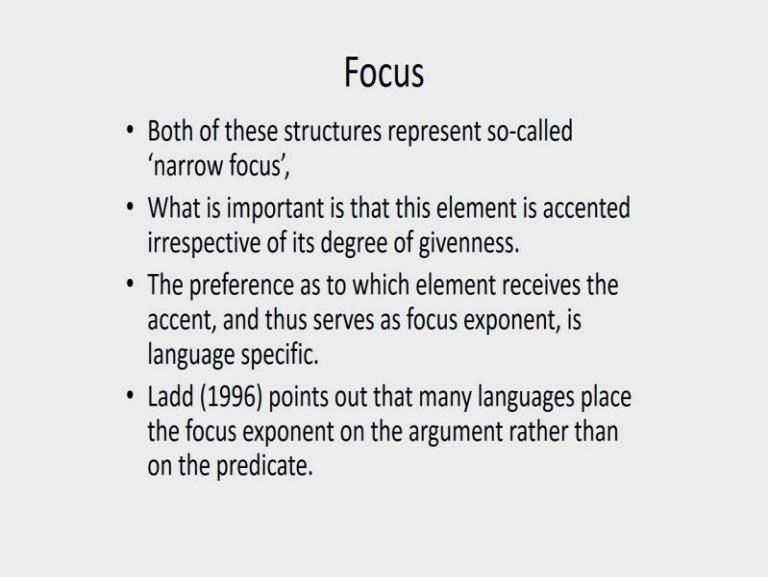

And both of these structure represents so called narrow focus, what is important is that this element is accented irrespective of its degree of givenness. So, as we said before irrespective of givenness it either John or drank or coffee could be focused. And the preference to which element receives the accent that serves as focus and that could also be language specific. And then Ladd 1996 points out many languages that place the focus exponent on the argument rather than on the predicate.

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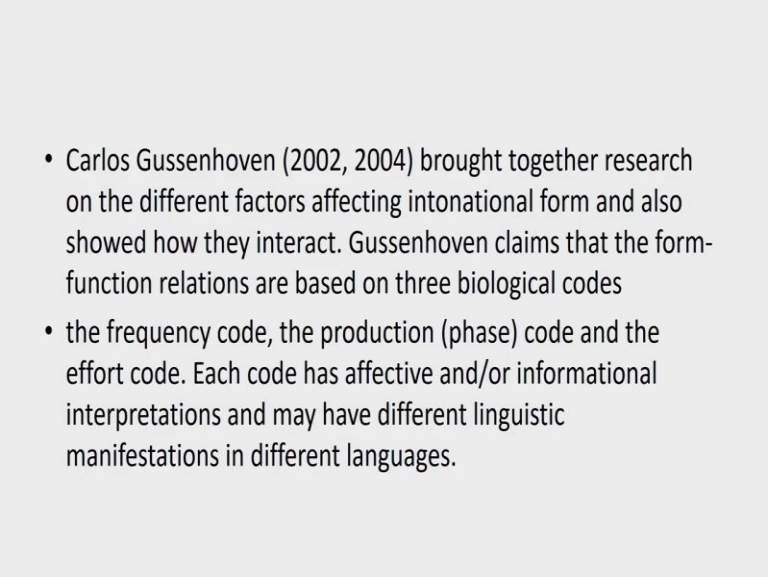

Another important thing when we talk about intonation is biological factors. So, Carlos Gusssenhoven has shown how research on the different factors affecting international form and also how they interact. Gusssenhoven claims that the form function relations are based on biological codes which are grammaticalize and these are the frequency codes the production code and the effort code and each code has affective or informational interpretations and have linguistic manifestations in other languages.

So, what are the frequency code and production code and the effort code? So, the frequency code is when we have the secondary use of the frequency code, that is, what the frequency code would say that in languages, we have depending on whether you are asking a question or a statement et cetera.

And so, these are so, as we saw when we are asking a question the pitch rises and when it is a statement, it is a falling intonation. So, we often find the grammaticalization of the frequency code and then however, there are also different ways of interpreting the frequency code because there are languages which do not use the rising tone sometimes.

And then we have the effort code, effort code would say that more effort is put in when you have to emphasize something and then suppose would you like still more coffee. So, would you like still more, would you like some more tea. So, we are so, when we are expressing something like that, we are emphasising on more to say to focus there.

So, and we are giving we are putting in a lot of effort to say that and that would be other grammaticalization of the effort code. So, and then there are examples that we have where in a tone languages high tones are lowered, and low tones are raised in negative sentences from the onwards and these could be some it could be interpreted as some way of expressing the effort code.

And then we have the production code. So, the that as shown by Gusssenhoven that the production code says that to produce, to say, to express something which is small and not threatening, et cetera. We use a high pitch but to show that something is for instance large creatures or that you are authoritative you use sort of a lower pitch and that code could also be grammaticalized and so, that is the research which shows that the different factors affecting intonational form and it can also and they can also interact in the grammar.

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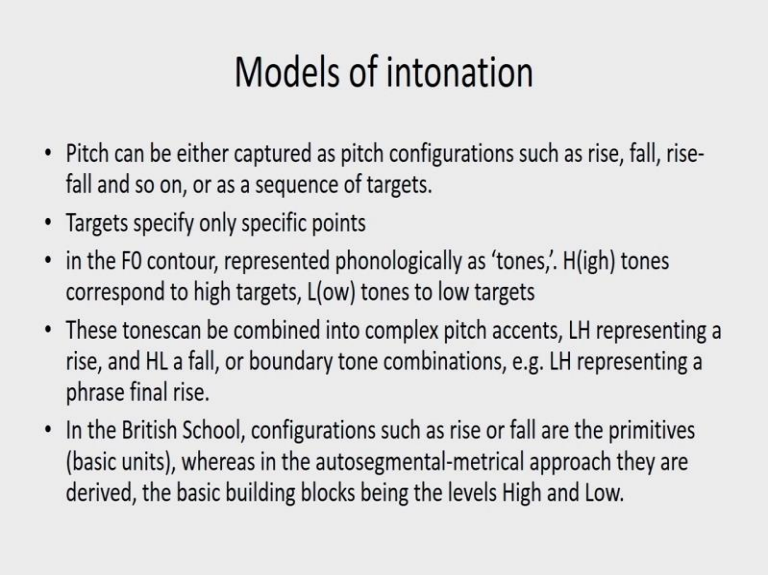

Now, we come to models of intonation and pitch can be either captured as pitch configurations such as rise, fall, rise, fall and so on or as a sequence of targets and targets specify only specific points. In the fundamental frequency contour represented phonologically as tones and high tones correspond to high targets low tones to low targets.

And these tones can be combined to complex pitch accents like LH representing a rise and HL a fall or boundary tone combinations LH et cetera. So, what are the models of intonation, we have

the British School, which uses rise and falls as primitives and then we also have the auto segmental, which uses high and low.

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So, the British school shows that the most important contour is the nuclear tone and it starts as the nucleus or nucleus syllable and the utterance as most prominent syllable continues to the end of the phrase and the nucleus represents only the obligatory part of the tone group. And then, a tone group consists of a pre-head and a head and a nucleus. So, the pre-head is unaccented syllables before the first pitch accent and the head is of course the first pitch accented syllable two including the nucleus syllable, and a nucleus, last pitch accented syllable within a tone group tail and the tail post unaccented post nuclear syllables.

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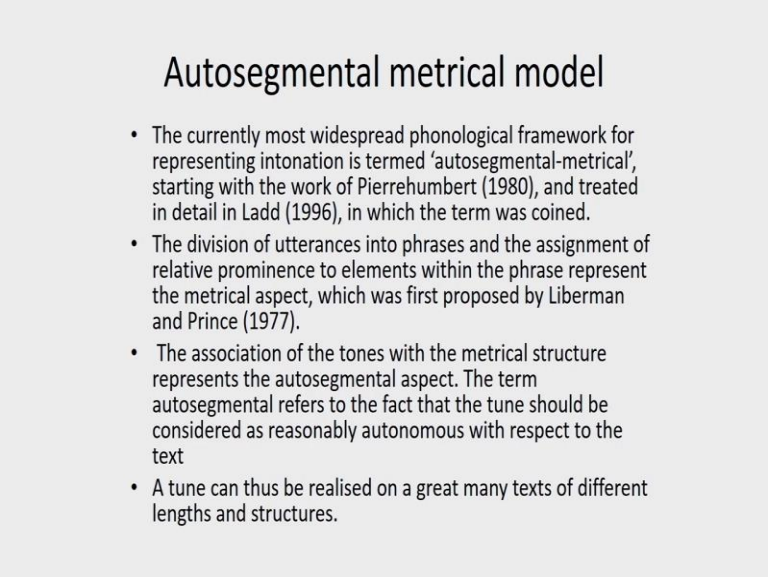

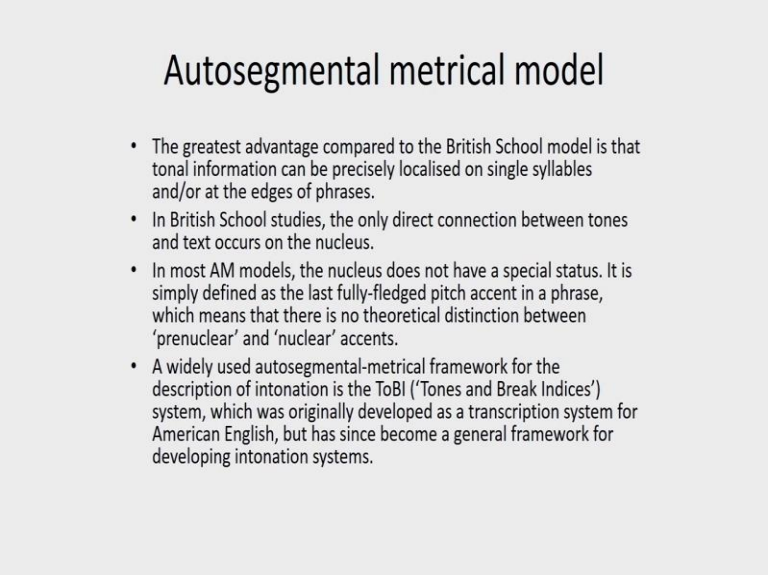

Now, unlike the British school if the tone head, pre-head and nucleus and a tail we have auto segmental metrical model, which is currently the most widespread phonological framework for representing intonation in terms of auto-segmental metrical starting with the work of Pierrehumbert and then in Ladd.

And the division of utterances into phrases in this assignment of relative prominence to elements within the phrase represent the metrical aspect, which is first proposed by Lieberman and Prince. And the associational tone with the metrical structure is the auto-segmental aspect of this model. And a term when we say auto-segment, what does it mean, it refers to the fact that tone should be

considered autonomous with respect to the text and we saw that when we looked at he forgot the raises and that we can ask is that a question or as a surprise or as a declarative sentence and then we can see that the tune is autonomous of the text and the tune can be realised on a great many texts of different lengths and structures.

And the greatest advantage compared to the British school model is that total information can be precisely located on single syllables and at the edge of phrases and in do not need entire tone groups or it is not explained over a whole group of syllables. And in the British school only direct connection when tones and text occurs on the nucleus, but here if the connection is quite direct.

In most auto-segmental metrical models to nucleus does not have a special status, it is simply defined as the last fully fledged pitch accent in a phrase. So, that is and it is does not have the status that is has in the British school and widely used auto-segmental metrical framework for the description intonation is ToBI or Tone and Break Indices system which is originally developed as a transcription system for American English, but has since become a general framework for developing intonation systems.

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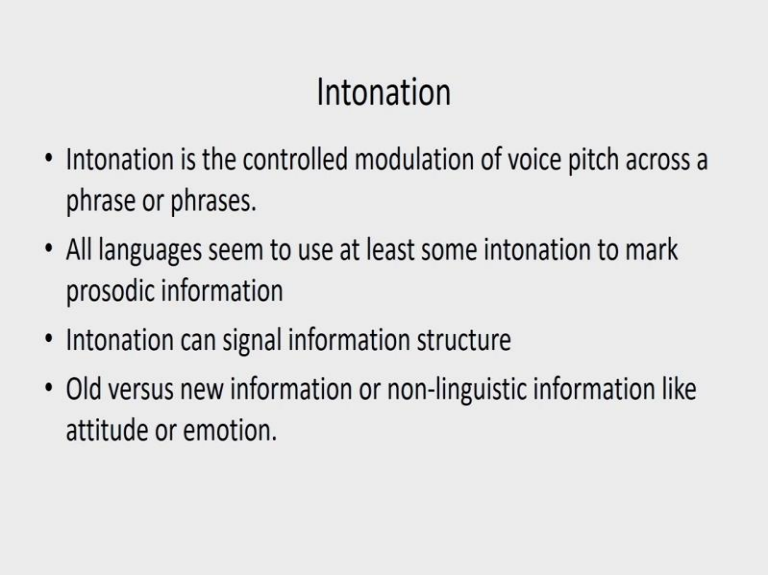

And again to repeat what we have said initially intonation can be considered as control modulation of voice pitch and as we initially said that you can express this as a continuation or

you can express categorically, you can say that high and low tones or you can say pitch variations.

So, all languages seem to use at least some intonation to mark prosodic information, intonation can signal information structure which we saw as focus and givenness et cetera. And old versus new information or non-linguistic information like attitude or emotion. So, this much we have studied so far.

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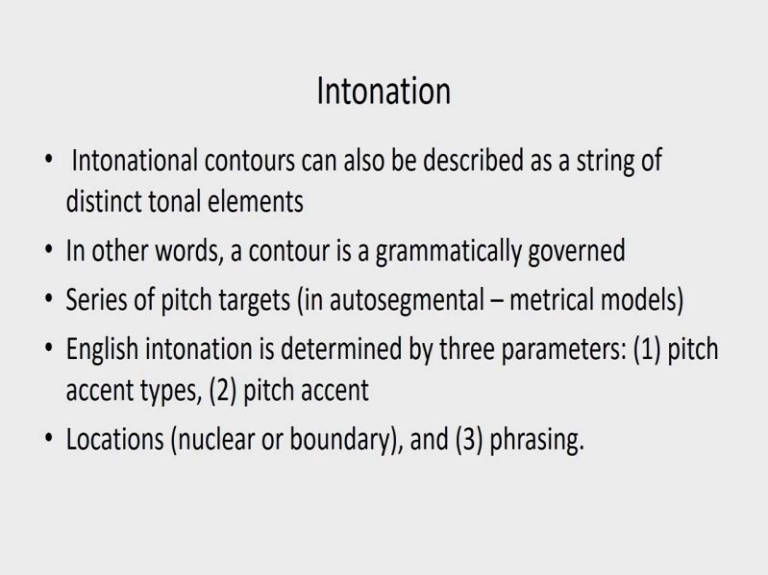

And, also, we have studied how we have seen how you can see rise and falls but does not tell us much about linguistic structure. And intonational contours can also be described as a string of distinct tonal elements. In other words, a contour is grammatically governed and series of pitch target and this is mostly in auto segmental metrical models. And each intonation is determined by three parameters pitch, accent type, pitch, accent, location, nuclear or boundary and phrasing.

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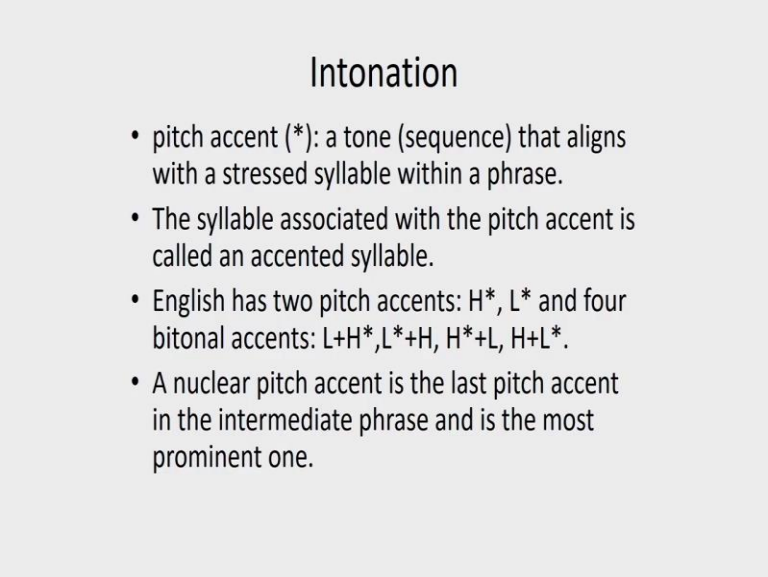

So, the start tone that we talked about initially this is also the pitch accent, this is how it is shown with a star. And the tone sequence is aligned to the stressed syllable within a phrase. So, if it aligns with the stressed syllable then, that is, L star or H star. The syllable associated with the pitch accent is called accented syllable. English as to pitch accents H star L star and four bitonal accents and this is from Pierrehumbert L plus H star, L star plus H, H star plus L and H plus L star. And a nucleus pitch accent is the last pitch accent in the intermediate phrase and is the most prominent one.

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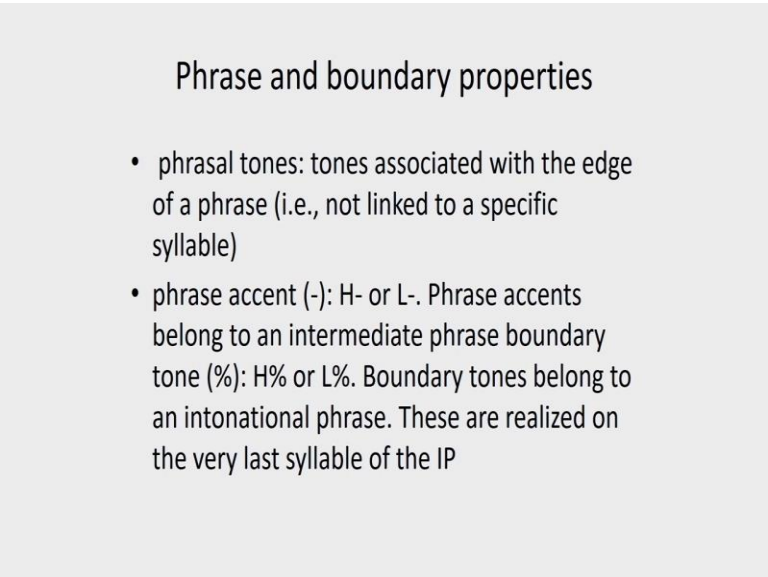

The other important properties are a phrasal tones, tones associated with the edge of a phrase not two syllable and then phrase accents. So, also the phrasal tones, phrasal accents. So, these are boundaries, these are shown with that percent symbol H or L percent showing boundary tones belong to an intonational phrase

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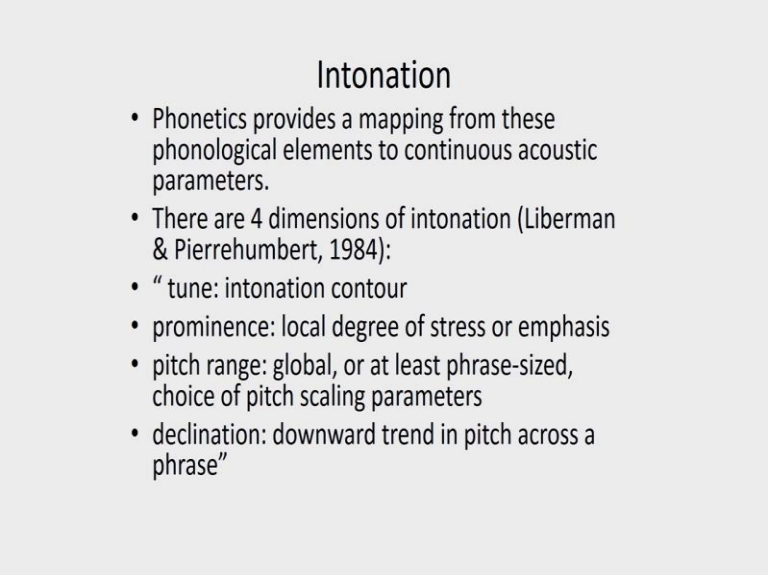

And phonetics provides mapping from these phonology elements to continuous acoustic parameters. So, we looked at it in our lecture yesterday and the 4 dimensions of intuition based on Liberman and Pierrehumbert and what are those as we have been repeating so far, tune is very important, prominent stress is very important, pitch range could be global, in the sense that the rise could show question and fall could mean declarative sentence or at least phrase size, choice of pitch scaling parameters. And declaration downward trend in pitch across a phrase. So, these are sort of dimension so intonation that you have to consider if you are doing an intonational study.

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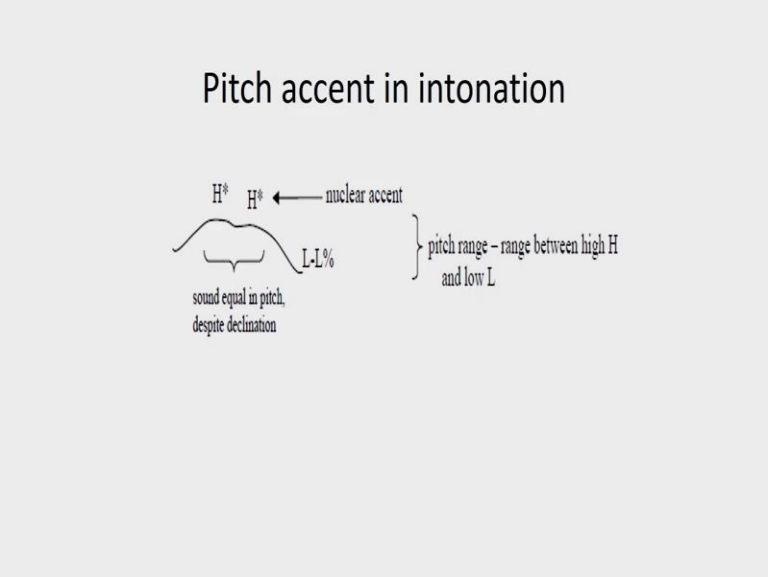

So, pitch accent in intonation so, you can have the nuclear accent, either is, as we said before, the relative differences do not matter so much. And range between high and low is pretty big, but between two highs, it may not be very significant, if the relative differences do not matter so much.

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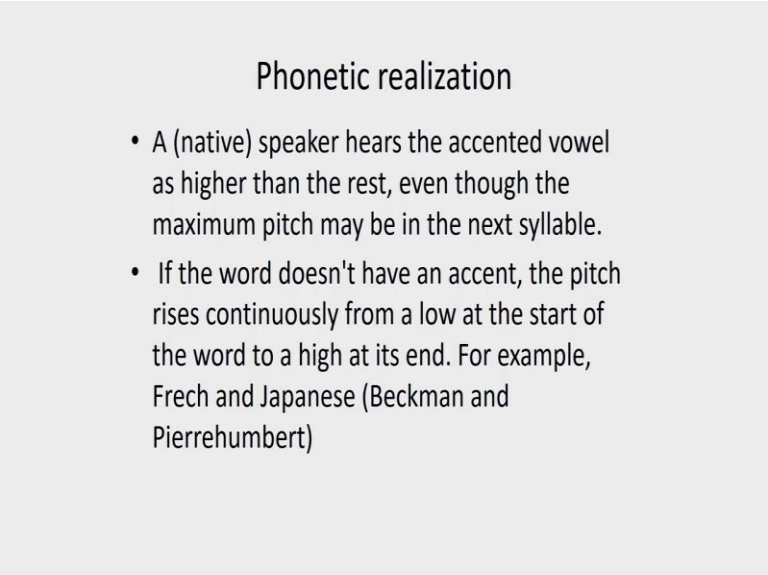

And continuing with phonetic realisation from the last lecture, native speaker hears the accented vowel as higher than the rest, even though the maximum pitch may be in the next syllable. So, those are some things that one needs to keep in mind while doing intonation analysis. And if the

word does not have an accent, the pitch rises continuously from a lower, the start of the word to higher end.

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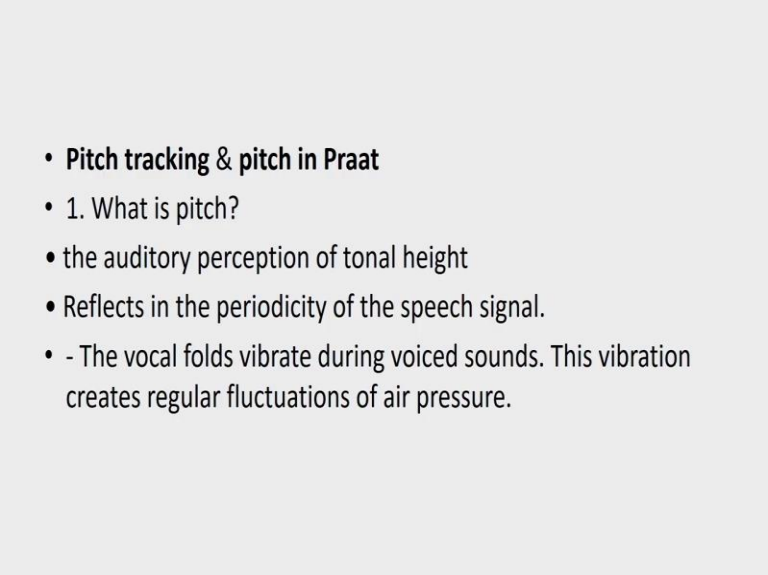

And some things that we can do while studying intonation, that is we use a software called praat, we locate, we do pitch tracking using praat and we find out how the pitch is changing using the various tools provided in praat.

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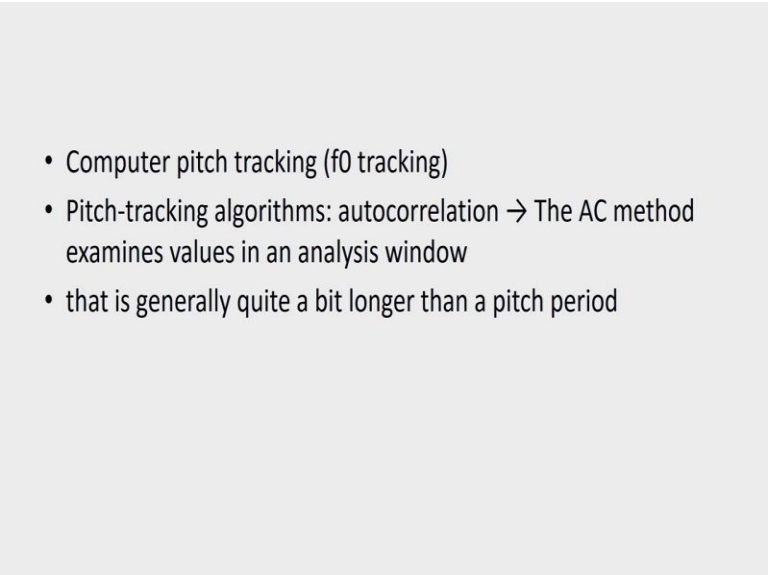

And so we use the computer pitch tracking and the pitch tracking algorithms, they do some auto-correlation.

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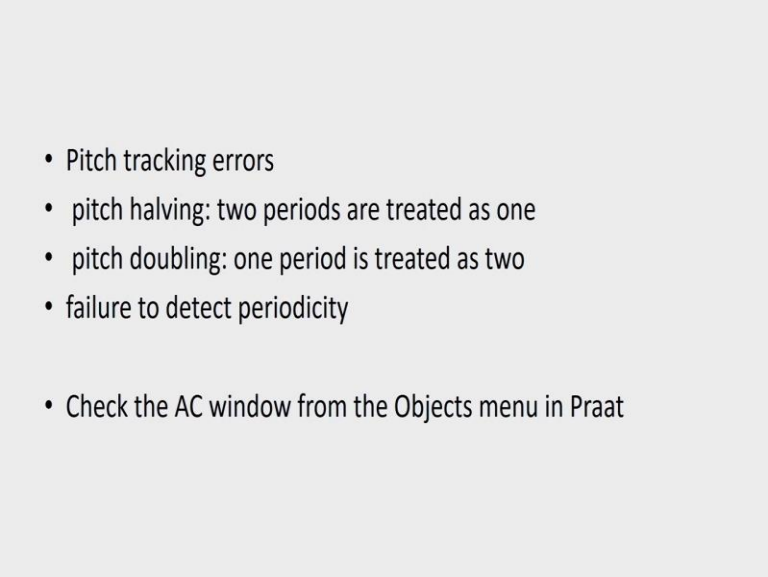

And then there are other things to consider, there is a pitch tracking errors, there is pitch halving, there could be pitch doubling. And all these are problems and then when you are using praat, many people use praat to understand intonation. These are some things to keep in mind.

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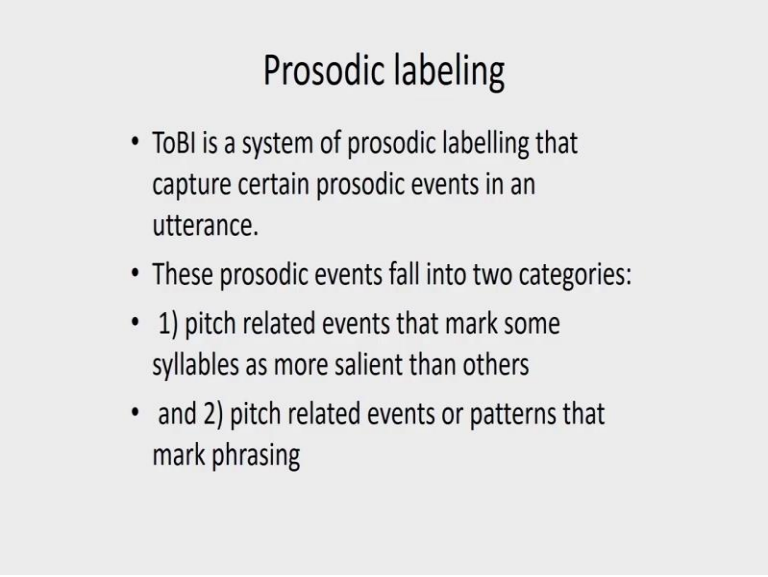

And then when we are discussing intonation, a couple of things that come into play is that when you are doing a ToBI, that is, tone and break indices, we have to remember that is a system of prosodic labelling that capture prosodic events in an utterance. So, when we are doing a ToBI labelling, we have to keep in mind that prosodic events fall into two categories and one is pitch

related events that mark some syllables as more salient than others. And pitch related events are patterns that mark phrasing. So, as we have been repeating the pitch related events, where we mark prominence and phrasing, so these are two important things, while if we consider using ToBI labelling for intonation.

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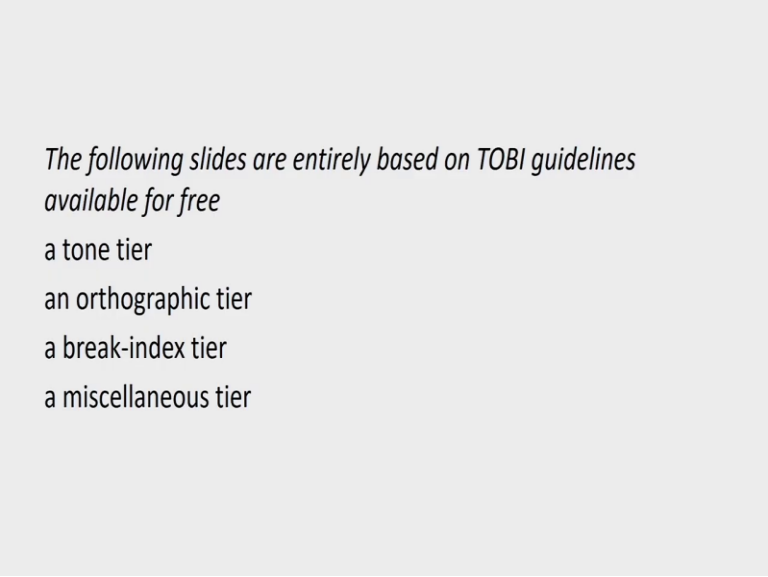

So, these are from ToBI guidelines available for free. ToBI has a tone tier and orthographic tier and a break index tier and a miscellaneous tier.

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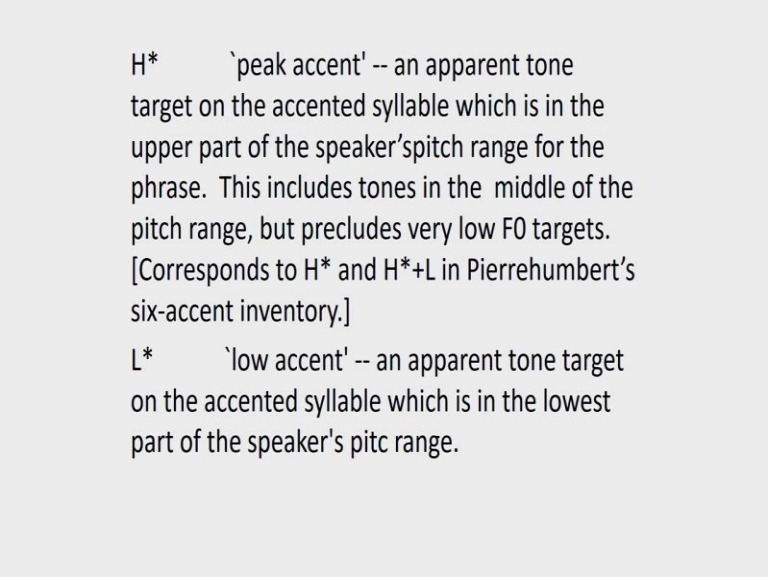

And then there is an H star peak accent. As we have already talked about this, it is the accented syllable that is a stress syllable which gets the pitch accent, and it will be called the peak accent with H star. And then as we have seen initially when we are looking at Hayes 2009, they had included in pitch the middle range here in the ToBI labelling, we do not use pitch in the middle range, and it uses relatively high pitches, excludes the low F0 targets. So, fundamental frequency, which is very low can never be H star and then L star is low accent.

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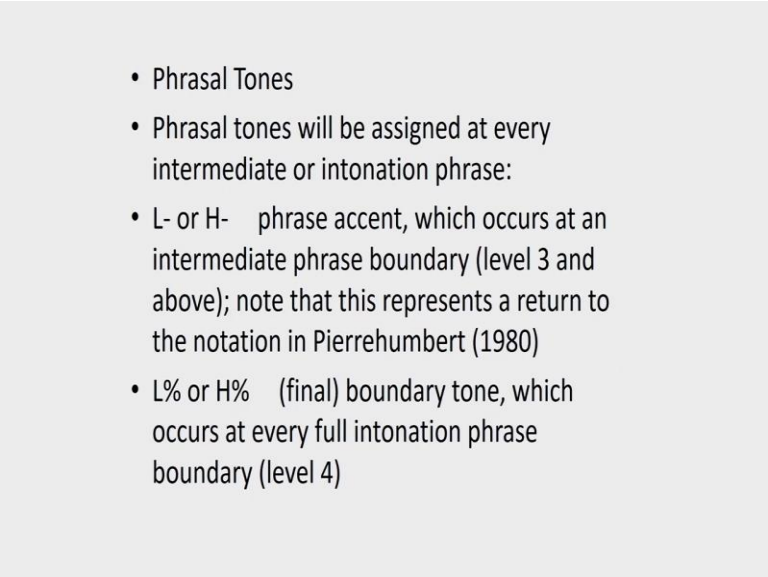

And then there are phrasal tones, which are L or H phrase accent, this is how they are represented with a dash. And then we have boundaries, which are shown in the percentage L star or H star.

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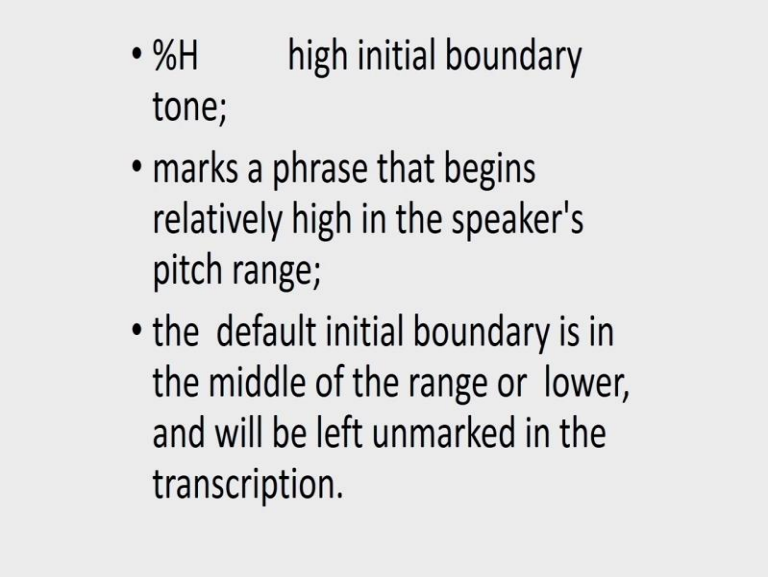

And we have a high initial boundary, can be shown with a percentage H and it marks a phrase that begins relatively high in the speaker's pitch range. And the default initial boundaries in the middle range or lower and will be left. So, almost always left unmarked in transcription.

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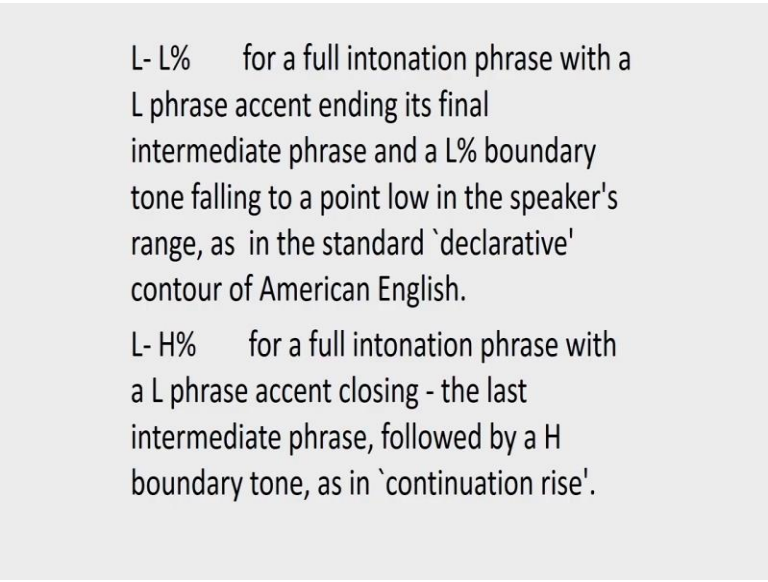

And for a full intonation phrase with the L phrase accent ending it is final intermediate phrase and L boundary tone falling to a low point and this is a standard declarative contour of American English then we have LH percent. Again, this is the last intermediate phrase followed by H. So, this is a continuation rise and we will play a sample for you.

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H- H% for an intonation phrase with a final intermediate phrase ending in a H phrase accent and a subsequent H boundary tone, as in the canonical `yes-no question' contour. Note that the H- phrase accent causes `upstep' on the following boundary tone, so that the H% after a H- rises to a very high value.

H- L% for an intonation phrase in which the H phrase accent of the final intermediate phrase upsteps the L% to a value in the middle of the speaker's range, producing a final level `plateau'.

And then we have H H percent for intonation phrase with final intermediate phrasing, phrase ending in H phrase continue accent and subsequent H bound tone and it is a canonical yes no question contour. And know that H phrase accent causes up step on the following bound tone and then we have H L percent for intonation phrase in which the H phrase of the final intermediate phrase up steps the L percent to a value in the middle of speakers' range producing a final level plateau. So, H L percent is actually a plateau and both H H percent and H L percent are the results of up steps.

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L*+H `scooped accent' -- a low tone target on the accented syllable which is immediately followed by relatively sharp rise to a peak in the upper part of the speaker' pitch range.

L+H* `rising peak accent' -- a high peak target on the accented syllable which is immediately preceded by relatively sharp rise from a valley in the lowest part of the speaker's pitch range.

And scooped accent is the one where you have a low tone target on the accented syllable but followed by a sharp rise and then we have the rising. So, note that is the difference between L star plus H and L plus H star, we have a rising peak accent a high peak target on the accented syllable which is immediately preceded by relatively sharp rise from a valley and the lowest part of the speaker's range.

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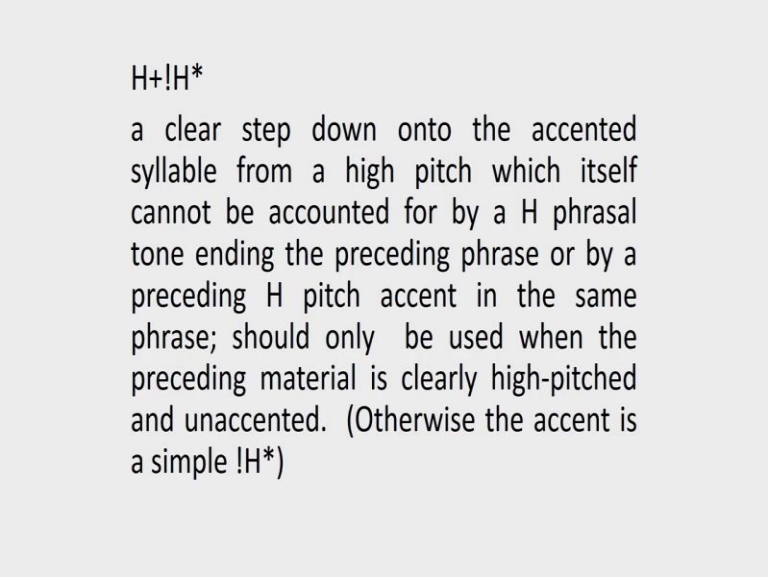

And then finally, we have H plus the exclamation mark. So, if this is a this is a step into a step down into the accented syllable from a high pitch which itself cannot be. So, this exclamation marks showing that there is a down step of the following H star H. So, H pitch accent in the same phrase and should be only using the preceding material is clearly high pitch and accented sorry clearly high pitch and unaccented and then causes a down step in the following accented high.

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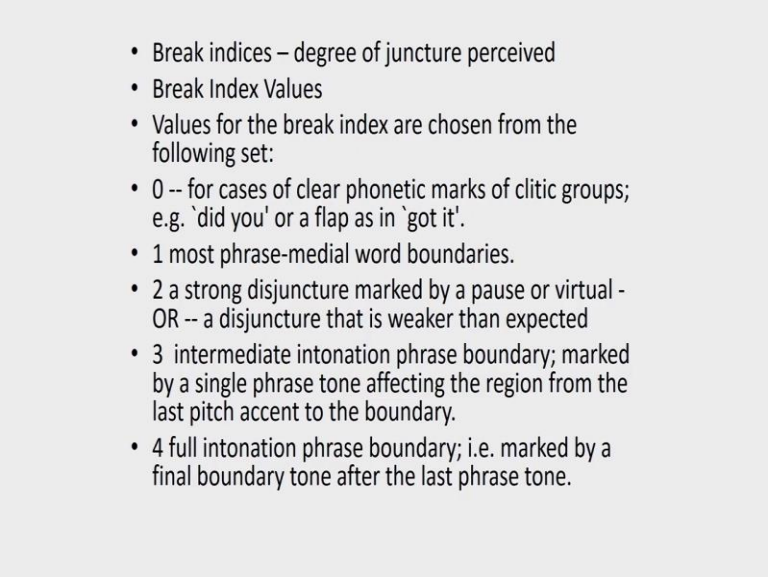

So, these are the things that is important for ToBI labelling, break indices and values for the break index are, so 0 for clitic groups et cetera. And then 1 for phrase medial boundaries, word boundaries and then 2 for a strong disjuncture and 3 for immediate intonation phrase boundary and 4 for full intonation phrase boundary.

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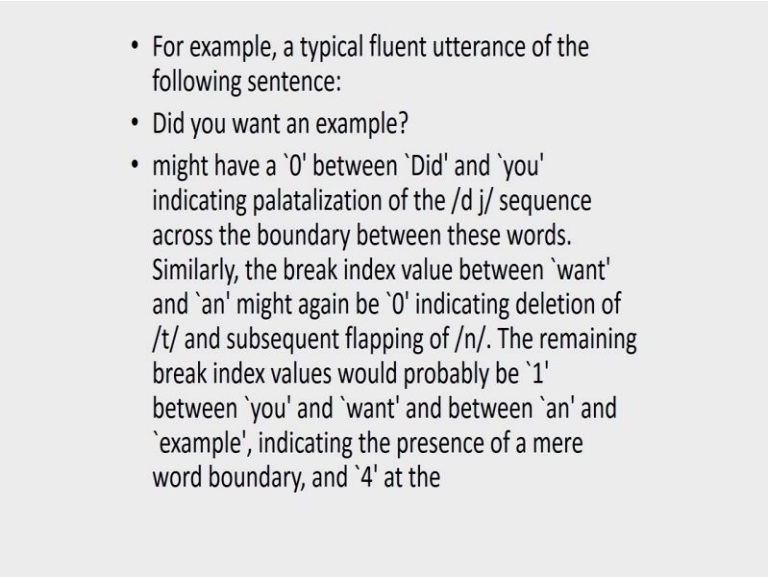

For example, a typical fluent utterance of a following utterance sentence. Do you want an example might have a 0 between did and you. So did you something like that, and then and want and again, between the two, there may be very little break so you can have 0 and then the

remaining break index values would probably be 1 between you and want and an example indicating the presence of a mere word boundary and 4 at the end of the utterance indicating.

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- For example, in the utterance shown in section 1 and repeated here <armani1>, the words *Armani*, *knew* and *millionaire* are more prominent than *the*.
- Moreover, within the multi-syllable word *Armani*, the syllable *-man-* is more prominent than *Ar-* or *–ni*. (What is your intuition about the relative prominence of *mill-*, *-io-* and *–naire*?)
- The sentence is also produced as two intonational phrases. That is, the first word, *Armani*, is not grouped with the remaining words in the utterance, *knew the millionaire*.

So, here is an utterance that will play now, before we end this lecture, which will show that will show the prominent parts will be very clear and then the two intonational phrases will also be very clear the gap between the two parts

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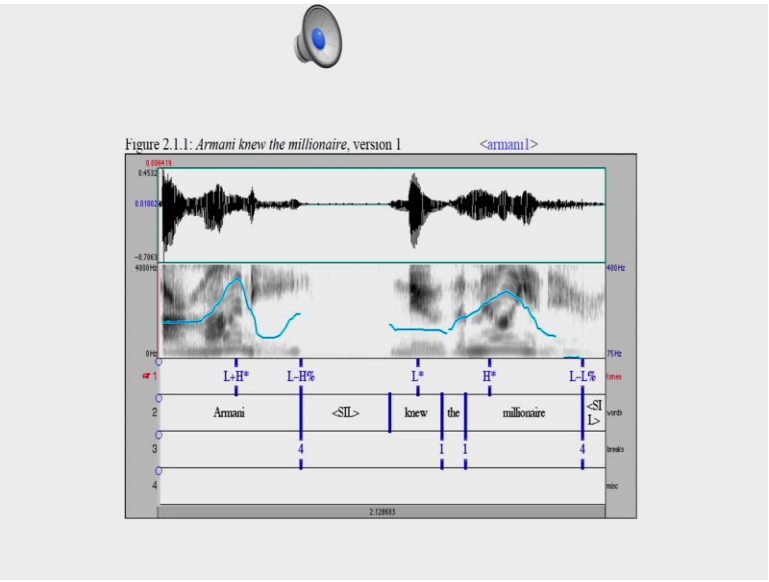

So, playing it now, Armani knew the millionaire. So, the sentences Armani knew millionaire so this is you can see the gap. So, showing that this is two intonational phrase as we talked before

the more gap you have showing that the strong breaks between two parts and then as we can see the L plus H star here star is aligned to the prominent syllable here again in millionaire again so, this H star on the prominent syllable. And again all of these, Armani knew the millionaire, they are all pitch accented and they are two IP is here.

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- The acoustic correlates mark prominence
- groupings are typically the f0 pattern
- perceived pitch pattern and the relative duration
- the contributions of other cues such as amplitude, voice quality, pausing, strength of articulation

So, the acoustic correlates mark prominence that is high pitch and groupings are typically the f0 pattern, perceived pitch pattern and the relative duration, the contributions of other cues such as amplitude, voice quality, pausing, strength of articulation, et cetera they are all there.

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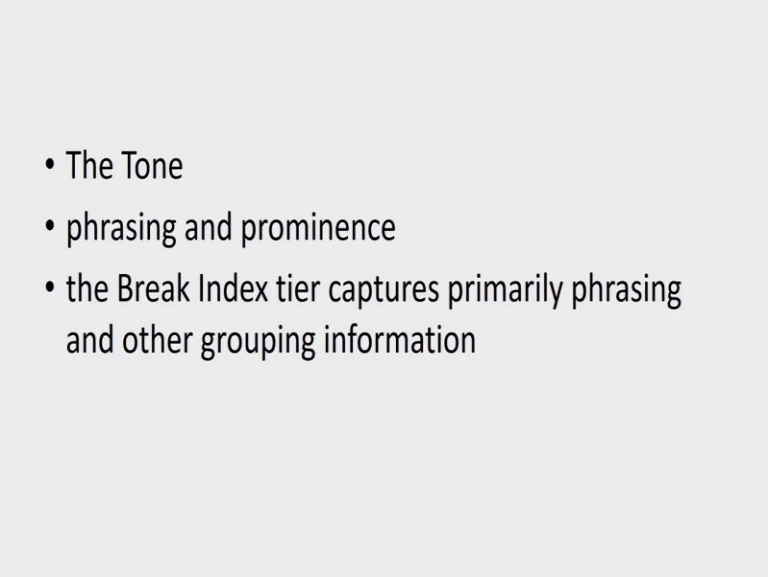

And then in a tone shows phrasing and prominence to break index tier captures primarily phrasing and other grouping information.

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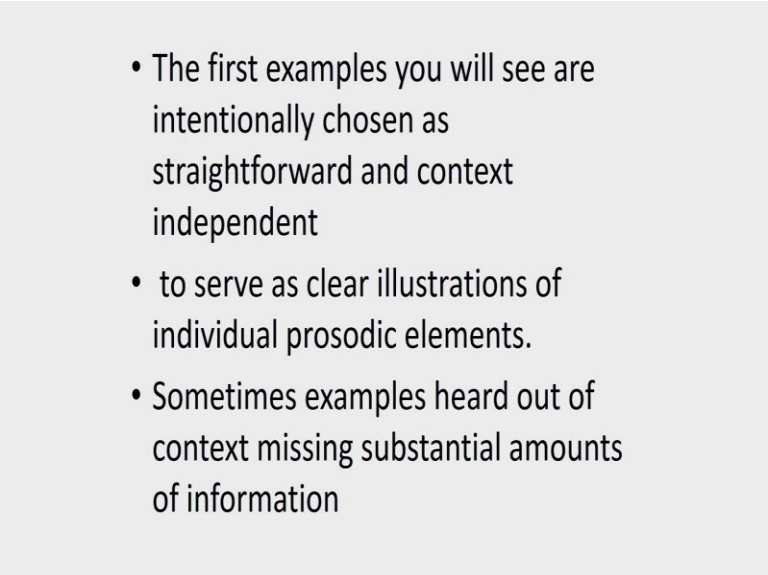

And then the example that you saw is straightforward and context independent. And then, they miss a considerable amount of information. We do not know how those sentences were produced.

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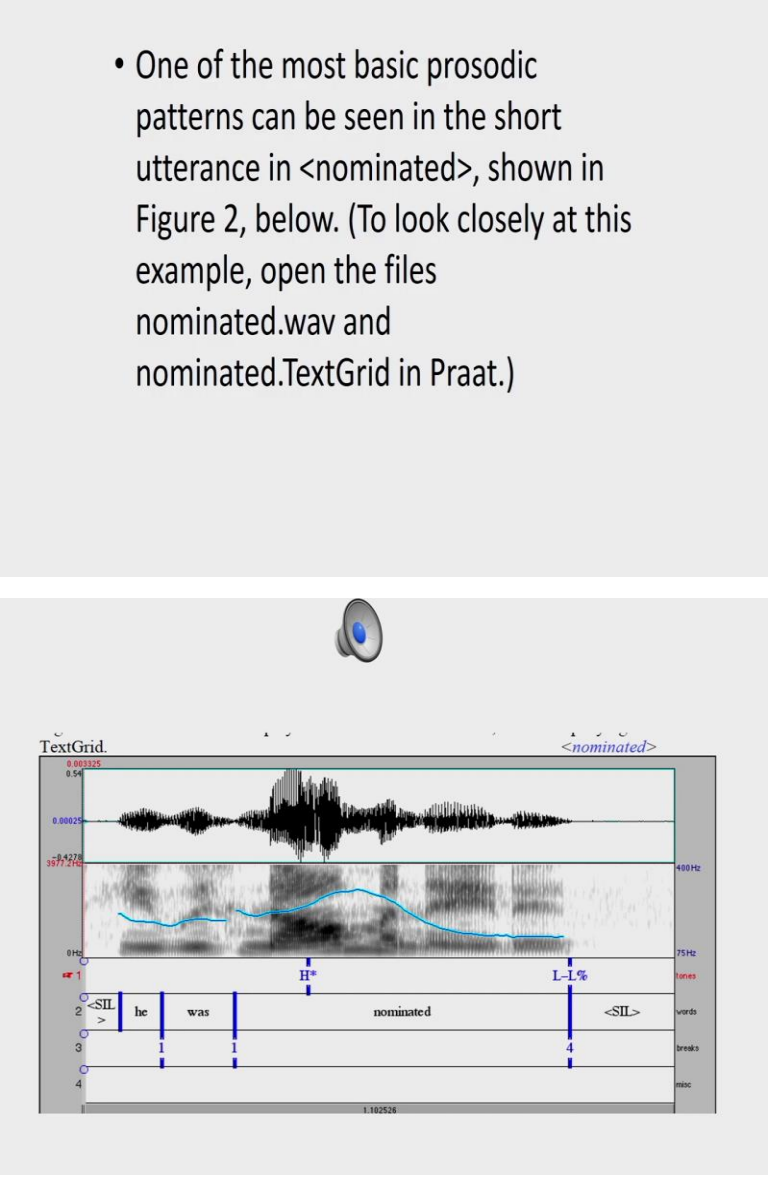

But again, we will play another sentence here before we wrap up, which shows basic prosodic pattern in a short utterance. He was nominated. So, again, this was he was nominated. So, showing the most important stress apart, here is showing nominated and then a final L person showing the boundary and then these are the most important parts in the sentence, also you notice that we have 1, 1, 1 for both as the boundary between these two words.

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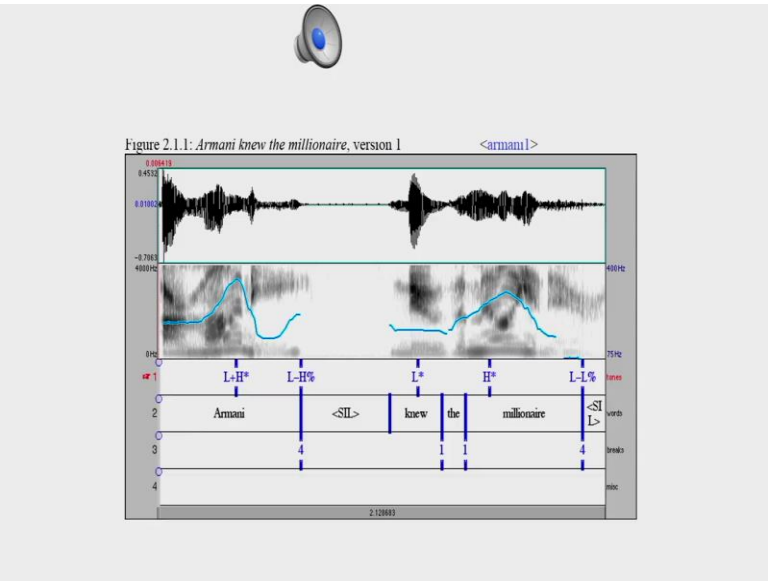

Similarly, for here, again, Armani knew the millionaire, there is one between knew, the and between Armani and next part we have four because those are two IP's.

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So, this has three words and is produced a single international phrase with one pitch accent, and as mentioned above the tone tier marks two types of events. And these are associated accented syllables and with phrasing.

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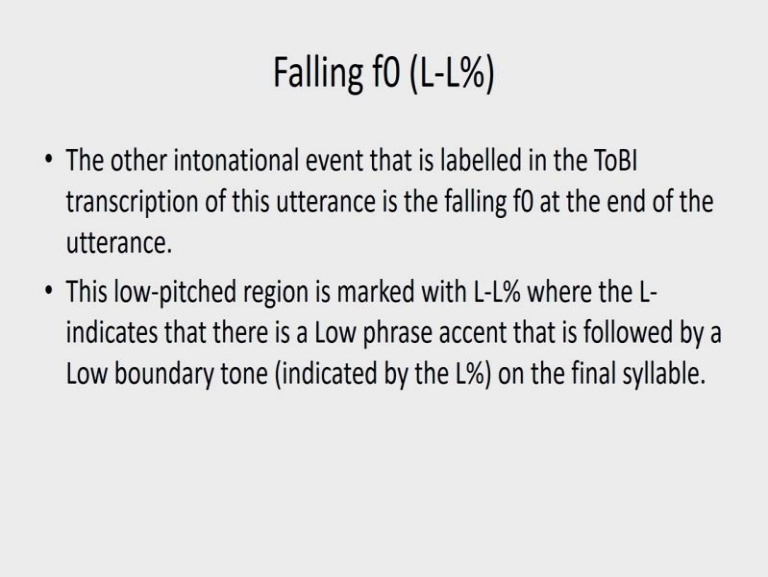

And then we have falling and the other intonational event, that is, labelled and ToBI transcription is falling f0 at the end of the utterance and the low pitch region is marked with L L person where L indicates that there is a low phrase accent that is followed by low boundary tone on the final syllable.

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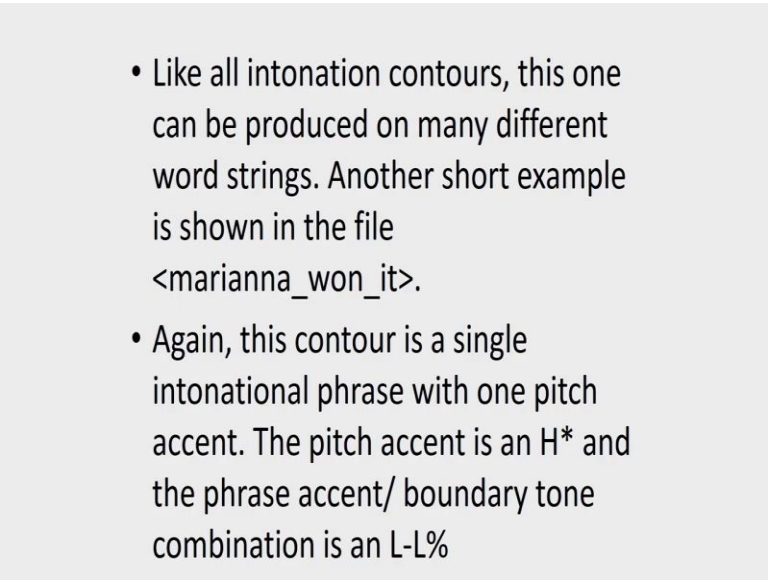
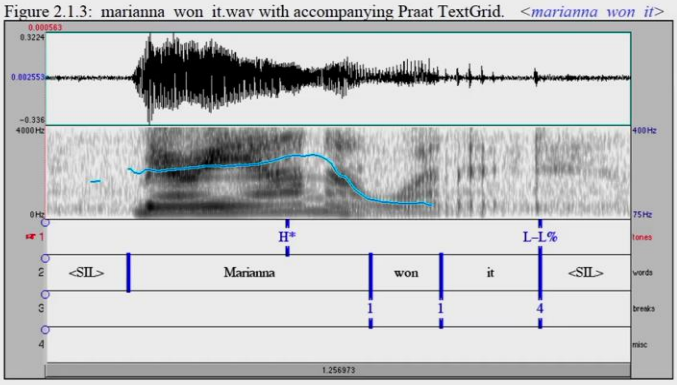


Figure 2.1.3: marianna_won_it.wav with accompanying Praat TextGrid. <marianna_won_it>



And again, like all intonation contours, as we know about tune and text. So, they can be produced as on many the tune can reproduce on many strings. And then another example is Marianna won it, single international phrase, one pitch accent and the pitch accent is H percent and phrase accent boundary tone is L percent. So, this is the sentence. Mariana won it. So, the sentence is Mariana won it and then so where we have 1, 1 between the break in this is between one and it is only one and this is a strongest break of four.

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- Before introducing other kinds of pitch accents, phrase accents and boundary tones, however, let's turn our attention to labels in the Break Index tier.
- A Break Index marks the level of disjuncture between two words.

So, the break index marks level of disjuncture between the words.

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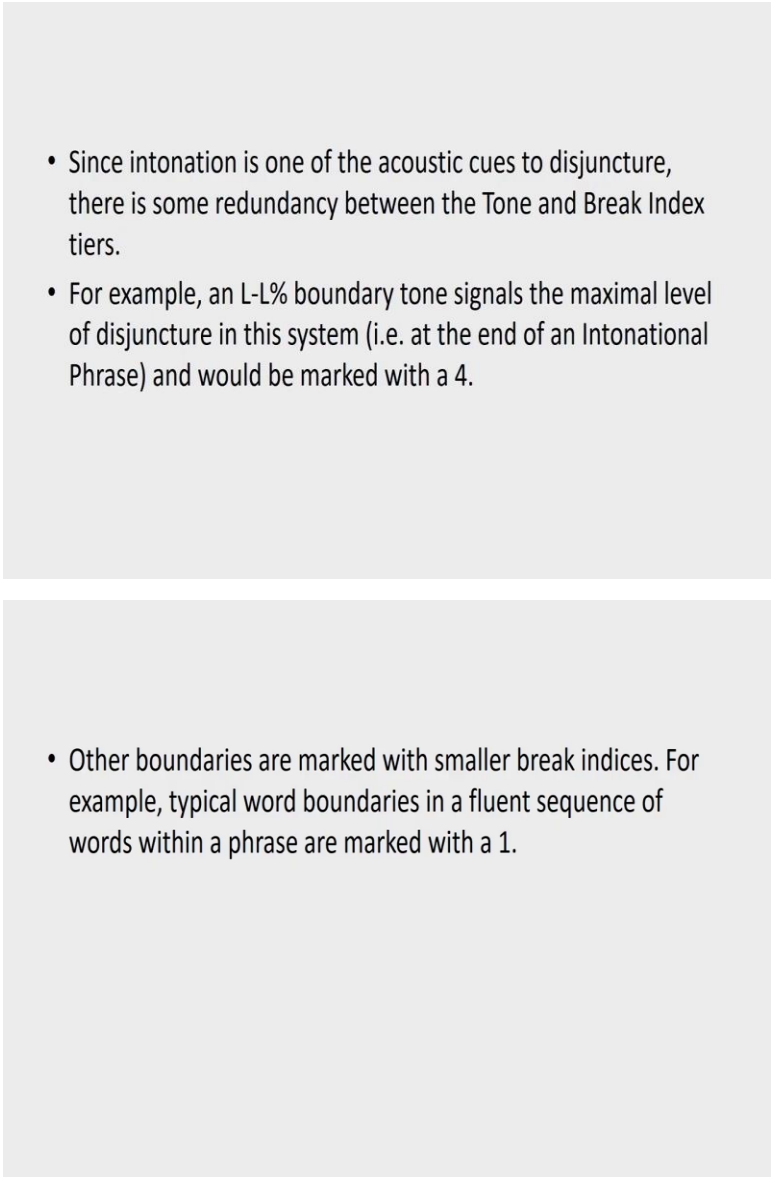

And intonation is one of the acoustic cues to disjuncture and between L L percent bounded tone signals the maximal level of disjuncture is. So, this is four as we saw in all the sentences there. If there are two IP's in a sentence, even if it sounds like one sentence Armani break and then the rest of the sentence. And other boundaries are marked with smaller break indices. For example, typical word boundary and fluent sentence of words within a phrase are marked as one.

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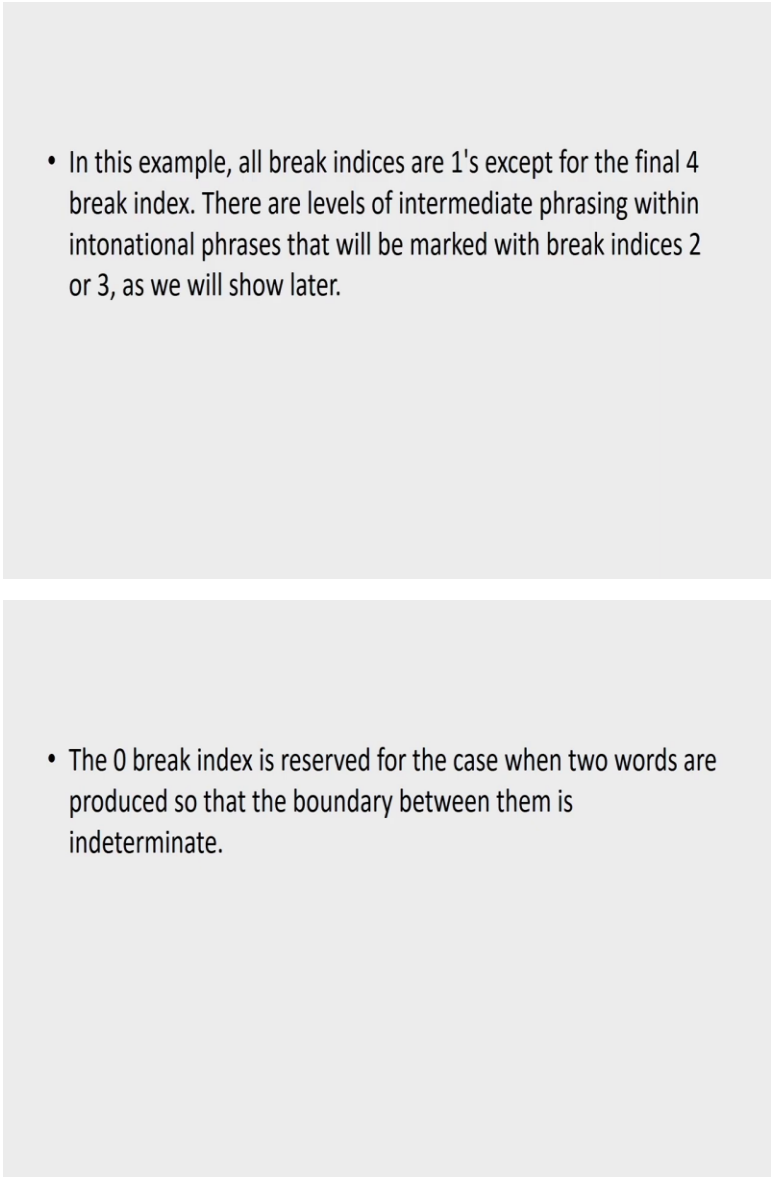

And then there are levels of intermediate phrasing between two intonational phrases that are marked with break indices 2 or 3, 0 is where the is reserved for case when two words are produced so the boundary between them is intermediate.

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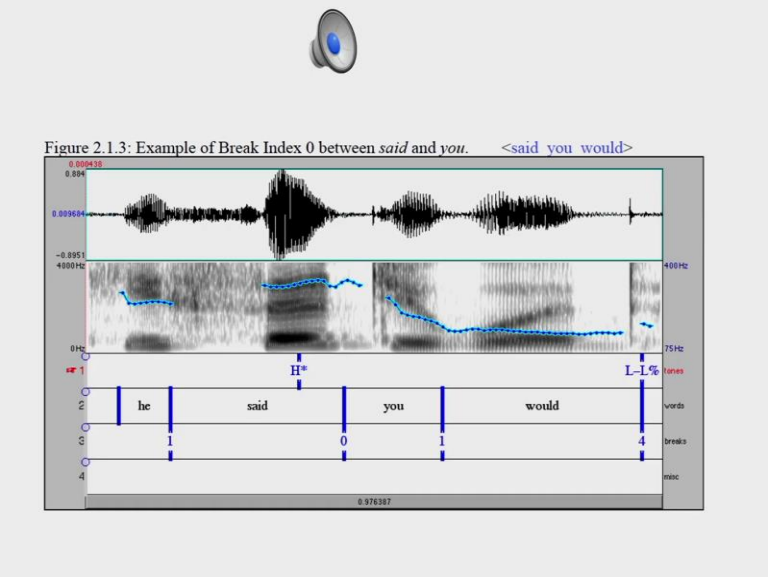

And we have here with a 0. He said you would. So, he said you would. So, here between said and you there is a boundary because typically the following pronoun is almost like uttered like one word

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- To summarize the inventory that we've seen so far:
- Tones: H* high pitch accent
- L-L% low phrase accent
- low boundary tone
- Break indices:
- 0: word boundary apparently erased
- 1: typical between-word disjuncture within a phrase
- 4: end of an intonational phrase

And this to summarise the inventory that we have seen so far tones H star pitch accent and L L percent low phrase accent and low boundary tone and then break indices 0 for word boundary apparently. So, which is almost erased, one typical between word disjuncture between a phrase and end of an intonational phrase is 4.

So, with this we saw how we can do ToBl labelling, here all the pictures that you saw are from praat even though we just mentioned praat which is a free downloadable software where you can do a lot of analysis of pitch acoustic, analysis et cetera. We do not introduce; we do not discuss praat a lot in this course and maybe in other one.

But it is very useful for the studying of your intonation and looking at pitch contours seeing the breaks between words et cetera. And these tiers can also be marked in those by using software's like praat which allows you to create different tiers for words in a sentence.

And also, we saw that we can very easily see prominence, the acoustic prominence lend by the properties of f0 and duration et cetera which are very clearly seen in the sentences that we played for you here and we can see Armani and then millionaire. So, where you have high pitch showing the prominence syllable and that brings us to the end of this lecture on intonation and also the end of this course and we will interact with you if you have questions et cetera. when you are doing this course. Thank you for your attention.