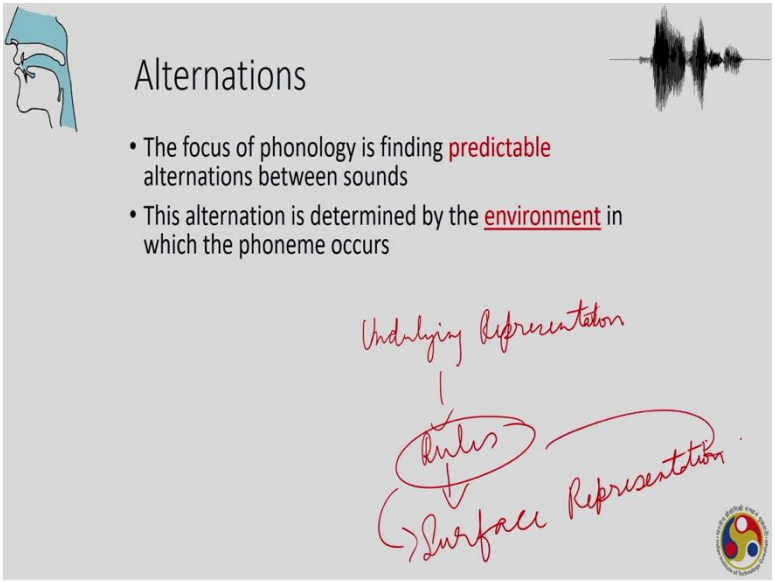
Phonetics and Phonology: A broad overview
Professor Shakuntala Mahanta
Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati
Lecture 20
Phonological rule application

Hello,welcome to this NPTEL Massive Underlying Open Course, Phonetics and Phonology, a broad overview.

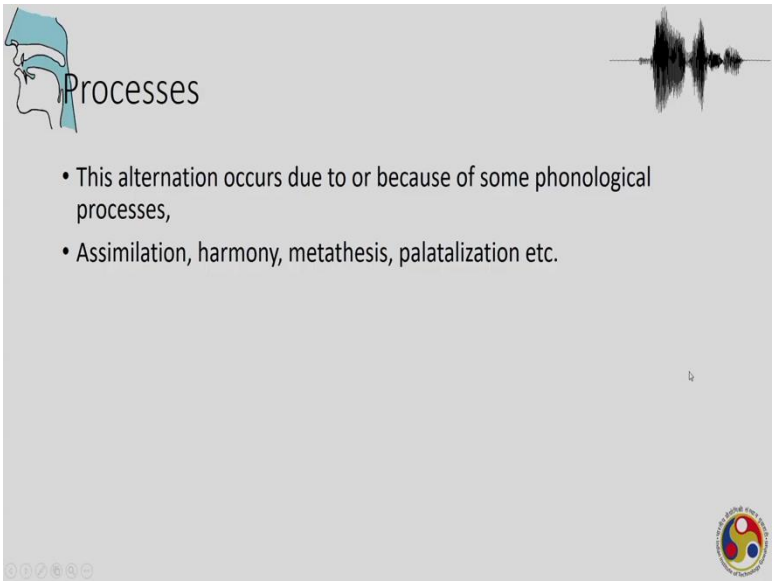
(Refer Slide Time: 00:38)



We have been talking about phonology, we talked about phonemes, phonemic features, and also about rules and how we formalize rules. And in this class also, we will continue in this lecture talking about phonological processes and alternations. So, what are alternations? So, the focus of phonology is to find predictable alternations between sounds.

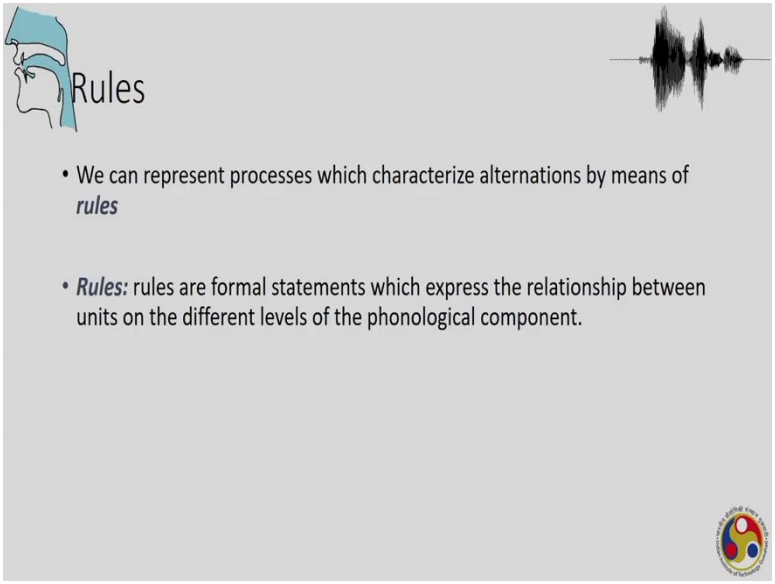
And as we saw in the last couple of lectures, that in phonology, we assume that there is an underlying form, there is a representation and we have rules and as a result, we get our surface representation. And we have seen this in our previous lecture also, that the application of rules gives us this surface representation. So, the alternation and then this surface representation is determined by the environment in which the phoneme occurs.

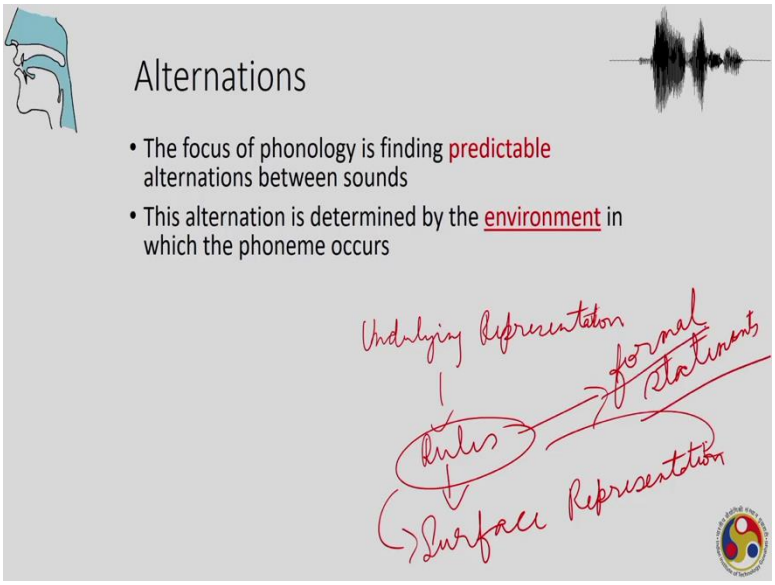
(Refer Slide Time: 01:59)



This alternation occurs due to or because of some phonological processes, and there are very many phonological processes in various languages and they have been analyzed in great detail and what are those? Those are called processes of assimilation, harmony, metathesis, palatalization, libialization, and consonant, how many vowels and voicing assimilation, and other processes.

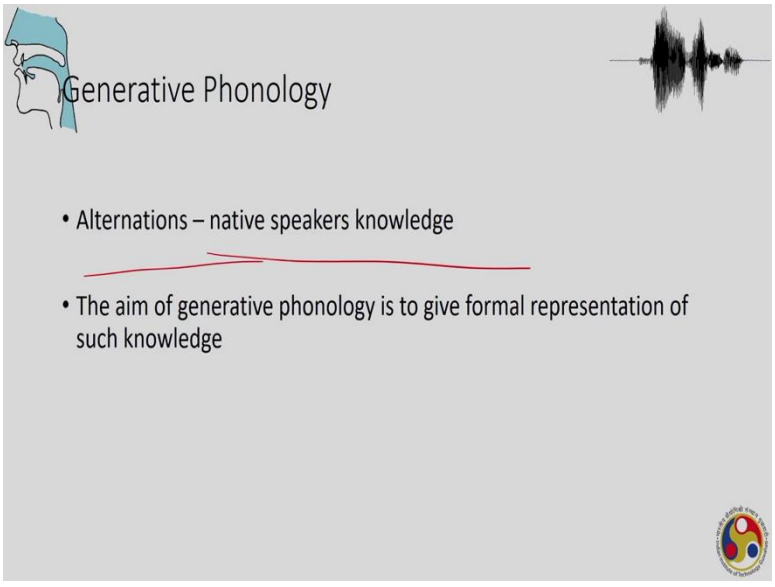
(Refer Slide Time: 02:25)





We can represent processes, which characterize alternations by means of rules. Rules are formal statements, which express the relationship between units on the different levels of the phonological component. And now, what we saw just now, that these rules are formal statements of a process happening in a natural language. So, the rules are formal statements, which express the relationship between units on different levels of the phonological component.

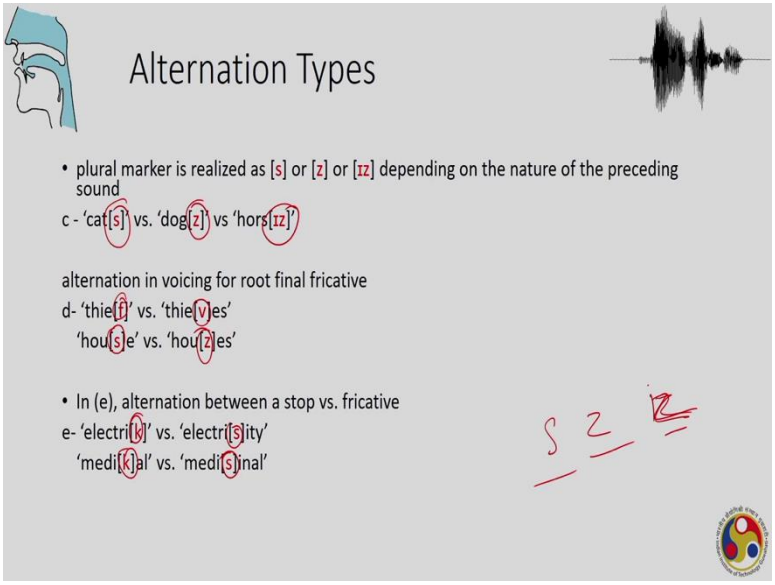
(Refer Slide Time: 03:08)



And these alternations are nothing but processes which are part of a native speaker's knowledge of the language and which are then expressed, formalized in terms of rules, and these rules show nothing else but the alternations.

And so, at the risk of repeating the thing, we have to keep in mind that formalizing rules is nothing but expressing the fact that this knowledge is there and native speakers' knowledge of the language and phonology tries to capture the mental organization, the representation of that knowledge through these formal devices. The aim of generative phonology is to give a formal representation of such knowledge.

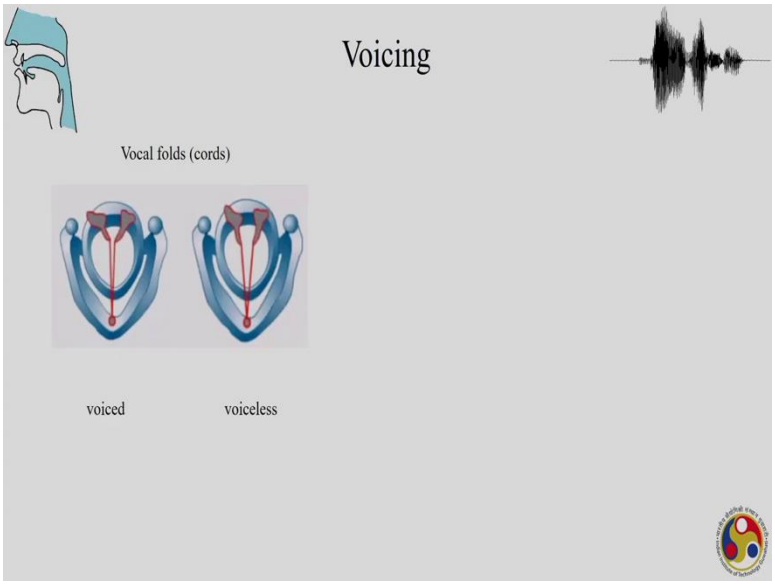
(Refer Slide Time: 03:55)

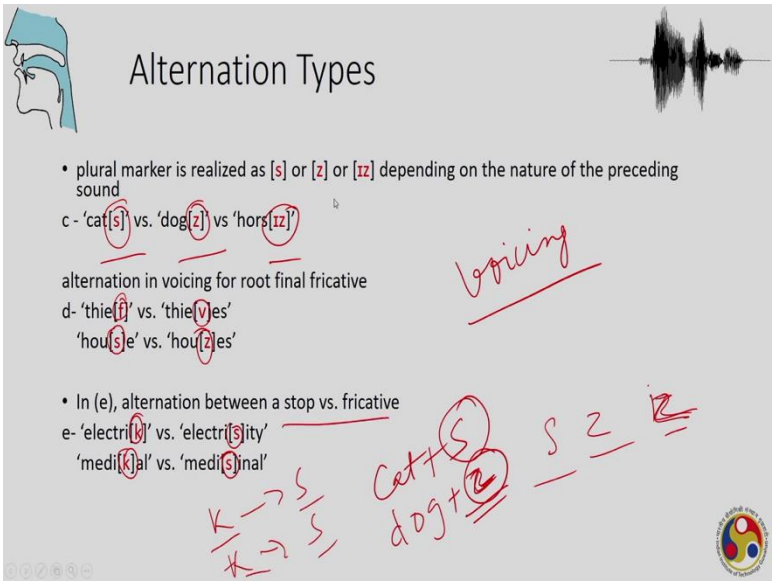


And suppose we talk about English plural, the English plurals are classic examples of phonological alternations, s, z, iz, and so we have these alternations like cats, dogs, and horses, an alternation in voicing for the root final fricative, for instance, thief versus thieves or house versus houses.

And then, we have electric, electricity or medical versus medicine. And so, the ones that you see in red, there is something happening there. So, we can see a change, this change is called the alternation. Now, why is this happening in English that repeatedly, we see things which involve a voicing property?

(Refer Slide Time: 05:02)





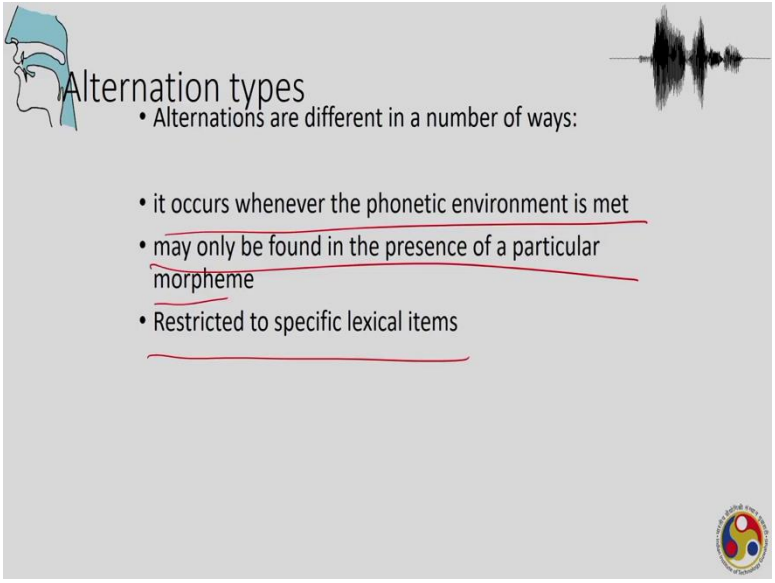
Now, just for the sake of bringing in something that when we looked at articulation, this is our voicing. So, this is our vocal folds voicing, which happens as a result of the vocal fold vibration. Now, we are looking at the phonology. But we have to bear in mind that these are the different levels, linguistic levels that we are talking about. And there is some relation of one with the other.

And this is the voicing that we are talking about, it is the voicing that we had seen when we are talking about articulatory phonetics. Now, this voicing is a process in English and in process, which shows up in the morphology. So, why are we saying morphology? Because remember that this is now an English plural that we are talking about.

We are not talking about a simple word without any morphological or any more morphological component, we are not talking about simple words. Without morphological complexity, we are not talking about just cat, we are talking about what happens when we add the plural morpheme to it, we are talking about what happens to dog when you happen to plural morpheme to it, it changes its voicing property.

Similarly, if we have thief versus thieves', house versus houses, and then we have some others like, as you can see, this is not the k to s change is not a voicing change, it is a change from stop to fricative. So, this is happening in the present when the morphemes are there in the word.

(Refer Slide Time: 06:48)



Alternations are therefore of various types and alternations can occur in the phonetic environment. And we saw that, when we saw the English flapping rule, we saw that with English aspiration, there we did not invoke anything with regard to morphology, but here the morphology is important because it is the plural morpheme which is behaving in a certain way.

So, alterations may occur when the phonetic environment is met, but they also maybe sometimes found only in the presence of a particular morpheme and they can also be restricted to some specific lexical items. So, morphemes can be the target of analogical alternations. Also, it may be just a phonetic context, regardless of whether there is a morphemic content to it or not. Also, sometimes it can be specific lexical items, as we just saw with the example of electricity or medicine.

(Refer Slide Time: 07:51)

➢Rhythmic lengthening in Choctaw

[p i s a]
[p i s a: l i]
[p i s a: tʃ i]
[tʃ i p i: s a]
[tʃ i p i: s a l i]
[tʃ i p i: s a tʃ i]
[p i s a: tʃ i l i]
[tʃ i p i: s a tʃ i: l i]

So, for knowledge coordination, sometimes we can have addition of morphemes but still the phonetic environment maybe just there. So, this data is from Choctaw, it is from again, Hayes 2009 introductory phonology. And something is happening here, you can see the symbol for the a vowel which is represented with these two dots. And those dots are used to show length in linguistics.

(Refer Slide Time: 08:29)

➢Rhythmic lengthening in Choctaw

[p i s a]
[p i s a: tʃ i]
[p i s a: l i]
[tʃ i p i: s a]
[tʃ i p i: s a l i]
[tʃ i p i: s a tʃ i]
[p i s a: tʃ i l i]
[tʃ i p i: s a tʃ i: l i]

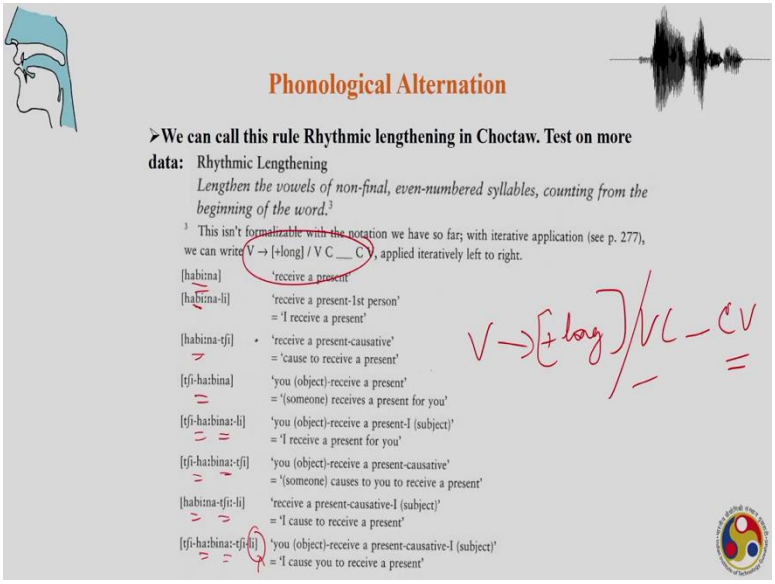
Now we can see the original word pisa but then we see that its length and in various places, it ispisa, pisali, pisachi, chipisa, or chipisali, or chipisachi, or pisachili, or chipisachili, so, not all a's are lengthened. So, this a here is not lengthened, only this a is lengthened. Now, we

see a repetition of something it is not the vowel a which is being the target of lengthening, the target of lengthening is something else.

So, this is called rhythmic lengthening. So, the pattern here is that the second syllable is lengthened. So, whenever we have a second syllable, or whenever we have the fourth syllable, and so this 1,2,3,4, so the fourth syllable or the second syllable is lengthened. So, what is happening here even-numbered syllables alone, and unless they are in the final syllable.

So, unless they are in the final syllable, it is necessary, because in words like chipi, sali this li is not long. So, initial and final syllables are not lengthened. Final syllables, even if they are the fourth syllables, they are not lengthened, they must be between two syllables, so that is why the second and fourth.

(Refer Slide Time: 10:14)



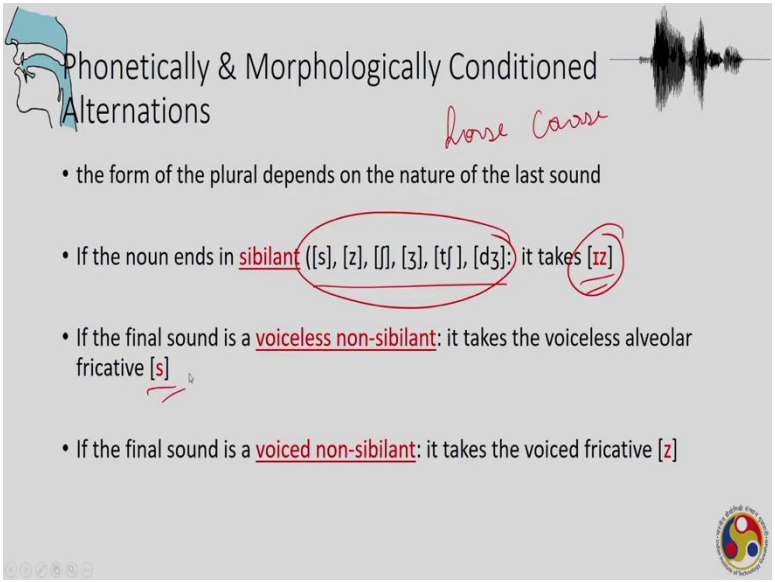
So, this is one type of Phonological lengthening. Even if we have more data, we see this happening. So, this is the second vowel lengthen here, second vowel and second and fourth vowel, second and fourth, second, fourth. So, if we have a very long word, then we have second and fourth as well, the final one is not lengthened, even if it is an even-numbered syllable.

So, now we have this very extensive morphology here in Choctaw, but we see that this rule that a vowel becomes plus long in the environment, where it is between one consonant and one vowel is repeatedly iteratively applied left to right. But this is not applicable if this VC,

CV is in the final syllable. And this is only applicable to even-numbered syllables counting from the beginning of the word.

Now, this is the Phonological alternation, and this happens irrespective of the morpheme. So, it is not dictated, it is not determined by the property of the morphemes which are being added to the word. So, the phonology of the word the phonetic context is given by the addition of the morphology, but the morphology per se is not determining this alternation.

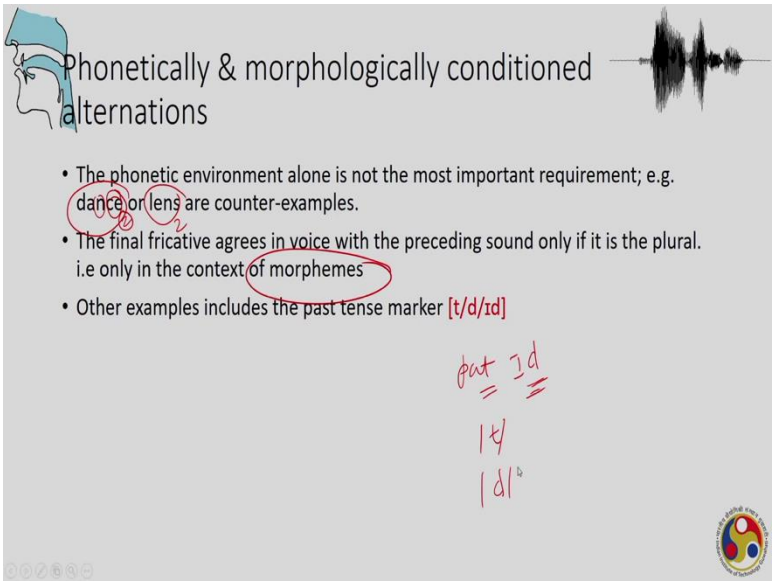
(Refer Slide Time: 11:54)



So, going back to the English examples that we have, the form of the plural depends on the nature of the last sound. So, if the noun ends in sibilants, like s, z, sh, z, ch, j, it takes iz, so these are called sibilants. And whenever there is a sibilant in English, so whenever you have a word like horse or course etcetera, then we have, it takes iz, horses, courses etcetera. And however, this rule of adding is in plural forms is applicable when the word ends in a sibilant.

Otherwise, it is a voiceless non-sibilant and it takes the voiceless alveolar fricative s. So, if the final sound is voice non-sibilant and it takes a voiced fricative. So, now, note that again coming back to morphological condition alternations, this alternation is different from the Choctaw alternation that we have just seen because the Choctaw alternation is not conditioned by the morphology.

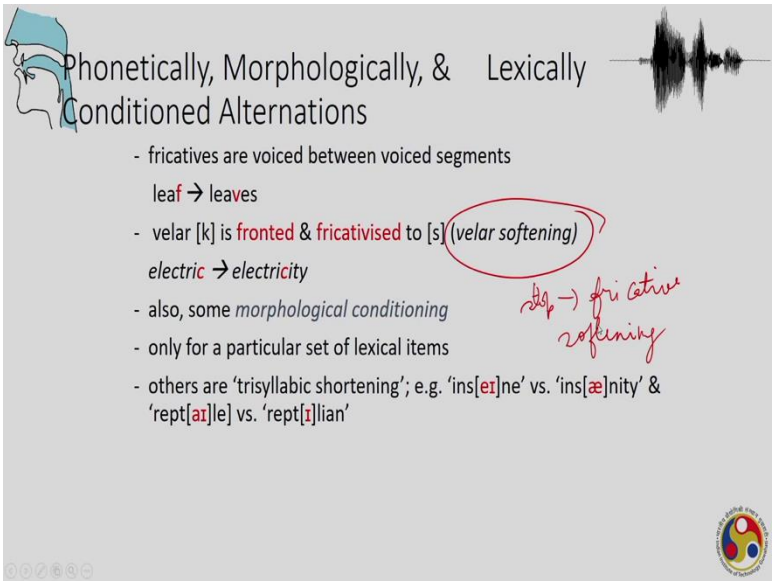
(Refer Slide Time: 13:04)



So, the phonetic environment alone is not the most important requirement. So, we can take examples like dance or lens, these are counter examples, which do not require, so we do not have the s changing to z because the proceeding n, so no that did not happen. The final fricative agrees in voice with the preceding sound only if it is the plural that is only in the context of these morphemes.

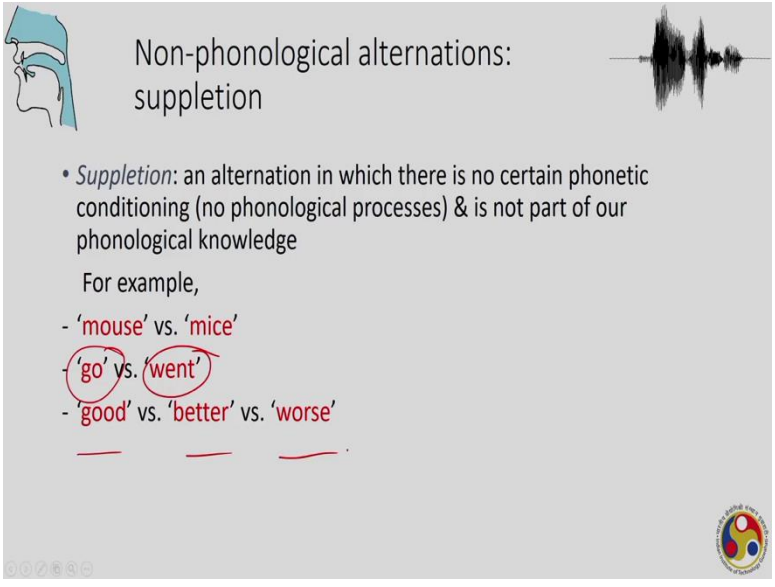
Other examples include the past tense markers t, d, id in English, we have t, d the past tense marker. And for instance, pat, pat, id and, if we have the voiceless consonant proceeding the past tense then it is t or if it is another alveolar then we have id, if it is a voiced consonant, we have d.

(Refer Slide Time: 14:10)



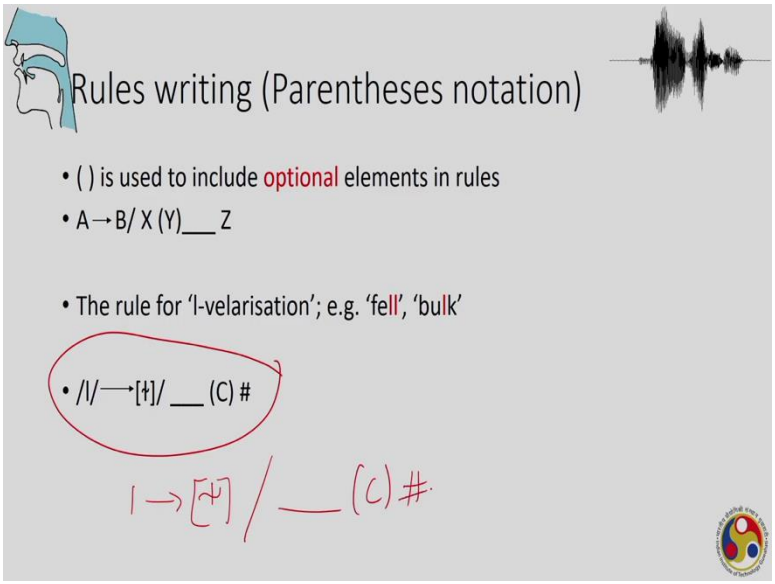
So, fricatives are voiced between voiced segments. So, we have leaf, leaves and the velar k fronted fricativized and we have velar softening, this is the process of change from a stop to a fricative, called softening. And also, some morphological conditioning, for example, there are others like trisyllabic lengthening in English.

(Refer Slide Time: 14:53)



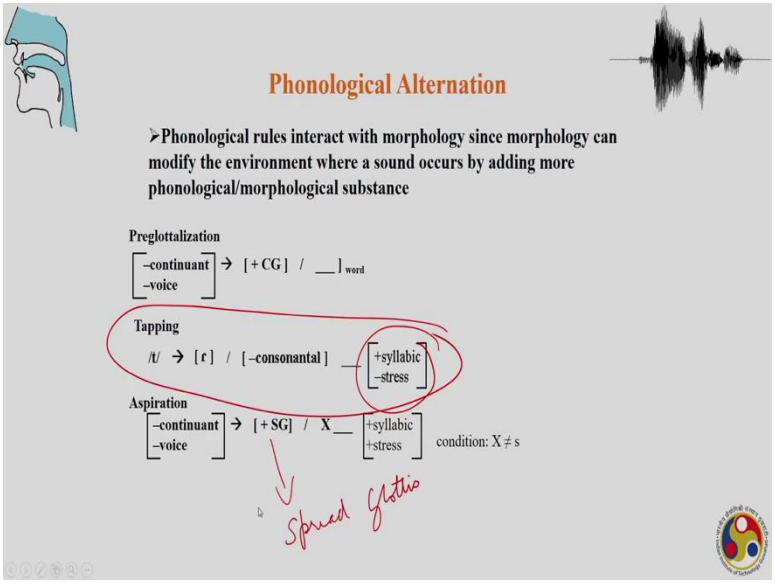
And also, the others non-phonological alternation, which does not involve phonology. For instance, go, went, where there is no relationship, we cannot see any phonological process happening when go becomes went or when good becomes better or worse.

(Refer Slide Time: 15:12)



So, rule writing as we know or as we saw in the last lecture, the rule of velarization in English. So, if we have lateral becomes velarized, there is a following consonant or if it is the word-final position.

(Refer Slide Time: 15:29)

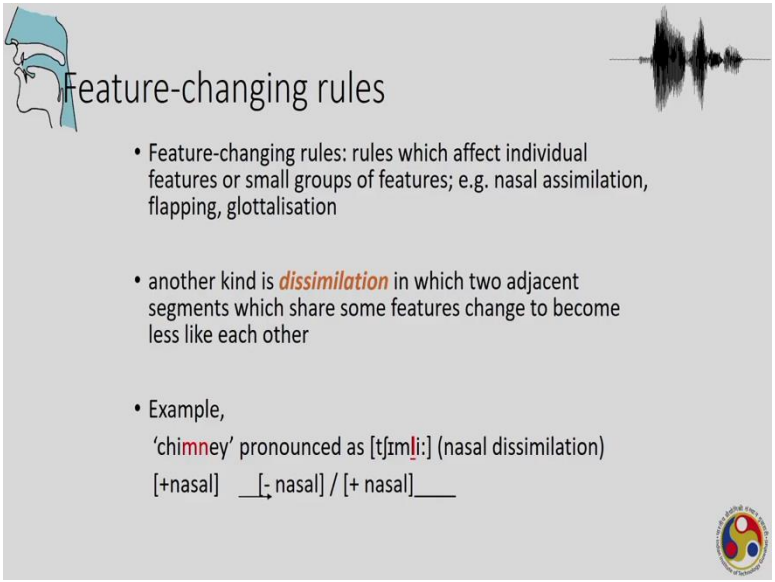


And other types. So, now, we have just looked at how Phonological rules interact with morphology. And morphology can modify the environment where a sound occurs by adding more phonological, morphological substance. So, we have pre-glottalization, it can become a minus continuant and minus voiced can become constricted glottis in the word-final position,

and more familiar with us is the tapping rule which we saw in one of the last lectures in English.

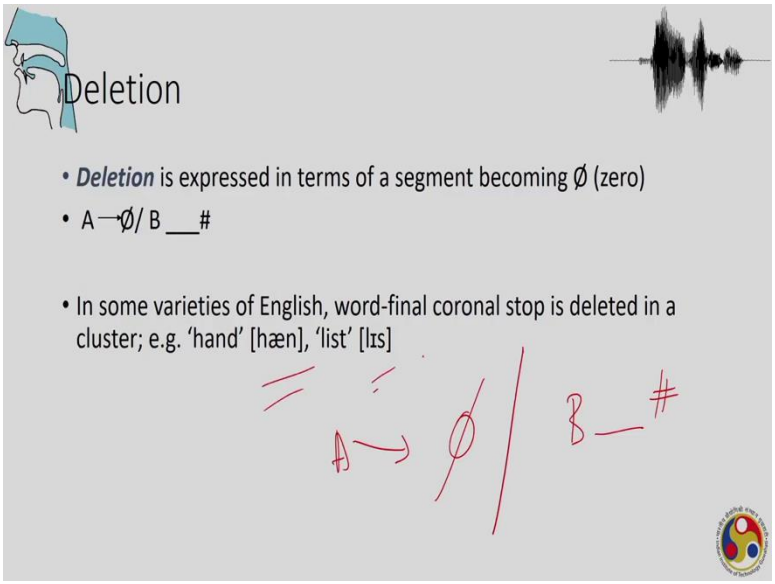
So, the tapping rule is t becomes ta, when it is between vowels, where one is minus stress and whereas, one is stressless. And, the aspiration rule that we know this SG stands for spread glottis, so minus continuant, minus voice becomes spread glottis when in the situation where it is in initial stress position or it is in a syllable initial position.

(Refer Slide Time: 16:39)



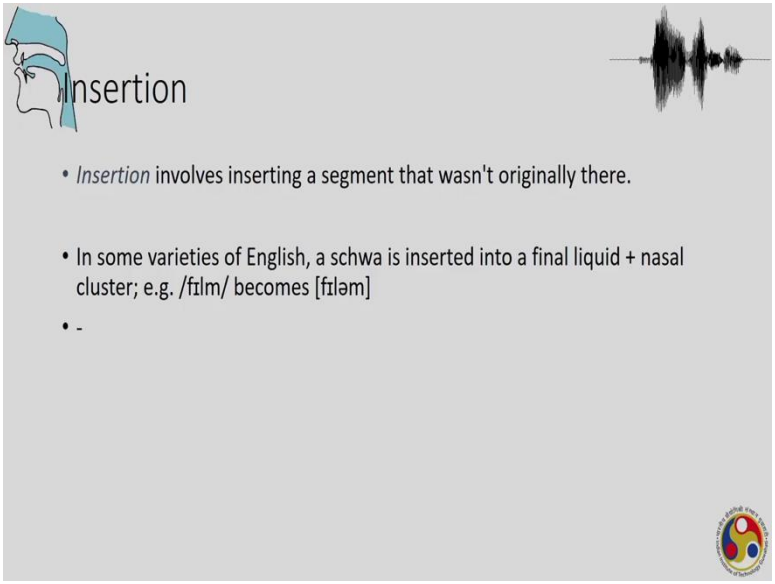
So, there are again other types of rules, feature changing rules, rules which affect individual features or small groups of features like nasal assimilation, flapping, glottalization. There is also rules of dissimilation where two adjacent segments which share some features become different from each other or change your features so that they become different from each other and that is called dissimilation.

(Refer Slide Time: 17:03)



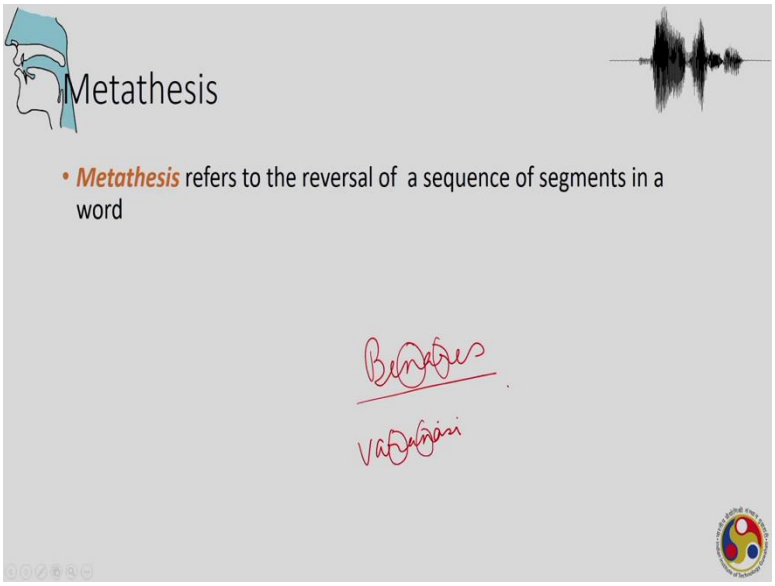
And more common are deletion rules when something is deleted, we use this symbol to express this. So, if in the word-final position, something is deleted, then we would use a rule like this that A goes to null in the context where it is in the word-final position following B. In some varieties of English, the word-final coronal stop is deleted. And this post-nasal deletion is seen here in hand or in list.

(Refer Slide Time: 17:39)



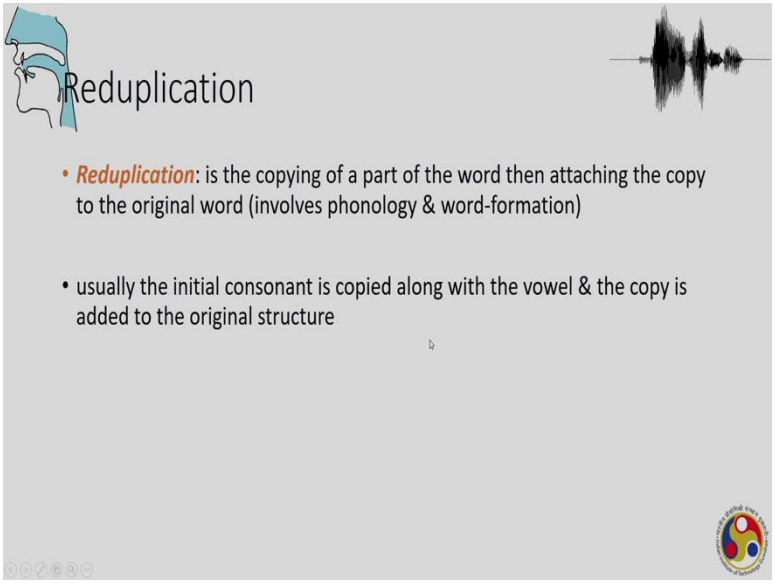
And also, there are processes of insertion, which involves inserting a segment that wasn't originally there. In some varieties of English, liquid, nasal, clusters film becomes philam, which is very common in Indian English.

(Refer Slide Time: 17:52)



There is metathesis is another process, metathesis refers to the reversal of a sequence of segments in a word. And then, we have also metasthesis examples would be if I can think of. So, this is an example of metathesis where we have Banaras, in English, where the n changes its position with the r, and whereas, the r this syllable, so the second syllable, and the third syllable have changed their word-initial onset, switch the word-initial onset from Banaras to Varanasi. So, this is a typical example of metathesis.

(Refer Slide Time: 18:46)

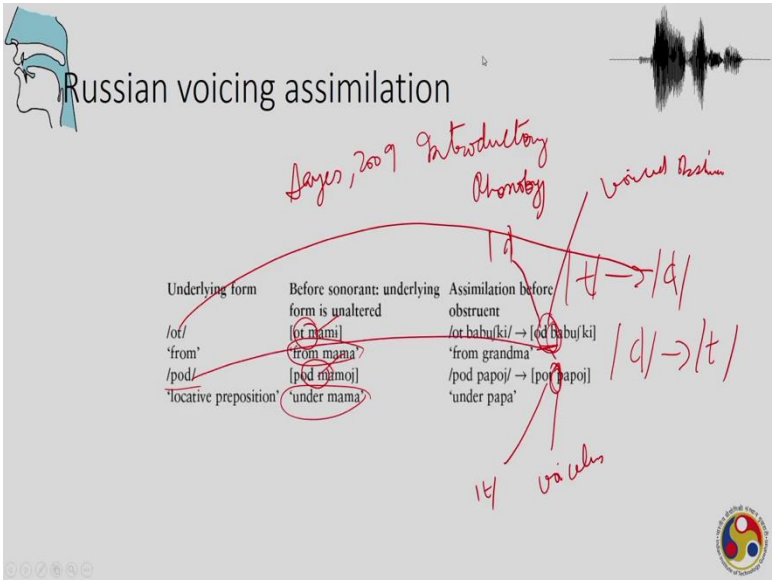


So, we have reduplication as one of the phonological, it is actually morpho-phonological. Reduplication is a huge topic which involves studying, how part of a word or parts of vowels

or consonants are repeated? Is just copying a part of the word and touching the copy to the original word?

And usually, the initial consonant was copied along with vowel but there are many, many different ways in which reduplication can happen in languages and Indian languages have a lot of reduplication or languages spoken in India have a lot of reduplication which can be studied in great detail.

(Refer Slide Time: 19:28)



Now, we can look at a bit more of how rules are expressed. And let us see the Russian voicing assimilation rule. And why is this rule expressed like this? So, look at the data here. So, the data is again from Hayes 2009, introductory phonology. So, underlying form is from ot, otmami, here it is from Mama, pod is a locative preposition, under mama. So, this is showing from and showing under.

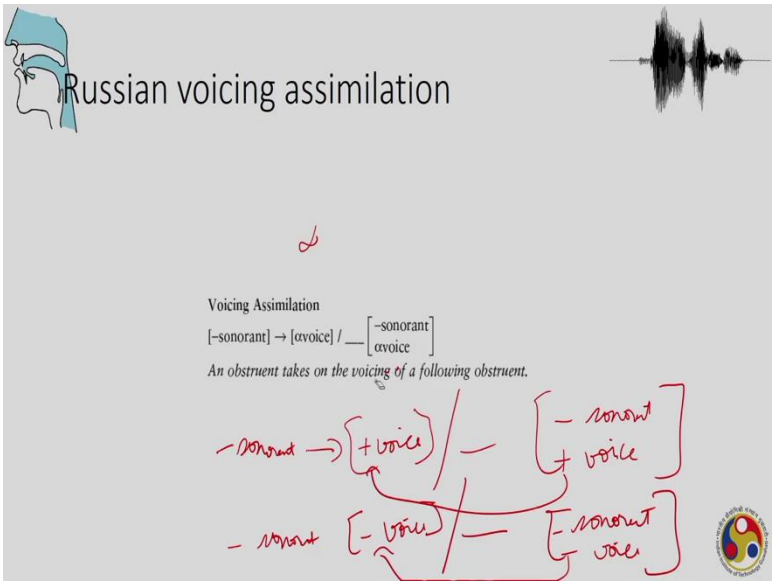
And if we have two words, if we say from grandma, or we say under papa, then what happens to ot and pod? So, ot can change from t to d. Why did this alternation happen? And pod has this alternation of d to t. Now, why do we have this reverse alternation in the two words here? Because, as is obvious that here, of course, we have two different words here we have a nasal, otmami, pod mamoj.

Here we have, we do not have a nasal in babushki which means grandma, we have an obstruent. Similarly, we have an obstruent and in the presence of obstruent, then t and d can

change their underlying form. So t can become d, and d can become t, so it can become reverse of each other. And depending on what the following consonant is?

And the following consonant may change from a nasal to a voiced obstruent and then t will change to d, the voiced counterpart and d will alternate with t, the voiceless counterpart if there is a following voiceless obstruent. So, here we have a voiceless obstruent. And so, we have t, here we have a voiced obstruent, so we have d. So, there is alternation from t to d and d to t.

(Refer Slide Time: 22:24)

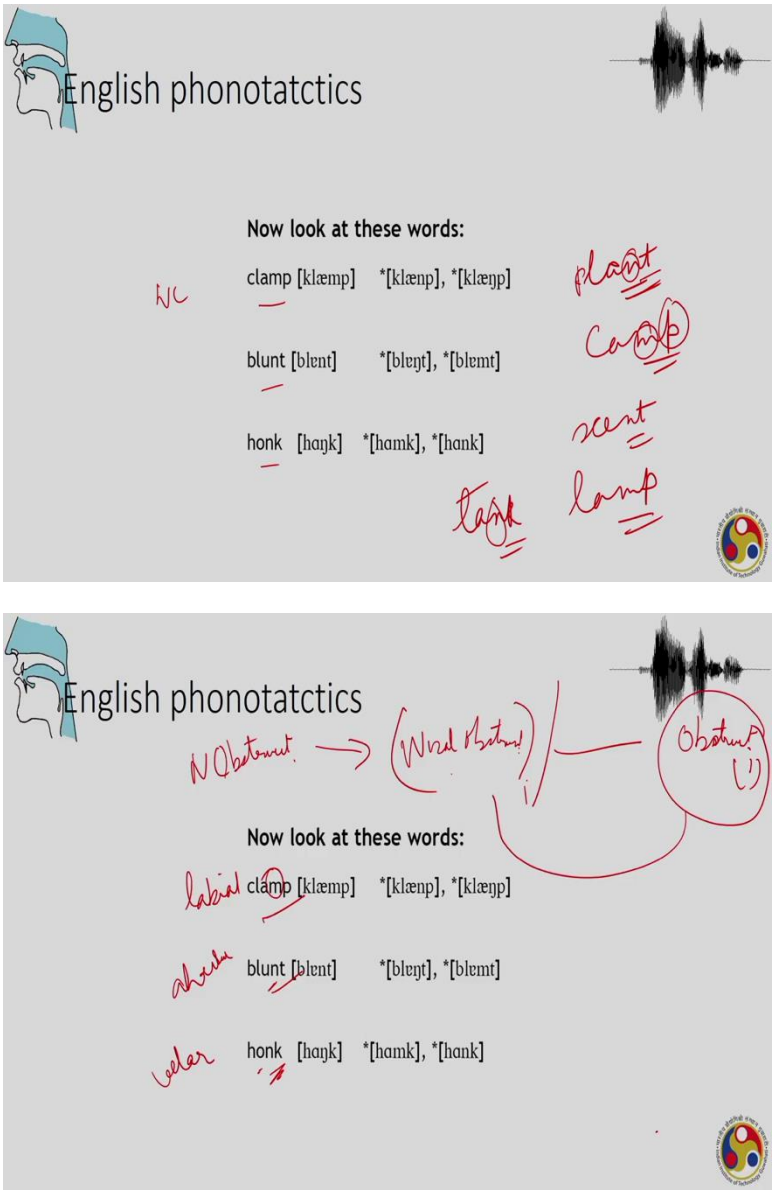


So, how do we express this? So, an obstruent takes on the voicing of the following obstruent. And, why are we expressing this with this notation of alpha? Because we are trying to capture the change of the alternation, that the minus sonorant will either become plus voice, if the minus sonorant is plus voice or the minus sonorant will become minus voice in the context where minus sonorant is minus voice, these two have to match.

So, it has the alternation, the result of the alternation has to match with the voicing feature of the following minus sonorant. So, if it was underlyingly minus voice it will become plus voice, if it was underlyingly plus voice it will become minus voice and that is captured with the use of the alpha voice, which means alpha, if this is minus, this is also minus, if this is plus this is also plus. So, sometimes this can be expressed with an i.

So, index and showing that whatever the value of the voice is, if it is plus this will be plus if it is minus this will be minus.

(Refer Slide Time: 24:17)



We also look at a bit of English phonotactics. English phonotactics is with regard to nasal, obstruent, clusters. So, these are all nasal, obstruent, clusters in English NC, clamp, blunt, honk, and we can take more words if we can think about them. So, let us think about plant or camp or scent or lamp or tank what we see here is a repetition of the place of articulation of the following consonant in these all that we see there.

So, if this is t this is also n, if this is p, this is also m, they are both labial, they are both alveolar, if this is velar, this is also velar. So, what do we see here in English phonotactics? In English phonotactics, now we have an example which shows that a nasal in NC nasal obstruent cluster in the following consonant, is the following obstruent is labial, then the

proceeding nasal is also labial if following consonant is alveolar then the nasal is also alveolar.

If the following consonant is velar, then the nasal is also velar. So, in English phonotactics extend nasal shares the place of articulation of the following of strength. So, like the Russian example that we just saw, we then have to express this by showing that the nasal, and following obstruent share the place of articulation.

So, in an NC nasal obstruction cluster in English becomes the nasal obstruction cluster in English the nasal obstruent shares the place of articulation of the following obstruent. So, we can either index it and show that this place of articulation of the obstruent is the place of obstruent of the nasal which is preceding the obstruent.

So, the nasal obstruent showing that the nasal obstruent share the place of articulation there and that place of articulation is the place of articulation of the following obstruent. Now, although we have to remember that this is a bit simplistic generalization of the use of English phonotactics because we may have other examples where, for instance, like examples like invade, etcetera or even other examples like infallible etcetera.

So, what happens in those words is that this nasal and this obstruent, they do not share the place for articulation. And then, we may have to express that part of the data as saying that whenever there is no corresponding place of articulation for the nasal, the nasal is alveolar. So, this is just to show that if there are phonotactic rules in languages, which can be expressed like this.

And so, now, the end of this lecture now, we have seen that languages have various rules and languages have phonetic rules which are determined by the phonetic context and they are always automatic, always apply in any. So, if the context is given, the rule applies. So, that happens automatically. And then there is sometimes which are rules governed by the morphology, their morphological condition rules and we have seen how that happens in English.

So, English plural formation or English past tense formation, we have seen that those rules, the voicing assimilation, there is determined by morphology, and then we have lexical condition rules. And then we have also phonotactics, which we saw in last lecture, where we

talked extensively about phonotactics about rules versus constraints, and also, we talked about the psychological reality of the phoneme.

And in that lecture, we saw that phonotactics is an integral part of the phonology of a language and right now, we saw how rule can be applied to different tactics. And also, in this lecture, we saw how rules are applicable in context of deletion or in the context of voicing assimilation or in the context of place assimilation etcetera. And how we can express those rules in the format of what we are seen x goes to y in the environment said.

In the next lecture, we will look at rules again, we will look at ordered rules, and we will look at more for phonology. And then, we come to the end of this overview on phonology, but till then, we have more to talk about in phonology. And after that, we also have to talk about syllables. We have talked about features today, and we will see how sonority plays a role in syllabification. And we also have to talk about tone and intonation. Thank you for your attention, and I will see you in the next lecture.