Phonetics and Phonology: A Broad Overview
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Lecture 22
Morphophonological Rules

Welcome to the NPTEL massive online open course on phonetics and phonology, a broad overview and we are continuing with our unit 7 where we have talked about phonological alternations, about finding underlying representations or ordered rules. And in this section, we will continue with those discussions and not just talk about phonetic alternations, phonemic alternations, but also look at what happens when there is a lot of morphological complexity in the data.

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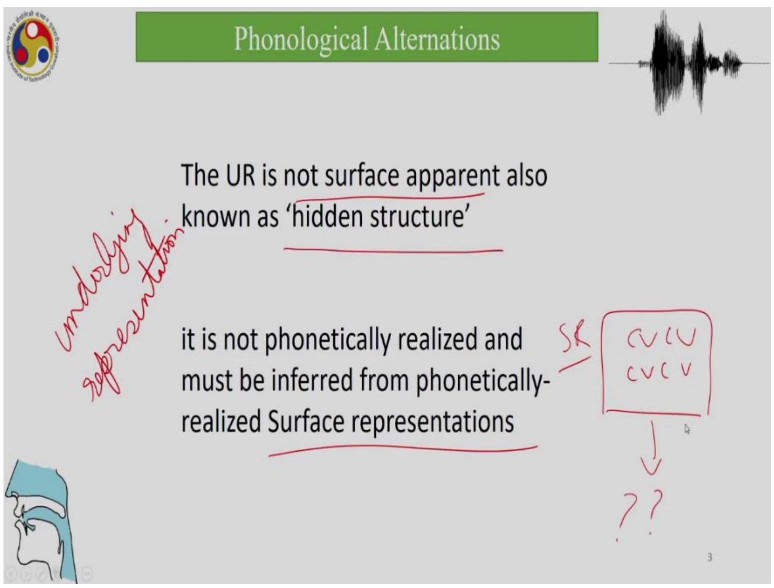

So, as we have already talked about, in the lecture on phonological alternations, the UR or the underlying representation, it is not there on the surface. So, it is not surface apparent and therefore, it is also known as hidden structure which has to be always discovered in a data set. So, it is not something which is phonetically realised and therefore, it must be inferred from the surface representations as what you see in the data, as your consonant and vowel combinations, that is your surface representation and that UR has to be inferred from this data. So, the UR is not there in the data that is presented to you or not there, when you hear speech, that is not underlying representations that you hear. So, if phonological analysis you try to understand hidden structures.

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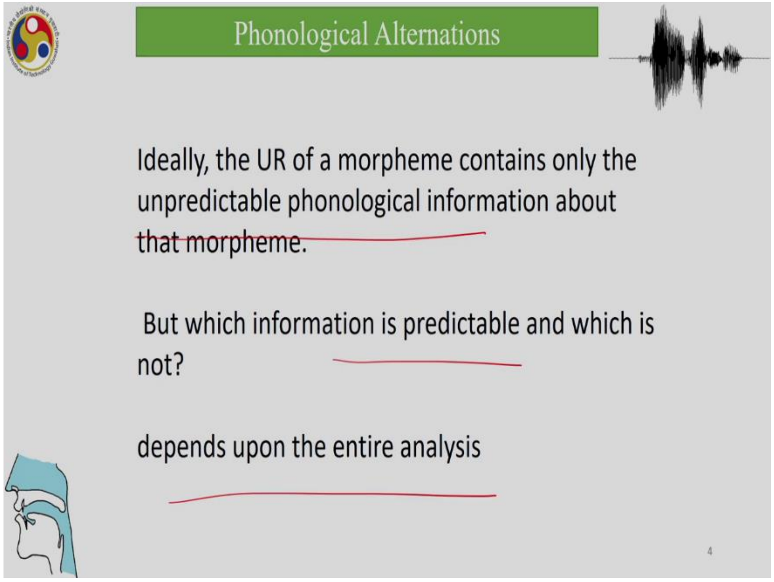

So, again as we have discussed before of the underlying representation of a morpheme contains only the unpredictable morphological information about that morpheme and the information is unpredictable, but how do we know which information is predictable and which information is not predictable? And the answer is entirely in the analysis and we will see in more detail today how we can proceed with that analysis.

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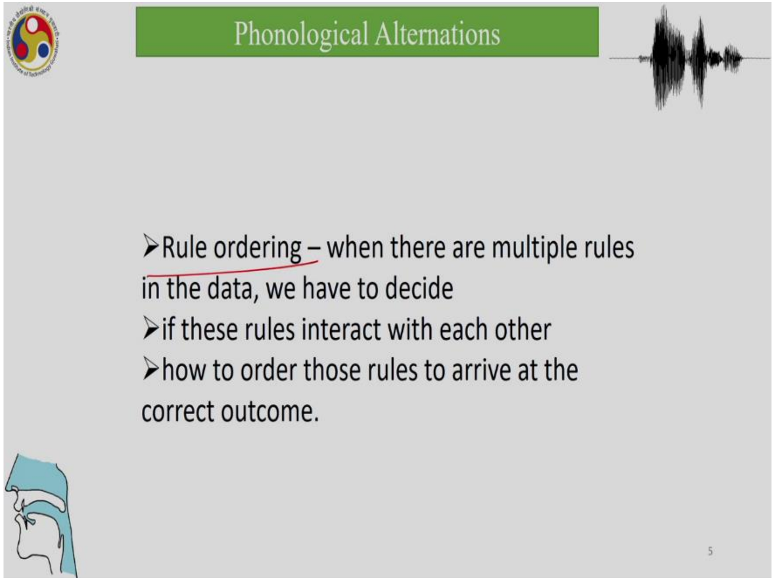

When we talk about alternations, both phonological alternation and morphophonological alternations, something which is of utmost importance is rule ordering. When there are multiple rules in the data, we have to decide if these rules interact with each other, how to order those rules to arrive at the correct outcome?

So, when we are doing analysis, phonological analysis, we not only find out rules, we also have to find out if there are to analyse a given set of data, we need more than one rule and if we have more than one rule, do they need ordering, is it necessary to place one rule before another rule so that one rule applies before the other rule and what is the order of two given rules and if they have to be ordered that means that the rules interact for the given set of data. So, we will not talk about phonological alternations now, we will talk about morphophonemic analysis.

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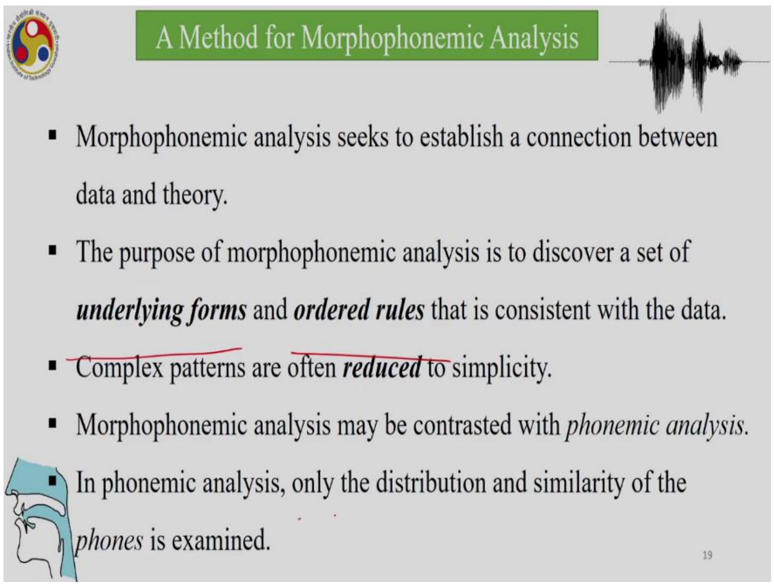

And what is a morphophonemic analysis? It seeks to, what does it do? It seeks to establish a connection between the data and theory and of course, because it is about morphophonemic analysis, it is data phonological data with morphological complexity. And the purpose of morphophonemic analysis is to discover a set of underlying forms and ordered rules that is consistent with the data.

So, as we just discussed, the two important things here would be underlying forms and ordered rules. And complex patterns can be described with great simplicity, if we find the underlying patterns, the underlying forms and see how rules are applying to those forms to give us the surface representations. And morphophonemic analysis may be contrasted with phonemic analysis, which we looked at in the previous lectures. What happens in the phonemic analysis? It is only about phones and phonemes.

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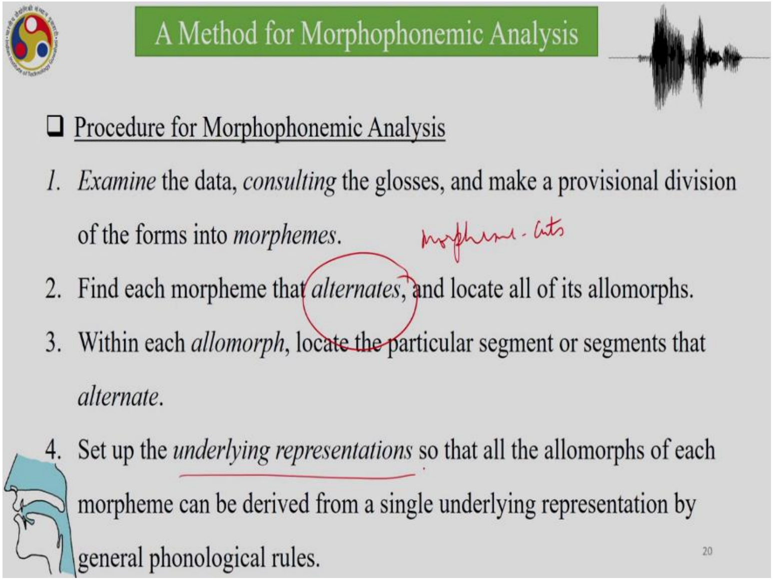

But morphophonemic analysis involves morphological complexity data which is morphologically complex. What is the procedure for morphophonemic analysis? We have to, of course, examine the data, we have to look at the glosses and make provisional division of the forms into morphemes.

So, we have to make some, what is known as, morpheme cuts and find each morpheme that alternates and locate all of its allomorphs. So, also, we have to see if there is alternation in the data. And within each allomorph, locate the particular segment or segments that alternate. And once we find the allomorphs, we have to locate the regularity of a process, we have to look at the segments, which are alternating.

And then we have to set up the underlying representations so that all the allomorphs of each morpheme can be derived from a single underlying representation. Remember, this is like what we did for phonemic analysis, but here, this has to be extended to morphemes, to more than one morpheme, in a word. So, like any analysis here also, we have to do some pre-processing. So, how do you pre-process the data?

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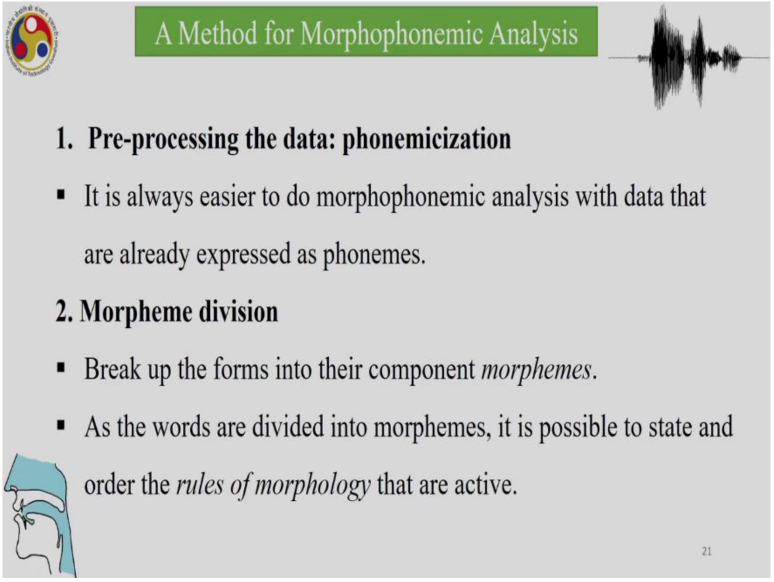

It is always easier to do morphophonemic analysis with data that are already expressed as phonemes. So, if they are not, then there is some further difficulty there and we have to make the morpheme division, the morpheme cuts and we have to break up the forms into their component morphemes, not just the phonemes, remember, the morphemes. And as the words divided into morphemes, it is possible to state and order the rules of morphology that are active.

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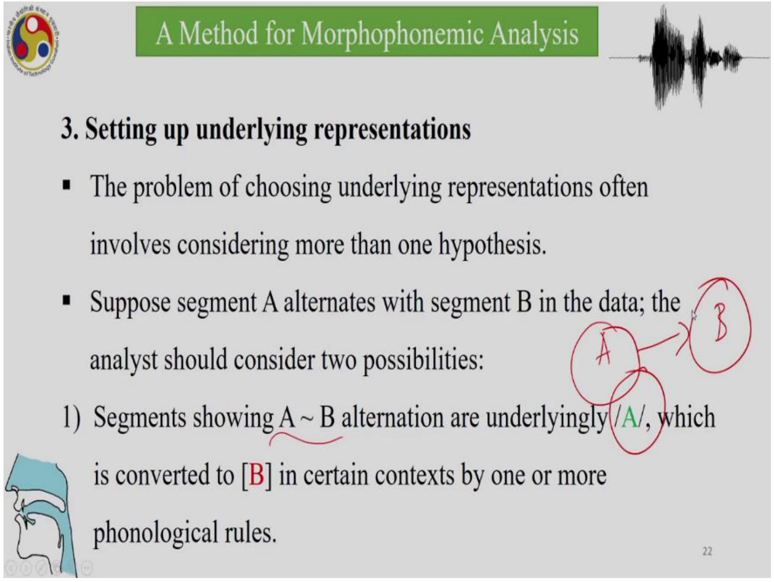

And setting up of underlying representations, it is a problem of choosing underlying representations often involve considering more than one hypothesis. And suppose segment A alternates with segment B in the data, the analysis should consider two possibilities. Segment A, segment showing alternation A, B alternation underlyingly /A/ which is converted to [B] in certain contexts, the rules apply and become B by one or more phonological rules. And this is one possibility that what is the unit, what is the unit which is changing, it is A which is changing to B, this is one possibility, as is the case with all phonological rules, if there is alternation, something changes to something else.

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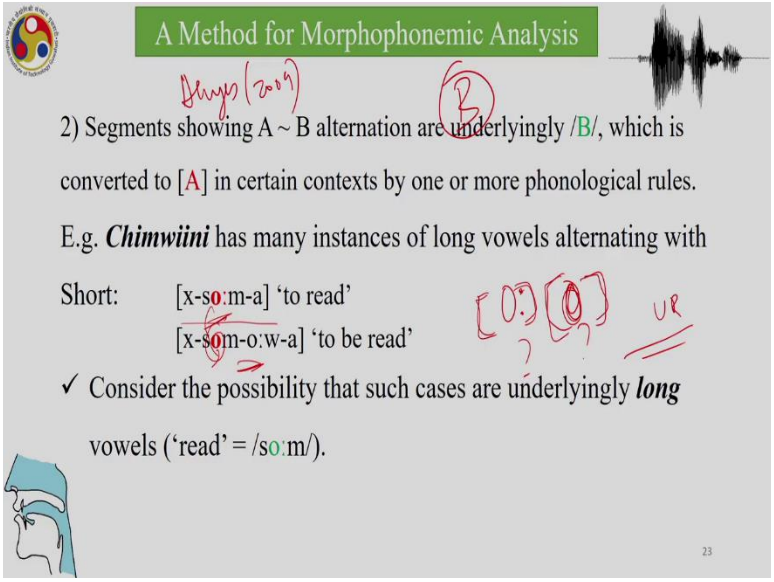

And segments, or the other possibility is that when you see an alternation that A, B alternation, the other possibility is that the underlying segment is not [A] but it is /B/, which stays as /B/ and in its context, but is converted to [A] in certain other contexts by one or more phonological rules. So, we have some data from Chimwiini, all the data analysis is from Hayes 2009. So, Chimwiini has many instances of long vowels alternating with short. So, we have the data of, we have the "khosooma" to read and "khosomoowa" to be read.

Now, we have this long vowel here, this long vowel here, this long vowel here is shortened. So, now, the problem in front of us is that we have two versions of the vowel o here. So, we have to now find out from the data if this or this is the underlying representation. So, which one is the underlying form? Is it underlying a long vowel or is it underlying a short o? How do we find out this from the data? So, that is how all these questions are put before you when we have phonological data, that what is the form which is alternating and to find out the form which is alternating, we have to find out the underlying form.

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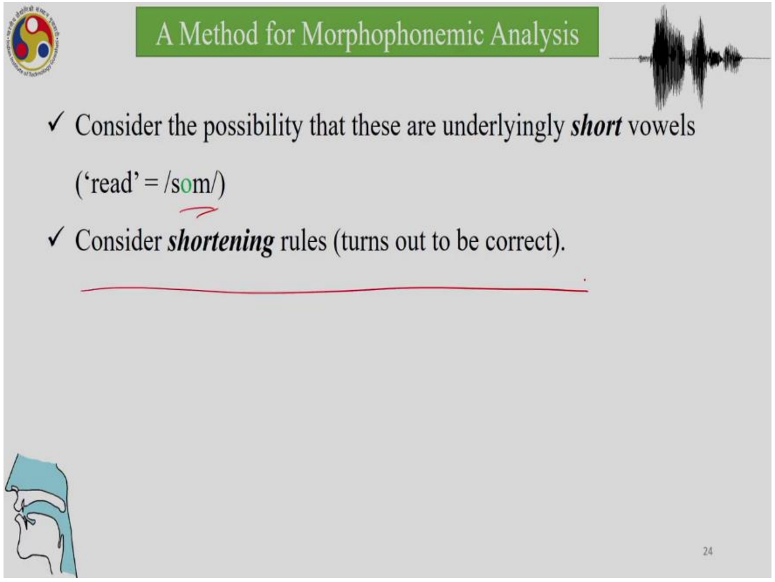

So, suppose we consider that the underlying form is a short vowel. So, which means, as the rule applies that all long vowels will become short in this context. So, underlying do you have a long vowel as in "khosooma" and this is becoming short as "khosomoowa" because of the addition of other morphemes here and the phonological context, which is provided by that morpheme.

So, the question that we have in front of us is it shortening or is it lengthening? So, the two words that we have in front of us shows that in one context, we have a long vowel and in one context, we have a short vowel. So, this is our short vowel, this is our long vowel. Now, what is inducing this change? So, if it is an underlyingly long vowel, then we have a shortening. If it is underlying a short vowel then it is lengthening. So, if it is an underlyingly short vowel, this is "o" if it is underlyingly a long vowel then it is "oo". So, it is a shortening rule.

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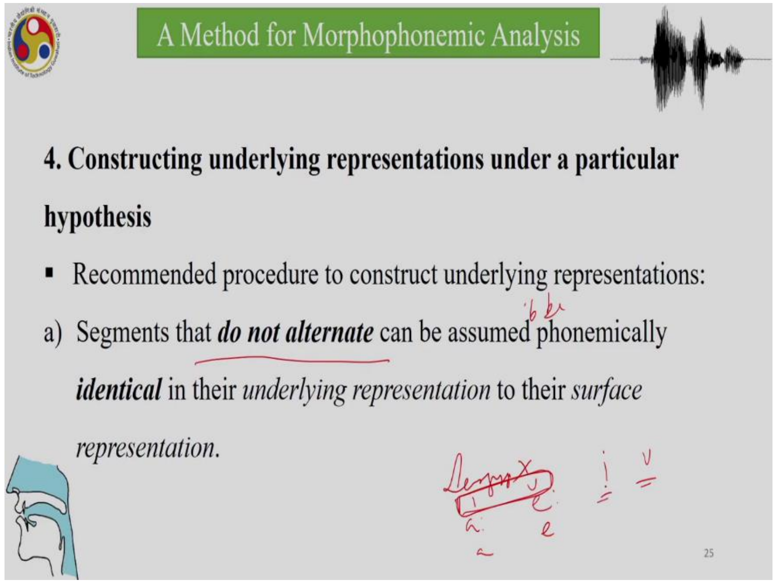

But how do we find out that, it is a “oo”? There is no algorithm and such in phonology to find out the underlying forms, but there are tried and tested methods of analysis. So, constructing underlying representations under a particular hypothesis. A recommended procedure to construct underlying representations, segments that do not alternate, can be assumed to be phonemically identical in their underlying representation to their surface representation. So, one as we just said that tried and tested things, one of them is that we often find segments which do not alternate.

So, if there is no alternation, if, for instance, language X and in that language a: lengthenings or e: lengthenings, but we have a and e, but we never find i or u lengthening in this language X, then we can pretty much be sure that this is identical. So, i and u, we never find i and u in any context to have lengthen. So, then we can be pretty much sure that they are identical to their underlying representation. Basically, no alternation means that there are no changes involved from A to B.

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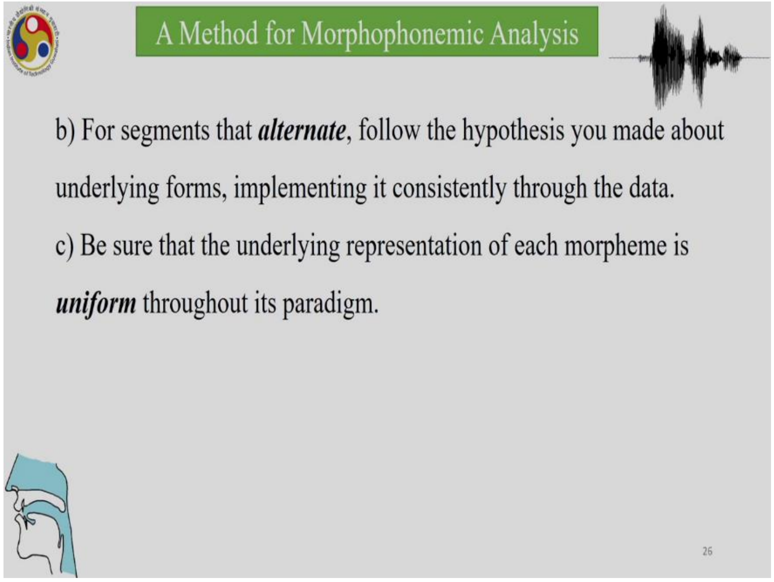

For segments that alternate, follow the hypothesis you made about underlying forms implementing it consistently through the data, that is another important aspect, that you not only have to apply your underlying forms to all the forms where it is alternating, but in all the forms whether not alternating, also to check whether there is any wrong predictions. So, hence, we have to check underlying forms that we construct for an entire set of data and not just for the forms which, where we see alternation. So, be sure that underlying representation of each morpheme is uniform throughout its paradigm.

So, you cannot have multiple underlying forms for the same surface form, but then there are other issues there, which we will talk about. There can be sometimes, underlying forms, which are different underlying forms for similar surface forms, but that is another thing altogether. But here, what we are talking about is that there should be uniform underlying forms so you cannot change the underlying form or else you will be predicting different surface forms.

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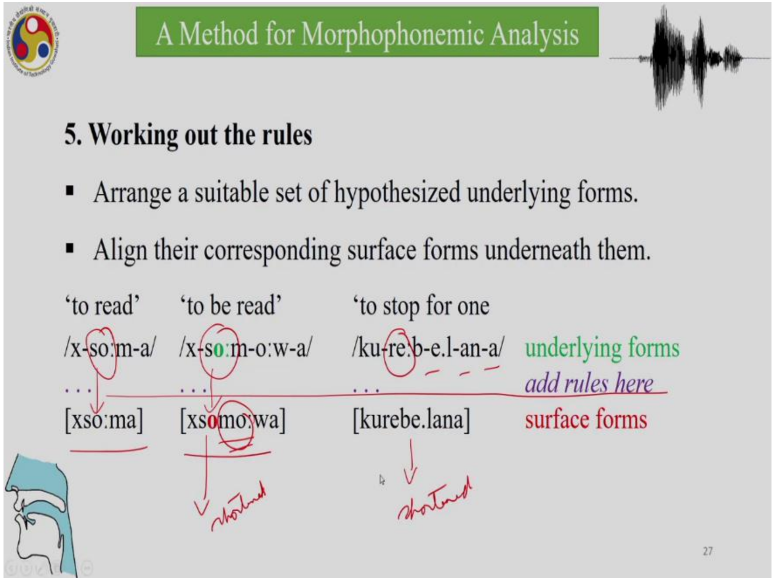

And then, we have to work out the rules. So, we have to arrange a suitable set of hypothesized underlying forms and align their corresponding surface forms underneath them. And suppose we take these forms now with this Chimwiini data that we just saw some time back, where we saw length and vowels, now we have so much of lengthening here, and we have a long a and we add our rules, the rules, let us for the time being not tell you what the rules are, and then we get all these surface forms.

So, what happened here, here we have the same form here, as in a lengthened o and here, unlike that word, here, we have a long o while we have a shortening here. And we not telling you the rule what exactly it is, but because we have put the same underlying form, because of the application of the rule now, we can get these correct forms.

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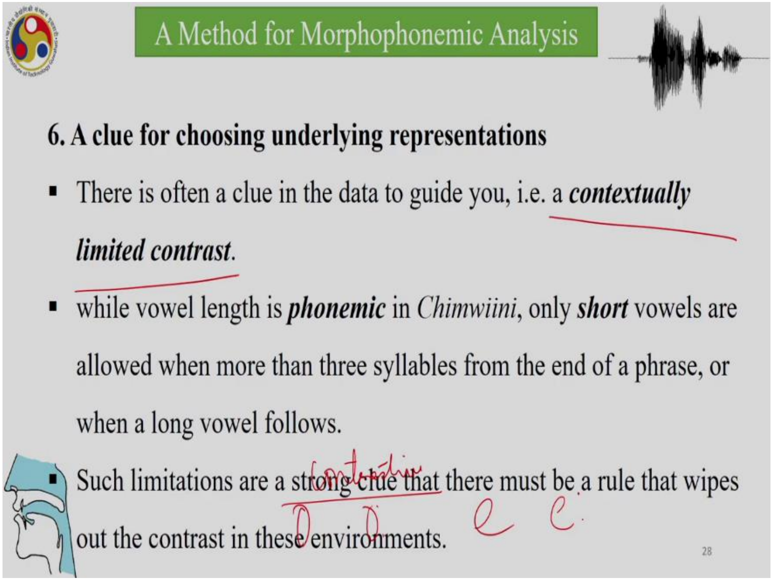

Now, clue for choosing underlying representations, there is often a clue in the data to guide you that is, contextually limited contrast. And while vowel length is phonemic in Chimwiini, only short vowels are allowed when more than three syllables from the end of the phrase or when a long vowel follows.

So, what is happening in Chimwiini, we showed you in a few slides before that, there are long as well as short versions of the same vowel and what seems to be the same morpheme in one place, we have the longer vowel in one and same place, we have a shorter vowel. So, context, contextually determined contrast is something which is contextually governed contrast, is something which is found quite often in phonological data.

So, what happens in Chimwiini is that, while vowel length is phonemic, which means there is a contrast between long and short e’s and long and short o’s contrastive, but, it is contextually governed contrast, the contrast is not found everywhere. So, short vowels are allowed when there are more than three syllables from the end of the phrase or when a long vowel follows.

So, what happens in our data here? So we have a long vowel following this, so this vowel is shortened. Again, this underlying long aa, we have how many syllables, we have 1, 2, 3 syllables following it, and that is why again, this is shortened. So, there are long and short vowels in Chimwiini but the long vowels can become short, because of certain context, the context of the following long vowel or three syllables from the end of the word, presence of more than three syllables from the end of the phrase.

So, such limitations are a strong clue that there must be a rule that wipes out the contrast in these environments. So, now, the contrast is not allowed to be seen in certain contexts, it is governed by, the contrast is taken away or wiped away or removed in certain positions. And we just now saw what they are, there is a following long vowel or more than three syllables from the end of the phrase. So, that is the limitation here. The long vowel's appearance in all positions can be curtailed by such contexts.

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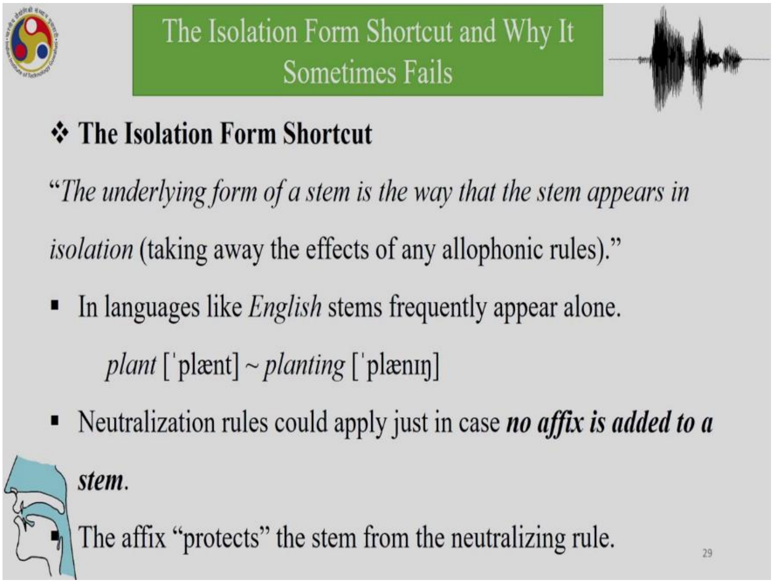

And finally the isolation form shortcut. The underlying form of a stem is the way that the stem appears in isolation, taking away the effects of any allophonic rule. So, the underlying form, so one of the hypothesis of the underlying form is that it is the one that appears in isolation, we will see how that works out.

In languages like English, stems frequently appear alone. So, as in plant, planting, we have t deletion there, neutralisation rules could apply just in case no affix is added to a stem. So, the isolation form that is here, the plant, then that is occurring with its underlying form, but when we have affix is added, then we have we can have what is happened here to plant, planting. So, the affix protects the rule from the neutralizing rule.

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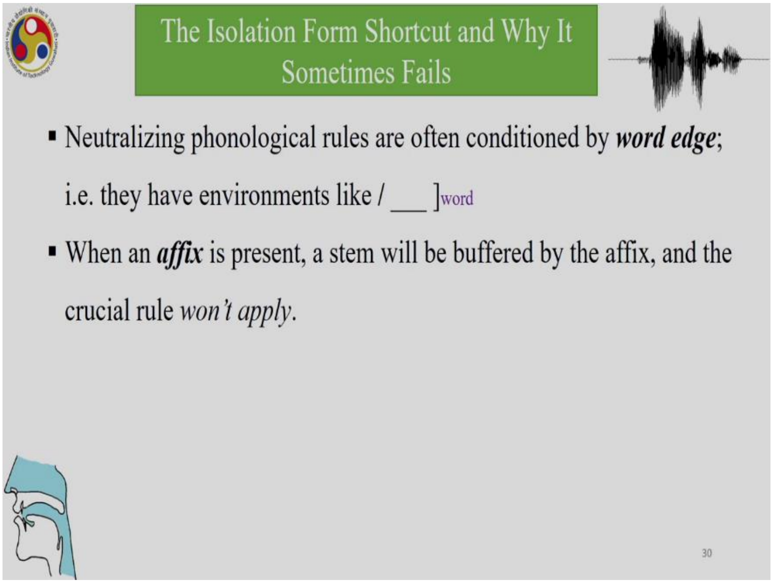

So neutralising phonological rules are often conditioned by the word edge, that is, they have environments like word and when an affix is present, a stem will be buffered by the affix and the crucial rule will not apply.

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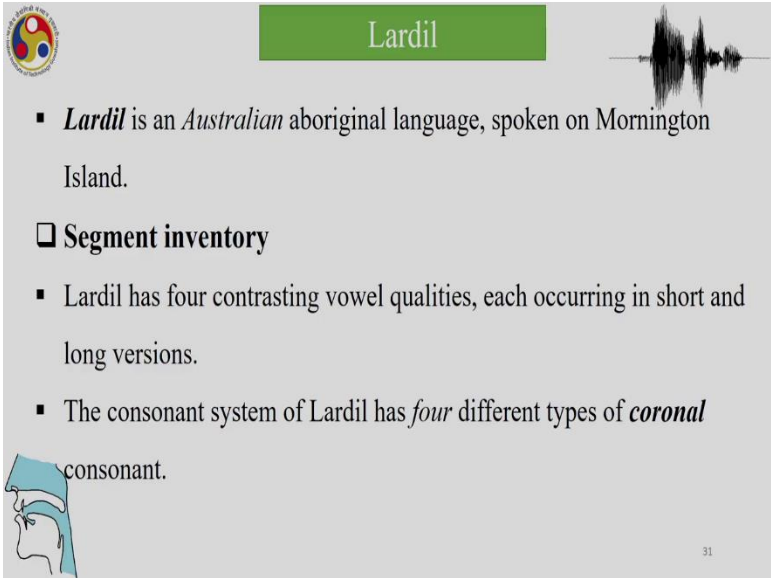

So, let us see of this example of Lardil. Lardil is an Australian aboriginal language spoken on Mornington Island. So, the Lardil segment inventory is such that it has four contrasting vowel qualities, each occurring in short and long versions. The consonant system of Lardil has four different types of coronal consonants as well.

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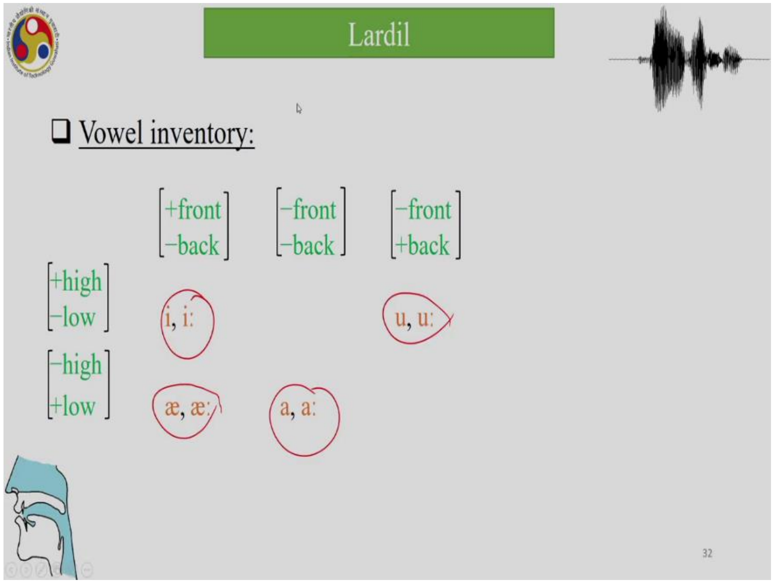

So, these are the Lardil vowels we have a long i, short i:, long u, short u:, long ae, short ae: and long a, short a:

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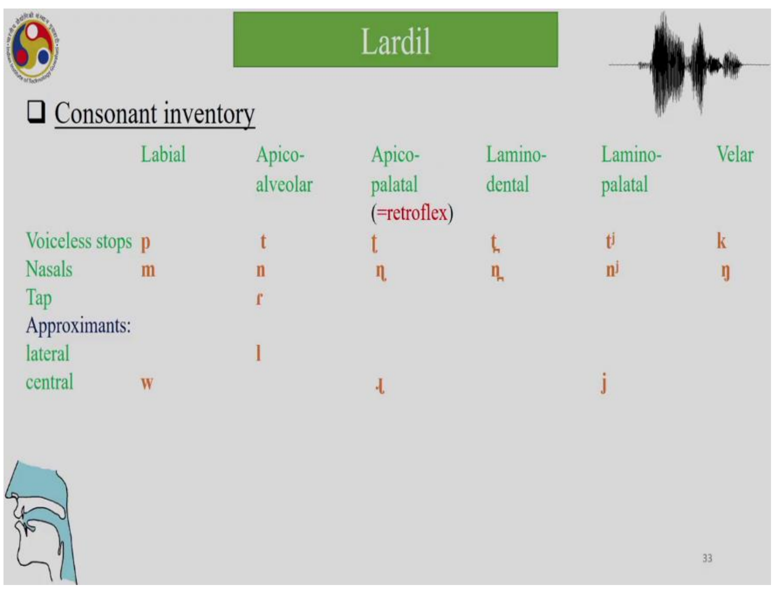

So, we have various contrasts in the consonant inventory as well. We have Apico-alveolar and Apico-palatal or retroflex consonants and Lamino-dental context and Lamino-palatal and Velar consonants as well.

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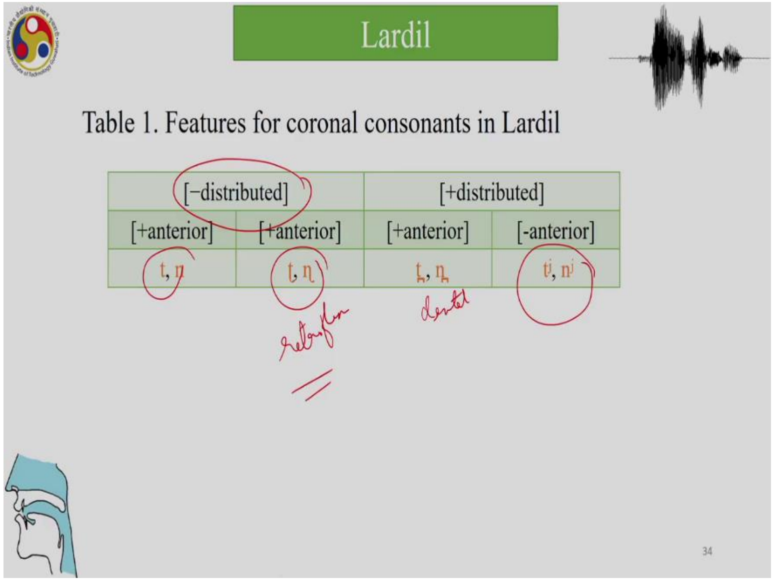

So, what we saw from the feature inventory in our previous lecture, we saw that among coronal consonants, we can divide them into the distributed, minus distributed can be anterior or plus anterior or minus anterior, where the minus anterior could be the ones which are palatalized and the plus anterior ones are the dental ones, the Lamino-dental ones and the plus anterior minus distributed ones are also the retroflex consonants.

So, what is important to note here is that among the coronal set, we have both minus distributed and plus distributed where we have alveolar and retroflexes which are minus distributed and which are both plus anterior as well but even the plus distributed set, we have the dental and palatalized consonants. So, a big inventory of coronal consonants in Lardil which can be divided based on their featural properties of minus distributed plus distributed and plus and minus anterior.

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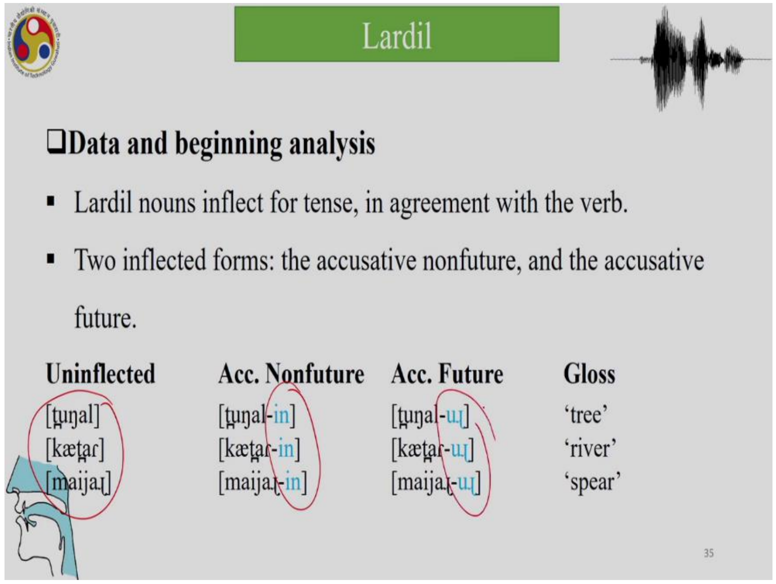

So, data analysis of Lardil, you can see that Lardil nouns inflect for tense in agreement with the verb and the two inflected forms the accusative non-future and accusative future. So, we can see that the uninflected forms do not have any affixes and accusative non-future has these affixes and the accusative future has these.

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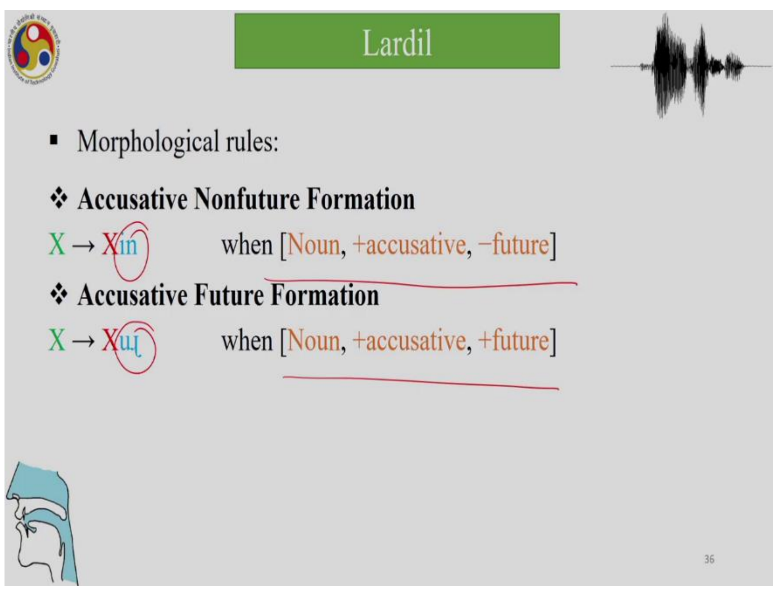

So, now, let us see what morphological rules that we have in Lardil. Lardil when we have noun and accusative minus future we have this morpheme, when you have noun plus accusative plus future, we have this morpheme.

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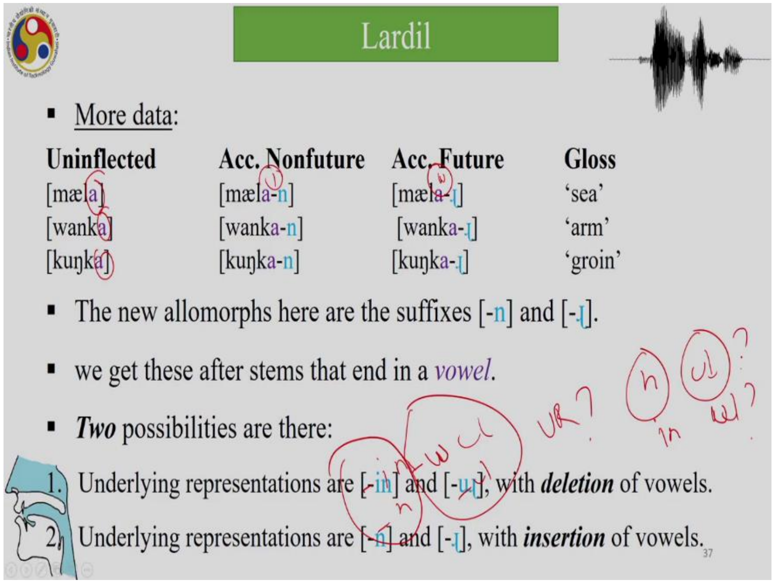

Now, with that knowledge, let us move on and look at more data from Lardil. So, what we see that in the uninflected form, we have one affix here, we have one sort of change there, which we did not see in the data previously. So, we do not see a final a in the uninflected forms. And also, here, because we have a, now interesting things are happening here, we do not get the i here, and we do not get the central vowel here, those are missing in the accusative non-future and accusative future.

So, we have now as you remember from your English data, where we discussed allomorphs. Now, we have allomorphs in Lardil, so we have in versus na. So, have these two allomorphs, while the accusative non-future and accusative future we have these two allomorphs.

So, another common thing that is seen in languages is that when we have a vowel ending and then the following suffix also ends in vowel, then there is deletion, there may be deletion of one of the vowels because the structure where two vowels occur in the same place is often avoided in languages and languages try to have one syllable there instead of two.

So, vowel initial syllables are avoided most of the time, and that is why we have a vowel deletion. And that is why also we can see that i and a are deleted because the final a in the uninflected form. Now, that is one way of thinking about the data that the i and a are deleted. What is the other way of thinking about this? That this na and this rhotic, they are the underlying forms. So, which is the underlying form this one or this one?

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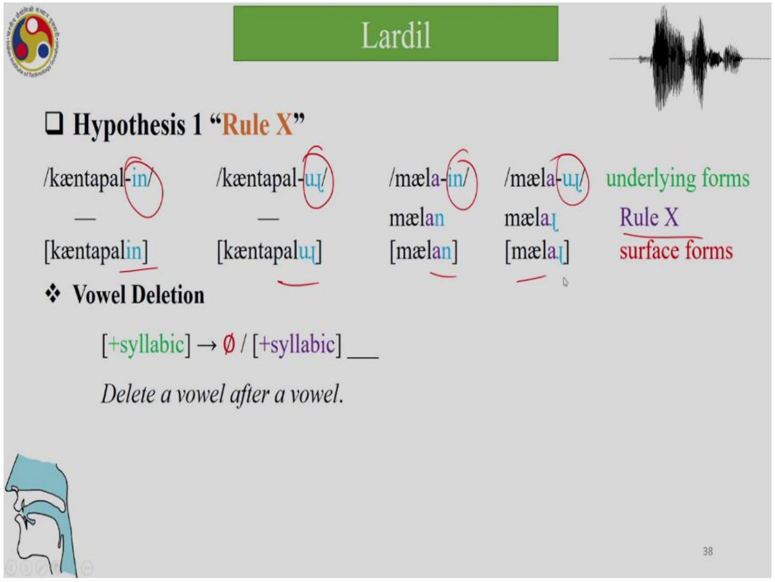

Now, we can work with both the hypothesis to see which one is effective to help us analyse the data that we have. So, to verify that, let us now have our affixes with the vowels across all the forms. So, remember, when you said that you have to use the same underlying form across all your data, that is what we are doing now.

And now when we do that, and we have to add rule X, which says that remove the two vowels, two conservative vowels, and let us see whether we get our surface forms. So, we get the surface forms, we add this rule, we apply this rule and we get our surface forms. So, we are saying that this is a rule of deletion. So, delete vowel, and in a situation where there are two vowels, one after the other deleted vowel, after a vowel.

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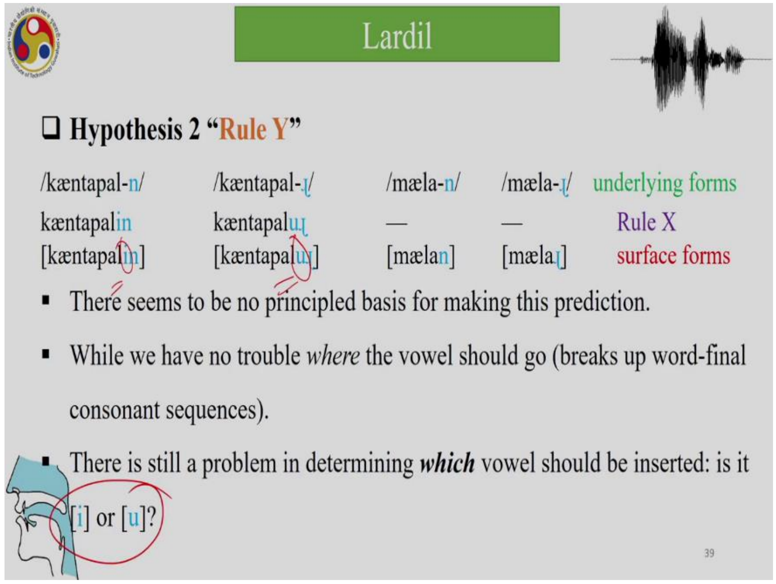

The other option with us is that the hypothesis 2, that the underlying form does not have the vowel the underlying affix does not have the vowel. And the vowel is inserted because of two consonants occurring together. So, now, when we do that, what do we get? So, if we say, insert a vowel, if there are two consonants together, then we would get these forms as before.

There seems to be no principal basis for making this prediction. While we have no trouble, where the vowel should go, breaks up word final consonant sequence, there is still a problem determining which vowel should be inserted, is it [i] or [u]? Now that is a crucial question here.

How did we know that we have to insert i here, versus we have to insert u here, there is nothing in the environment telling us that there should one should be i one should be u. While there is nothing wrong, in saying that, we have to insert a vowel between two consonants because two consecutive consonants, they are not possible in the coda position in this language. But that is a possible way of explaining this, but we do not have any way of explanation of why we get two different vowels. And something that you can remember that in languages, there is always, if a vowel is epenthetic, then the vowel would be the same in all the forms.

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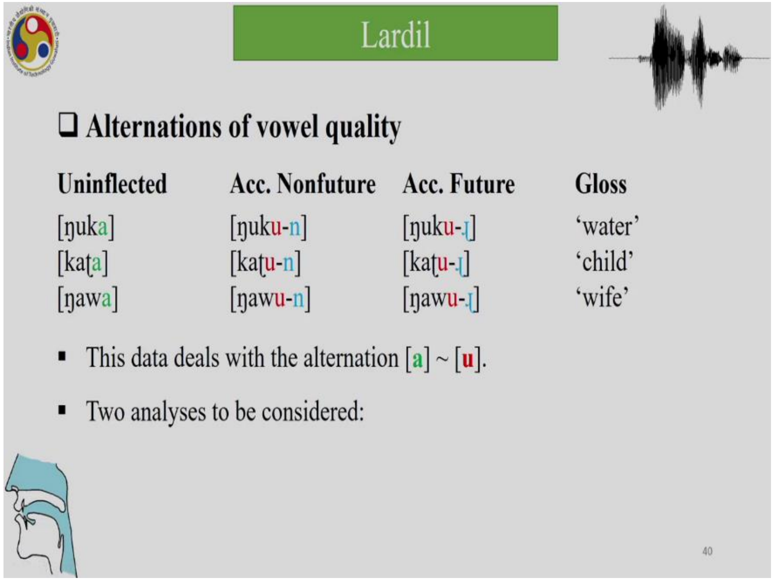

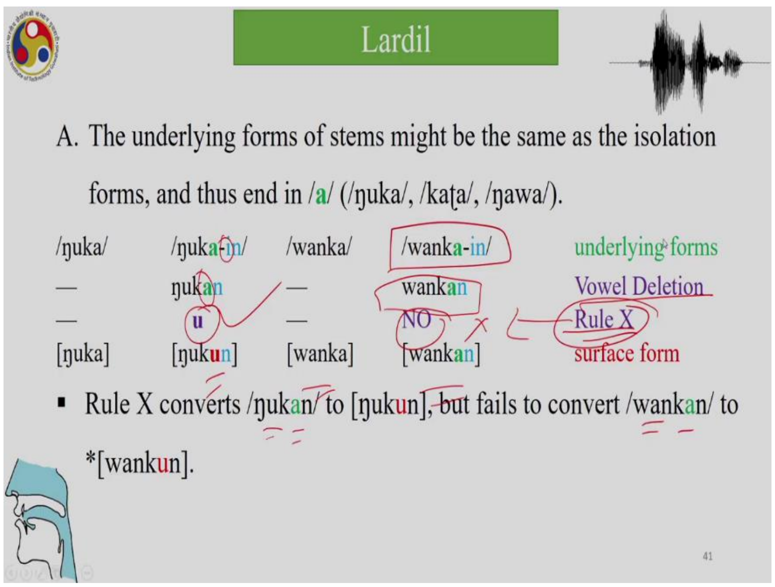

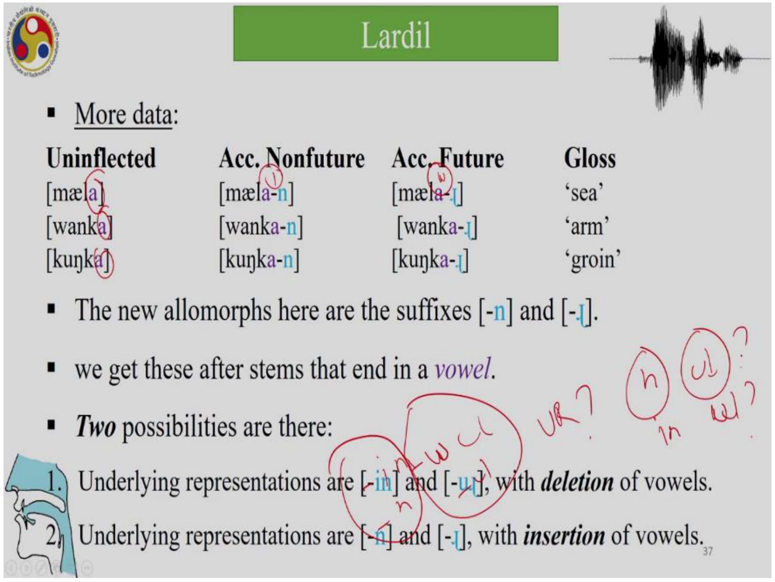

Now, we have all these forms that you see here and the data deals with the alternation of a and u and two analysis to be considered the underlying forms of stems might is seems as the isolation form, that is, nguka, kata, ngawa and if we add u in ngukun, so we get the form ngukun.

So, suppose we have the rule of vowel deletion there unlike what is said, the other hypothesis that we entertain of insertion if we do not entertain it anymore, and we have this rule of vowel deletion and then we have a rule of u insertion, then we can explain why we get ngukun here, as we see in this new data that we have of Lardil.

So far, our Lardil data had these words. Now, we have this data, where we are using the, where we can now consider the vowel deletion rule to be applicable, but we have some more complexity here. So, what is happening here is that we do not get either this vowel or this vowel, and we get a different vowel, which is not the case in this word.

So, here wanka-in is the rule of vowel deletion applies correctly, we get wankan, but in the final surface form, it stays wankan. The intermediate rule here that we have rule X does not apply here, it does not apply but it applies here. So, what more is happening in Lardil apart from vowel deletion? So, rule X converts ngukan to ngukun, but fails to convert wankan to wankun. So, something to note here is that the two vowels here are different. Whereas the two vowels here are the same.

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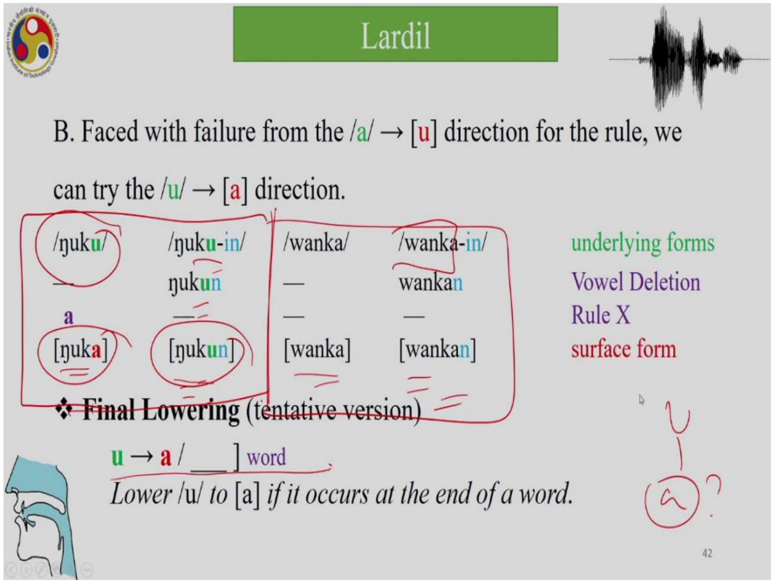

So, faced with the failure from the a to u direction for the rule, we can try the u to a direction. So, now let us add some more interesting analysis to the Lardil data and see what if we, instead of trying to say that a to u why do not we think that u goes to a?

So, let us think that data we have is, is not nguka but nguku. So, which means our underlying form is nguku and as a result, what are we supposed to get? We get nguku and finally we get ngukun and whereas wanka is wankan, it does not have to change because the final form is also wankan.

So, there is no problem in this derivation with wankan but the problem is with the derivation with ngukun because in one form, we are getting nguka in another form we get ngukun. So, we can draw a distinction between this set and this set nguku and wanka where here we get one form is nguka and one form is ngukun whereas wankan and wankan remains the same.

So, again, we can say that Lardil has something called final lowering, u goes to a in the final word position, as you see in this word in nguka, so u lowers to a and so we get nguka, lower u to a if it occurs at the end of a word.

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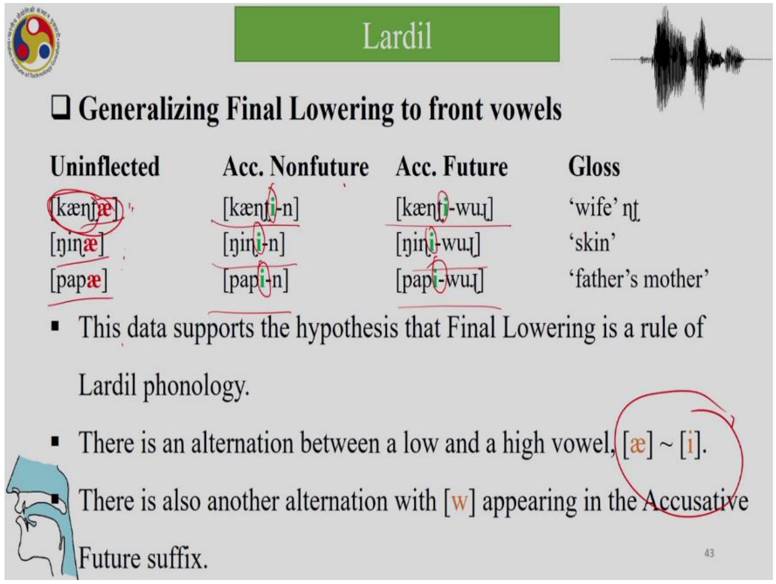

Now, actually we need more data to see what is happening in Lardil. With the data that we have seen so far, we will not be able to say if there is final lowering in the Lardil or not. So, there is final lowering in Lardil, how do we know that? Look at this data that we have in front of us. So, we have kentae, we have nginae, we have papae we have kentin, we have nginin, we have papin, we have kentiwur, we have nginiwur, and we are papiwur.

So, when we have kent, which is the underived form, note that when the form is kentae in the accusative non-future, we consistently find i in accusative future, again we consistently find i. So, which means there must be a rule of lowering, which means that the underlying i must have changed in the uninflected form.

So, this Lardil data shows us something very significant, it shows us that morphemes here can appear in different shapes, and you can see the underlying form in a derived form and in the inflected form, you can see the underlying form and not in the uninflected form, in the uninflected form we have further phonological rule applying.

So, as a result, the data supports the hypothesis that final lowering is a rule of Lardil phonology, as you can see in the uninfected forms, we do not have the i we have ae which means a lower vowel. So, there is an alternation between low and high vowel ae i as we have just discussed, and there is also another alternation with wa appearing in the accusative future suffix.

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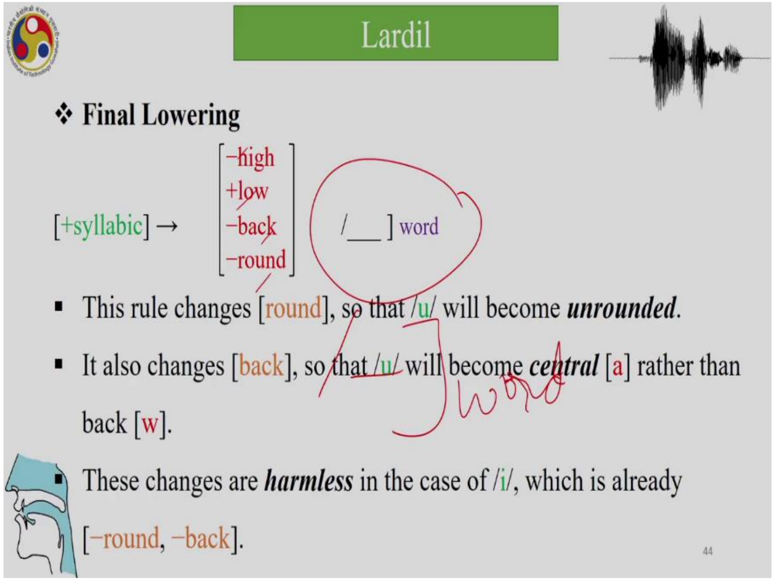

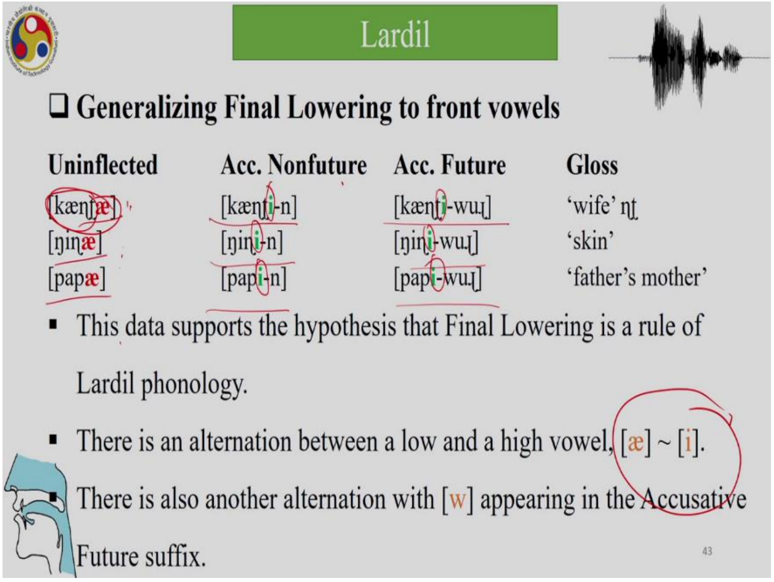

So, what is final lowering? A vowel becomes low, this is minus high and low and minus back minus round in the word final position as shown by this, the way this is written as we have discussed rule writing before. So, this rule changes round so that u will become unrounded.

So, the u becomes unrounded and as a result, we have changed to i in the accusative future also. So, this rule which changes u to unrounded, it does not affect i u which is already minus round and minus back.

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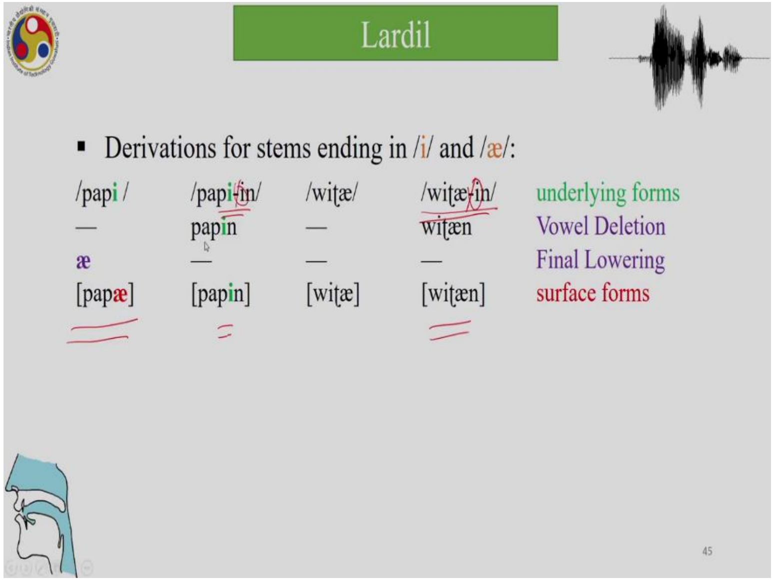

So, now looking at the Lardil data, we have a couple of rules to work with. So, now we have initially if you recall, we had the first we found that there is vowel deletion in Lardil and then we found that there is vowel lowering in Lardil and then we, as a result of post vowel deletion and vowel lowering, we have forms like papi appears as papae and papin, two i's appears with only one papin. And similarly, witae-in, we have witaen where i is deleted, the i which underlyingly was there in the morpheme is deleted.

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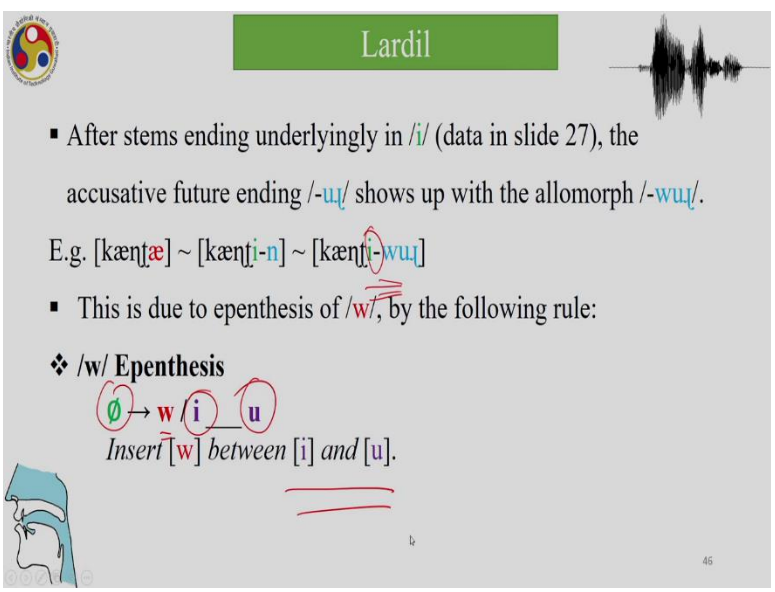


Lardil

❑ Generalizing Final Lowering to front vowels

Uninflected	Acc. Nonfuture	Acc. Future	Gloss
[kæɳʈæ]	[kæɳʈi-n]	[kæɳʈi-wuɻ]	‘wife’ ɳʈ
[ŋiɳæ]	[ŋiɳi-n]	[ŋiɳi-wuɻ]	‘skin’
[papæ]	[papi-n]	[papi-wuɻ]	‘father’s mother’

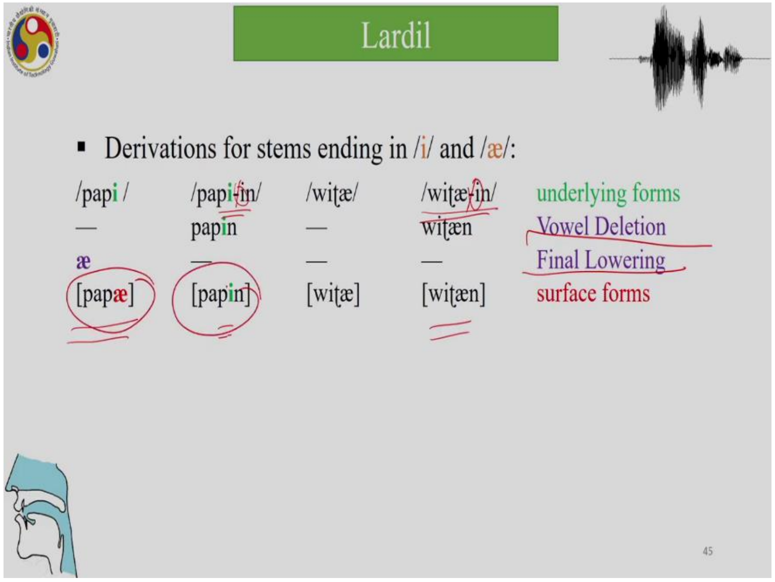
- This data supports the hypothesis that Final Lowering is a rule of Lardil phonology.
- There is an alternation between a low and a high vowel, [æ] ~ [i].
- There is also another alternation with [w] appearing in the Accusative Future suffix.

Lardil

❑ Hypothesis 2 “Rule Y”

/kæntapal-n/	/kæntapal-ɻ/	/mæla-n/	/mæla-ɻ/	underlying forms
kæntapalin	kæntapaluɻ	—	—	Rule X
[kæntapalin]	[kæntapaluɻ]	[mælan]	[mælaɻ]	surface forms

- There seems to be no principled basis for making this prediction.
- While we have no trouble *where* the vowel should go (breaks up word-final consonant sequences).
- There is still a problem in determining ***which*** vowel should be inserted: is it [i] or [u]?



So, after stems ending underlyingly in i the accusative future ending ur shows up with the allomorph wur, where did we see that, again, let us go back to the data, which we did not discuss then when we talked about kenti. So, recall that now we have wur in this data. Recall that earlier in the data, we did not see a wa there.

So, let us look at the wur data that we discussed before, yes, so we here either we have the ra or we have as an wur here. But this form that we see here is a new in the data wur. Why do we have the glide there before the u and that is what we are discussing here. Now, after we have gone through vowel deletion, final lowering two steps to one gives us forms like papae and the other uses form they papin.

Now, we have the rule of wa insertion in Lardil. So, when we get wa in the wur allomorph, so when we get that, we get that when we have i, then there is u insertion in the suffix wur, and as a result, we also have the third rule that is, epenthesis of wa by the following rules. So, wa, as in null goes to wa, if there is a preceeding i and following u insert wa between i and u.

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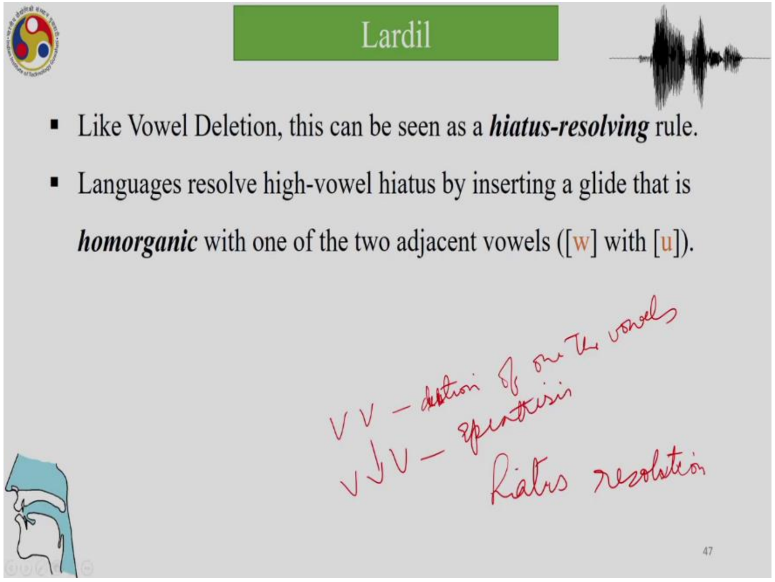

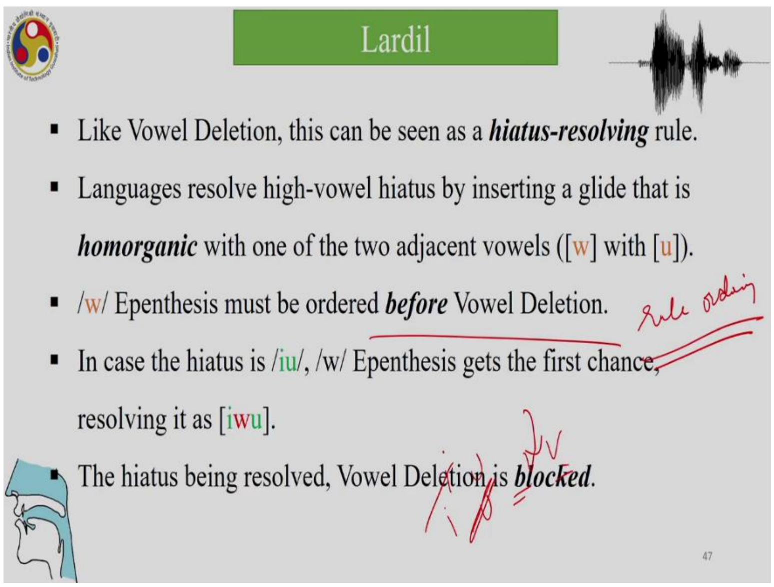

Now, we have our third rule of Lardil. So, like vowel deletion, this can be seen as a what is called, hiatus resolution. What does hiatus resolution rules do? So, if there are two consecutive vowels and as a result, we can have two syllables ending in one vowel starting with another, most of the time, this sort of hiatus is resolved by any language by either deletion of one of the vowels or epenthesis, so something is inserted between the two vowels and this is also a case of hiatus resolution and languages resolve high vowel hiatus by inserting a glide that is homorganic with one of the two adjacent vowels and while epenthesis must be ordered before vowel deletion in case to the hiatus is iu, one epenthesis gets the first chance resolving it as u.

Now, we have to deal with a rule ordering. When is epenthesis ordered vis-a-vis deletion, if we have a context i and u. If either of the vowels are deleted in a V-V context, then there is no need for the application of epenthesis rule if either this is deleted, either e is deleted or if either u is deleted, the context for epenthesis is not there. And hence the epenthesis must be ordered before the deletion of these rules. So, once epenthesis occurs vowel deletion is blocked.

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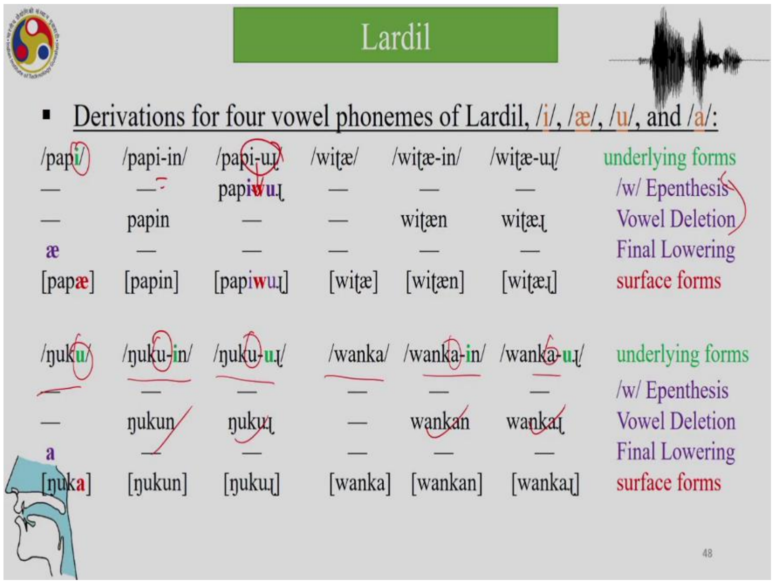

So, now we have four rules for four vowel phonemes of Lardil; i, ae, u and a. What is our first rule? Now we just talked about epenthesis, how do we know epenthesis occurs before vowel deletion? Because if there is vowel deletion, then the context for the application of the rule of epenthesis is not there, does not exist hence it has to occur first.

So, we have a context for the application of this rule of the rule of epenthesis e u, so something has to be inserted here and we get the wa in our Lardil. So, we have wa epenthesis. We have, then vowel deletion as we just talked about epenthesis should be ordered before deletion. If deletion was before vowel epenthesis then in a word like papiwur there would have been no epenthesis.

Because then just like in papin the i would have been deleted and we would just get papi-ur and not papi-wur. Then we have the rule of final lowering if this vowel is in the final word, final position, the high vowel does not occur in that position it is ae, it is lowered and then we have our surface forms.

Now, we can see the surface forms of, we see the underlying forms of another set. Let us apply all these rules that we have just found, the epenthesis deletion, final lowering of Lardil with another set of data and see how it works. So, we have wa epenthesis, is there any context of all the application of epenthesis, remember epenthesis occurs only when there is a context of two vowels i and u in Lardil, so we do not have that context here. So, wa epenthesis does not occur.

And then we have vowel deletion, we have many contexts for vowel deletion. So, this, this, this and this and we will see that vowel deletion applies in all those contexts. And then we have final lowering which can only apply here which is the high vowel and u becomes a and as a result, we have the surface forms nguka, ngukun, ngukur and wanka. wankan, wankur.

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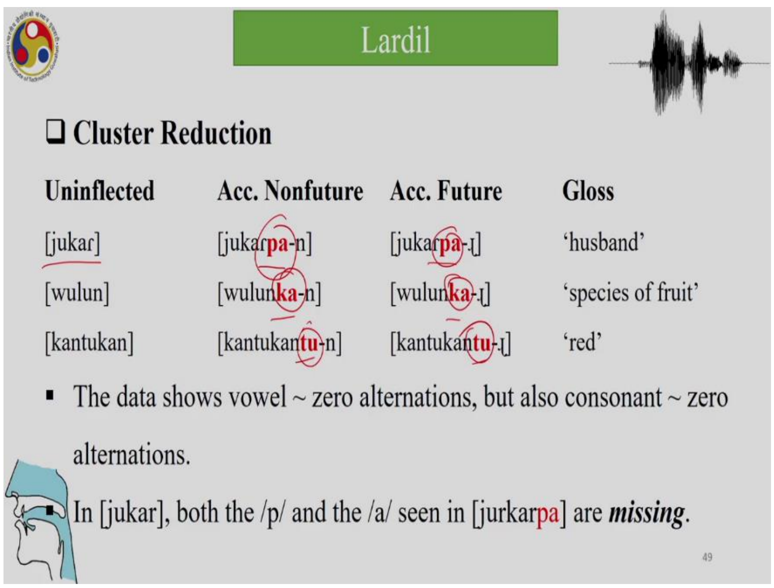

So, continuing Lardil, there is more data in Lardil which can be discussed. So, we have again the uninflected forms with final consonant, and then we have the accusative non-future with pa, ka, tu and par, kar, tur as one of the extensions of jukarpar and wulunkar and kantukantur. The data shows vowel zero alternations, but also consonant zero alternations.

So, what happens when you see vowel zero alternations is that here all this is missing in the uninfected form. So, all this is missing in the inflected forms as we see a considerable part of the form what we think underlying form to be missing. So, similarly, it is not just vowels zero which not just a vowel, which is missing both the, it is the consonant also which is missing.

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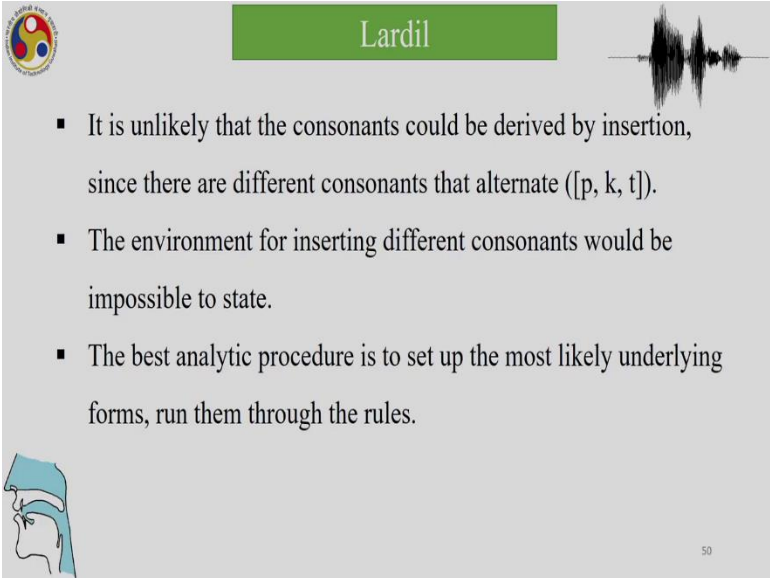

So, it is unlikely that the consonants could be derived by insertions since there are different consonants that alternate so p,k,t. The environment for inserting different consonants would be impossible to state and the best analytic procedure is to set up the most likely underlying forms, run them through the rules.

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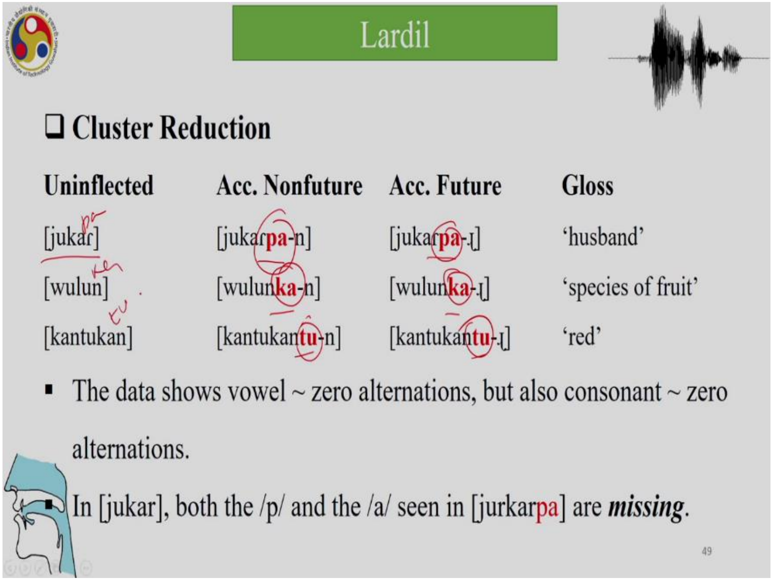


Lardil

- <u>Predicted output forms:</u>

/jukaɾpa/	/jukaɾpa-~~i~~n/	/jukaɾpa-~~u~~ɻ/	underlying forms
—	—	—	/k/ Epenthesis
—	—	—	/w/ Epenthesis
—	jukaɾpan	jukaɾpaɻ	Vowel Deletion
—	—	—	Final Lowering
jukaɾp	—	—	Apocope
*[jukaɾp]	[jukaɾpan]	[jukaɾpaɻ]	predicted surface forms

- The analysis works except where it generates *[jukaɾp] instead of the correct [jukaɾ].

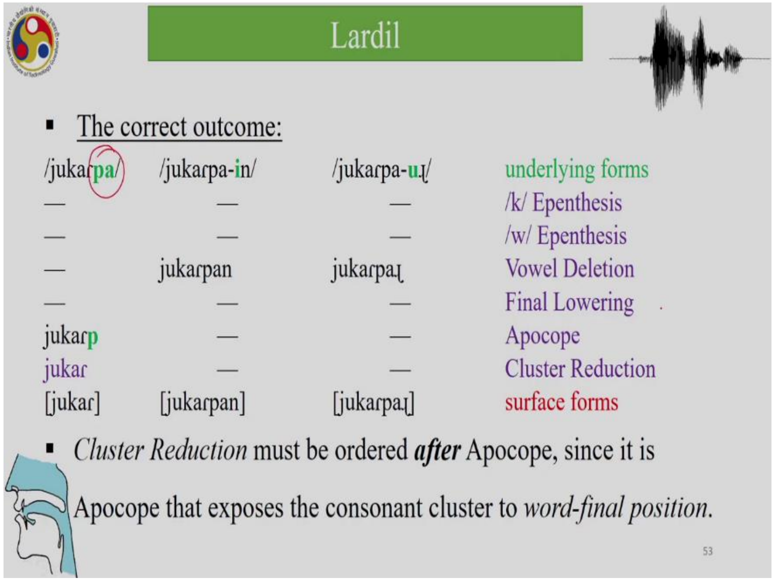
Lardil

- *Apocope* applies freely to words of sufficient length.
- When it creates a final consonant cluster, further rule eliminates the cluster by *deleting* its ***second member***.
- The rule may be formulated as follows:

❖ **Cluster Reduction**

$C \rightarrow \emptyset \,/\, C \_\_\_ \,]_{word}$

Delete a word-final consonant when it is preceded by a consonant.



So, we predicted then that as we talked about this, so we predict then the p and the k and t appear are there in the underlying forms. So, if we present that as one of our hypothesis, then what do we get, so, we have k epenthesis w epenthesis, then we have and vowel deletion and final lowering and insertions, we get a surface form which is difficult to analyse. If all our rules of vowel deletion, if you recall the two vowels, one will be deleted, our rule of epenthesis, our rule of final lowering, if they all apply along with the apocope, if they all apply then our predicted surface forms would be not be the output form in jukarp.

So, this is which is foul in our analysis. So, the analysis works except where it generates jukarp instead of the correct form and apocope applies freely towards of sufficient length. So, when it creates a final consonant cluster, further rule eliminates the cluster by deleting the second member. Apocope is applying freely is what we were trying to say and it also eliminates the cluster by deleting the second member.

So, we have cluster reduction where C is completely deleted in a final word. So, delete a final consonant, word-final consonant went is preceded by a consonant. So, now when we apply the apocope rule properly, then followed by cluster reduction, then we get these surface forms. So, cluster reduction must be ordered after apocope since it is apocope that exposes that the consonant cluster two-word final position. So, because of consonant zero, we do not see these forms uninflected form and as a result, we need more rules of and cluster reduction to arrive at our surface forms here.

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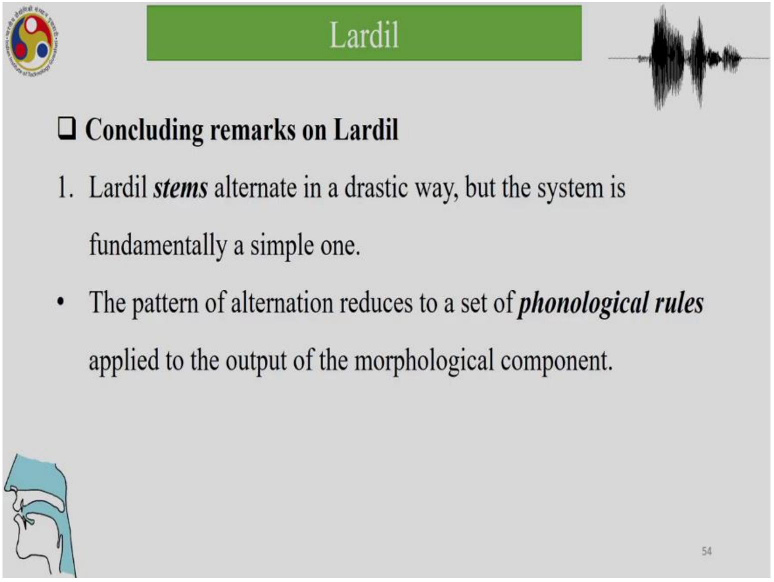

So, Lardil stems alternate in a drastic way, but the system is fundamentally a simple one, the pattern of alternation reduces to a set of phonological rules applied to the output of the morphological component and this part is very important that alternation reduces to a set of phonological rules.

So, these are all phonological rules which are applying to output of the morphological component. And also, that Lardil is an illustration of the fact that isolation form shortcut does not always work. So, that is something we have been talking about that the isolation form will not give us the uninflected form, will not give us the underlying forms. So, we have to look at the entire paradigm to get our underlying forms.