NORVIN RICHARDS: All right, now my mic is on. That has an effect on my voice. I'm being amplified, right? Cool. So it'll be easy for you to tell whether I've got my mic on or not. So here's another assimilation rule. We said, in Arabic, there's an assimilation rule-- wow, I'm really being amplified-- in Arabic, there's an assimilation rule that creates or causes two consonants to be identical to each other. This one is not that. The consonant at the end of that prefix is always nasal. It just assimilates in place to the following consonants. You get "impossible" and "incredible," where you get a velar nasal version of "n." It's not "incredible" [with alveolar nasal "n"] at least, unless you're speaking very carefully. That sound right?

Well, we're talking about assimilation rules. I want to show you another example of vowel harmony. We looked at one example of harmony before, which was from Turkish. And it was the observation that the Turkish plural suffix is sometimes "-lar" and sometimes "-ler," and it depends on the vowels that are in the noun that's being made plural. So "lions" was "aslanlar"-- which I cannot spell all of a sudden. But "roses," I think, was "gyller." It's either "roses" or "flowers," I forget which. Oh, we have a native speaker. What does this mean, "gyller"? Is it "rose" or-- "rose," OK, good.

So yeah, "aslanlar" but "gyller"-- why? Well, because this, we were going to say, is harmonizing with the vowels that are in the noun in question. So in particular, it's deciding whether to be back or front depending on whether the vowels in the noun are back or front. So I want to show you another example of vowel harmony, and we'll talk about it a little bit more. But that's what vowel harmony was. And as you can see, it's a kind of assimilation rule. So here's a vowel, and it's deciding whether to be-- it's gaining its front or back property for-- it's becoming the same as the vowels that are in the noun.

So let's talk about another vowel harmony case. This is from Finnish. So here are the Finnish vowels. You can see it has-- what does it have-- eight of them, and they can all be long or short, but long or short for this just means how long you hold them. Since we're talking about Finnish, I have to tell you my favorite Finnish word, which is this, [NON-ENGLISH SPEAKING]. I was taught that word by a linguist who specialized in Finnish-- Erica Mitchell-- It's the only Finnish word I know. [NON-ENGLISH SPEAKING]-- I figure it'll come in conversation at some point, if I ever get back to Finland. It means wedding night intention. So I'm not sure what kind of conversation that will be, but I have to work on that.

So there's the Finnish vowel inventory. One of the things you can see about this inventory-- it's got front vowels and back vowels. The vowels can be high or mid or low. And it is like English in that its back vowels are rounded if they are not low. So the back vowels are "u," "o," and "a." And so it has a high back rounded vowel-- for example, "u." But it doesn't have a high back unrounded vowel, "ouh." So far so much like English.

Difference from English is that it also has front rounded vowels. So front high rounded vowel, front mid rounded vowel, "eouh" and "ouh." So English doesn't have those, but Finnish does.

On the other hand, it also has front high and mid unrounded vowels, "i" and "e"-- so the pairs of vowels there. So I'm going to erase my favorite Finnish word, just so as not to confuse later classes. OK, so that's the Finnish vowel inventory. Now Finnish has vowel harmony like Turkish. It has a lot of suffixes that harmonize with the noun and, in particular, Finnish is kind of famous among linguists for having a lot of suffixes on nouns that are thought of as cases.

So if you study languages like Latin or Russian or I bet Ukrainian, you need to learn that nouns come in a bunch of different forms depending on how they're being used in the sentence, the nominative or accusative-- they get little markers on them saying whether the subject or the object or the indirect object or whatever. This is what we call the case of a noun.

Finnish-- languages that have case, they often have two cases or three or five or six. Finnish, depending on how you count, it has something like 12 or 13. It's just nuts. And that's partly because it has a bunch of case suffixes that, in English, would be prepositions. So it has a case suffix that means "on." This is the case suffix that means "on." And it is either pronounced "laa" [WITH LOW FRONT VOWEL] or "lah" [WITH LOW BACK VOWEL], depending on the noun. So the word for "table" is [NON-ENGLISH SPEAKING] and "on the table" is [NON-ENGLISH SPEAKING]. The word for "street" is [NON-ENGLISH SPEAKING] and "on the street" is called [NON-ENGLISH SPEAKING].

I should be careful saying things like the word for "street" is [NON-ENGLISH SPEAKING]. I think the word for "street" is actually [NON-ENGLISH SPEAKING] if you have it by itself. But if you add the [NON-ENGLISH SPEAKING], it changes the "t" to a "d," something like that. There are all kinds of sneaky things that happen in Finnish, that I forget, when you add them. But anyway, if you add [NON-ENGLISH SPEAKING] to street, you end up with [NON-ENGLISH SPEAKING]. If you add [NON-ENGLISH SPEAKING] to table, you get [NON-ENGLISH SPEAKING], and the change in the vowel is conditioned by the vowel of the noun. Now I've kind of color-coded the vowels here. You can see there are some front vowels that are red and some back vowels that are blue.

And if you have a noun where all the vowels are red, like "table," then the vowel of the suffix is also red. You have a vowel where all the-- sorry, a word where all the vowels are blue, then the suffix is also blue. So if all the vowels in the noun are back, like in "the streets," then the suffix gets a back vowel. If they're all front, then the suffix gets a front vowel. So far so good?

Now here's the thing. There are also the green vowels. Why do I have green vowels? The red vowels all have the property that there is a blue vowel-- so a back vowel-- that is identical to the red vowel in every way except that it's back instead of front. So the red vowel "eouh" for example, the front high rounded vowel, has a corresponding blue vowel that is high and rounded and different only in that it's back. That's "u." And similarly, there is a front mid rounded vowel, "eouh," and there is another vowel that is identical to it in every way except that it's back instead of being front. That's oh.

But the green vowels don't have any such correspondence. So "i," the front high unrounded vowel, there is no vowel which is identical to that vowel in every way except that it's back. There isn't an "ooh." Does that make sense? So the red vowels and the blue vowels are identical in every way except for front versus back. The green vowels don't have a corresponding back vowel that's identical to them except being back. Yeah?

AUDIENCE: [INAUDIBLE]

NORVIN
RICHARDS:
Well, it would be-- let's see, it would be "oueh." It's not a popular vowel, but there are languages that have it. The IPA symbol for it, I think, is something like this. So it exists. We haven't talked about a language that has it. I'll erase it quickly before it upsets anybody. So it's physically possible to make these vowels in their languages that have them, but Finnish doesn't have them.

And so the question is, what do you do when you add a suffix to a noun that has these vowels? And the answer is that these vessels are just invisible, basically. So at the station is the less interesting case-- you have a couple of front vowels that do have corresponding back vowels, "y" and "ae," and then you have this "i," which doesn't have a corresponding back vowel. You have two red vowels and a green vowel.

And you get a red vowel in the suffix, so you get [NON-ENGLISH SPEAKING] for at the station. But for "on the child," [NON-ENGLISH SPEAKING], well, you have a blue vowel that is a back low vowel, "a," and then you have a green vowel, which is front, but the green vowel doesn't have a corresponding back vowel, and so it's like it doesn't count. The green vowels can go with anything.

So you have vowel harmony for the vowels that have corresponding front and back versions, but for those that don't have corresponding front and back versions, it's like you get to ignore them. They're not there. Is that clear? That makes sense? So there are-- I mean, it's as though you can say as long as you only look at blue and red vowels, all the vowels in a word must be blue or red. But you don't look at green vowels. You don't look at vowels that don't have a corresponding back vowel that is identical in every way except for being back. So you get [NON-ENGLISH SPEAKING] for "on the child."

There are also words in which all the vowels are green, like "at the family," and the fact is that for suffixes, you get front vowels corresponding to those. And the green vowels are front, which is itself kind of interesting. So at the family is [NON-ENGLISH SPEAKING]. You get "lah" for that one.

Is this clear? That's the Finnish system. If any of you ever want to go learn Finnish, you're now all set up. Does anybody speak Finnish? Here I am pretending to speak Finnish.

Yeah, so just to summarize that again, if a vowel is not round and not low, then it is front. So one way to think about what's going on in these suffix versions at the bottom is to say there's a rule saying give all the vowels in the word the same value for back, "o," except don't create vowels that don't exist in Finnish. So when you're doing "on the child," it would be nice if-- the fact is that you've got a back vowel and then a vowel and then a back vowel. But there's nothing you can do about the front vowel, eh. There isn't a corresponding back vowel in Finnish.

So it's like the rules are-- first of all, remember Optimality Theory. So yeah, the generalization goes, give all the vowels in the word the same value for back, but don't create non-Finnish vowels. Don't create back vowels that are not round and not low. Don't create "ooh" or "eouh." There's that symbol you were wondering about.

If we want to talk about this in terms of Optimality Theory, what we say is the most important thing is don't create back non-low unrounded vowels. Don't create "ooh" or "eouh." Finnish doesn't have those vowels. Don't do that. But as long as you-- so that's the most important priority. That's the highest ranking constraint. But as long as you don't do that, make sure all the vowels have the same value for back. They're all either back or front. That's one way to talk about what's going on in Finnish.

Now there's a popular approach to phenomena like vowel harmony that I just wanted to introduce you to, partly because a version of it will float up again when we talk about syntax, I think, which involves saying it's as though-- and actually semantics as well-- it's as though we want to talk as though features of sounds can sometimes show up in multiple places.

So here's the Finnish word for "on the table" again, [NON-ENGLISH SPEAKING]. And if you were listing all of the properties of all of those vowels-- that's what I've done here, and I just haven't listed the consonants just because there wasn't room and I'm not good at graphic design. But first of all, "ouh," is round and mid and not back. That is front. And the second vowel is round and high and not back. That is front. And "ae" is not round and is low, and is not back. That is, it's front. This is just a little list of all the properties of each of those vowels.

And so you could specify all of these properties of these vowels this way. But there's a popular thought about what's going on here, which is to say it's as though Finnish wants the value of back to be kind of shared among all the vowels. That is, you're just going to state it once. This is a word in which all the vowels are front or all the vowels are back. So you say somewhere, Finnish doesn't allow you to state over and over again this vowel is front and this vowel front and this vowel is front and this vowel is front, you just have to say once, for the whole word, these vowels are front.

And then there's this thing about, oh, and I don't like certain kinds of vowels, so those vowels get to be specified. But words just specify whether they're front words or back words. You don't specify it over and over again from one vowel to the next. This is one popular way of talking about how we want to do vowel harmony. It's as though there's only one back feature in the word, and all the vowels that can share it do.

The name for this-- it's called autosegmental representation. This is the kind of moment where I think I'm swimming against the stream of your normal instincts for classes. This is a class in which there aren't quizzes or exams, so putting something like that up on the slide is triggering all your instincts to write that down and memorize it because you figure it'll come up on the test, but there is no test. So memorize that if you would like to, if you want to impress linguists at parties or if you want to make your TA happy, but there won't be a test. You will never be counted off on the paper for failing to use the phrase autosegmental representation. On the other hand, it is a way to impress people at parties.

So that's one form of harmony. It's called vowel harmony. We've seen it now in Turkish and in Finnish. Those are not related languages. Vowel harmony is crosslinguistically not-- it's not hugely common, but it's not rare either. It's popular in the Turkic family. There's a very large family of languages that are related to each other and they all have various kinds of harmony. There's lots of interesting work on exactly what kinds of harmony you get in which languages.

I want to show you another kind of harmony which is a lot rarer. This is from a language, the Navajo language, which is an Indigenous language of the American Southwest. Here are a bunch of verbs in Navajo in what we could think of as the past tense. And you can see that all of these verbs-- so what I've done is boldfaced a part of the verb that you can think of as the part of the verb that tells you who the subject is.

So there's a morpheme "sé" that's showing up in the first three verbs, which tells you that the subject is "I." And there's a morpheme "síní" in the next trio of verbs that tells you that the subject is "you." And then there's a morpheme "soo" in the last three verbs. It tells you that the subject is "you two"-- that's you dual.

To say that this is a single morpheme is a little bit misleading. The "s" at the beginning of this morpheme is probably partly a marker of what I'm translating here as past tense. Navajo verbs are extraordinarily complicated. So these particular verbs are in a class that takes this "s" version of the past tense, what are called s perfectives. There are also y perfectives. There are other kinds of perfectives.

But anyway, this class of verbs takes these past tense morphemes, and this is what they look like. Are there any questions about any of this? Navajo has tone. That's what those markers are on the vowels. So the markers mark high tone. There's another marker that you're seeing underneath the vowel in the verb for "stand." That's a marker of nasalization. So "I stood" is something like [NON-ENGLISH SPEAKING]. So you have to nasalize the "eh," say that.

Here's some Navajo. Here's some more Navajo. "I boiled it" is [NON-ENGLISH SPEAKING]. "You boiled it" is [NON-ENGLISH SPEAKING], and "You two boiled it" is [NON-ENGLISH SPEAKING]. So you can see, in the three verbs that I had on the previous slide and that are still up here, there are these three morphemes, "sé," "síní," and "soo." But for "boil," the morphemes are [NON-ENGLISH SPEAKING] and [NON-ENGLISH SPEAKING].

This is called sibilant harmony. What's going on here-- and here's another example of it-- you get "sé," "síní," and "soo" for "played" and "stood" and "crawled around," but [NON-ENGLISH SPEAKING] and [NON-ENGLISH SPEAKING] for "boiled" and "worked." And the relevant difference between "boil" and "work" on the one hand and "play," "crawl around," and "stand" on the other is that "boil" and "work" have, in the verb, a sibilant, which is postalveolar. So "boil"-- the stem you can think of as [NON-ENGLISH SPEAKING], and "work"-- its' [NON-ENGLISH SPEAKING] is the verb stem, [NON-ENGLISH SPEAKING].

So "boil" has a "zh" in it and "work" has a "sh" in it, whereas "play" and "crawl around" and "stand" either don't have sibilance in them at all or, in the case of "stand," it has a sibilant, but it's not a postalveolar sibilant, It's an alveolar sibilant, "z." This is called sibilant harmony, or I think we've also called these strident. I'm sorry, that's the term you're familiar with. So this phenomenon is called sibilant harmony-- so sibilant is another name for strident, sorry. So let me just say all that again, there are these postalveolar stridents, "zh" and "sh" in "boil" and "work," and those are triggering the postalveolar versions of these morphemes, the [NON-ENGLISH SPEAKING] and [NON-ENGLISH SPEAKING] instead of "sé," "síní," and "soo."

I started this by saying vowel harmony is pretty common. There's a lot of work on vowel harmony because you find it in lots of unrelated languages. Sibilant harmony is quite rare. Navajo has it. A few other languages have it. But it's similar in the sense that it looks as though, if you have a sibling-- morphemes in these prefixes whose form is being conditioned by corresponding sounds in the verb stem. So for vowel harmony, it's the vowels. For sibilant harmony, it's these stridents. So if there's a strident or sibilant, an "s," "z," "sh," or "zh"-- those are the Navajo sibilants-- in the verb stem, then any of the sibilance and the subject prefix have to match it. They're getting the same thing.

Vowel harmony and maybe this idea of sharing a feature across sounds-- it's not just for vowel harmony. Maybe it's for assimilation generally. There might be some other kinds of harmony we'd want to apply it to.

Wanted to show you another bit of Navajo before we leave Navajo behind. Here's how you say you are playing in Navajo. So we're switching tenses now. We're going to get away from sibilant and harmony. This is the present tense, the imperfective aspect people call it when they work on Navajo. It's not exactly tense. So this is how you say you are playing in Navajo. It's [NON-ENGLISH SPEAKING].

This verb has three morphemes in it. You can think of the "né" at the end as the part that really means "play." There's a morpheme at the beginning, "na-," which is a prefix. We don't have to worry for this about what it means. It's a marker of a certain class of verbs what are called atelic verbs. These are verbs in which you can continue doing something and there is no natural endpoint to what you do.

So if you compare something like walking around to walking to work-- if you walk to work, then when you get to work you stop. And if you interrupt me while I'm in the middle of walking to work, then I did not walk to work. That's a telic predicate, as opposed to walking around. If I'm walking around for an hour and then you stop me, well, I still walked around for a while. So that's atelic. It doesn't have a natural endpoint, something you're trying to achieve. So "na-" is a marker of atelic verbs like play or walk around. Feel free to ignore all that if you want to.

So there's a "na-" at the beginning of this verb. There's a "né" at the end, which is the part that really means play. And then in between them, there's an agreement morpheme, something that's telling you what the subject is. And that morpheme is "ni" for you, and it's "sh" for I, and it's "oh" for you two, and it's "ii'" for we two. So you get [NON-ENGLISH SPEAKING] for those forms of the verb.

So far, here's a bunch of Navajo. Oh, one thing I have to ask you to believe me about because it would be hard to demonstrate is that the ee in we two are playing is underlying-- so that apostrophe there, this is Navajo orthography. It represents a glottal stop, but that glottal stop is originally a "d." I'll just ask you to trust me about that for the next little while.

Now I started with play, which is a comparatively simple verb. The verb really is "né." But there are some other verbs that we can talk about. You've seen versions of them in the preceding slides-- work and investigate-- that I now want to turn to. Work and investigate-- we can think of them as starting with clusters of consonants. So you are working. You've got the "na" and the "ni" that we have up above, and then the verb stem is [NON-ENGLISH SPEAKING].

People who work on Navajo really think that that "l" is a separate morpheme. They call it the classifier. Really, for our purposes, all that amounts to is that there are a bunch of verbs that start with "l," and then the "l" is followed by another consonant. We don't have to worry too much about what that is. So for our purposes, "working" starts with two consonants, [NON-ENGLISH SPEAKING]. And "investigating" also starts with two consonants. The first one is a voiceless [NON-ENGLISH SPEAKING] so this [NON-ENGLISH SPEAKING] is "You are investigating it."

Why am I telling you all this? This is where the action is. "Ni-" is the prefix for you singular, and it ends with a vowel. But if we switch to the other prefixes, which all end in consonants, then some interesting things happen. So I am playing-- we saw that the subject agreement prefix for "I" is a "sh." So you get [NON-ENGLISH SPEAKING]. The subject agreement prefix "sh," if you put it before it [NON-ENGLISH SPEAKING], you might have expected that to be [NON-ENGLISH SPEAKING]. But it isn't. It's [NON-ENGLISH SPEAKING]. So the "l" vanishes.

Similarly for investigate, we've decided that "investigate" is [NON-ENGLISH SPEAKING]. So it starts with two consonants, a voiceless "l" and then a "k." If you also have a [NON-ENGLISH SPEAKING] before all that, well, you get rid of the voiceless "l." So you get [NON-ENGLISH SPEAKING] is "I'm investigating it."

The reason I'm doing these particular prefixes is that you can see different things with the different ones. So if you add "oh," what happens is that the "h" goes away, but the distinction between the voiced "l" in "work" and the voiceless "l" in "investigate" also goes away. So "work"-- we decided, looking at you, starts with a voiced "l" It's [NON-ENGLISH SPEAKING]. But "You two are working" is now [NON-ENGLISH SPEAKING]. So the "h" is gone, but that voiced "l" has become voiceless. It's now barred. And we're getting a voiceless "l" down there in "You two are investigating it" too. It's now [NON-ENGLISH SPEAKING].

And the thing that I said is underlyingly "eed," well, the "d" is gone, but the distinction between the voiced "l" and the voiceless "l" has gone in the other direction. So now they're both voiced. So "We two are working" is now [NON-ENGLISH SPEAKING] and "We two are investigating" is now [NON-ENGLISH SPEAKING].

Do you remember when I said that Navajo verbs are extraordinarily complicated? Navajo verbs are extraordinarily complicated. There are all these morphemes, but they don't coexist peacefully. When we were talking about Native languages in which you have a whole bunch of morphemes, and they're easy to separate from each other, and there's nothing very spectacular that happens, you just attach them to each other-- this is the natural enemy of that kind of language. It's the opposite. Here, we have a bunch of morphemes, and you put them together, and there's like open warfare between them. There's all kinds of strange stuff that happens as they interact with each other.

So let me summarize what we've just seen. If you have the "sh" followed by two consonants, like if you're going to say "I am investigating it," so "sh" is the "I," and "investigating," we decided, starts with [NON-ENGLISH SPEAKING] and then "k," you get rid of the first consonant. So you get [NON-ENGLISH SPEAKING] not [NON-ENGLISH SPEAKING].

If you have an "h" followed by two consonants, like in "We two are working," so where you've got an "oh" followed by [NON-ENGLISH SPEAKING], well, the "h" goes away, but the "l" devoices. So instead of [NON-ENGLISH SPEAKING], we get [NON-ENGLISH SPEAKING].

And if you have a "d" before two consonants, well, the "d" goes away, but the "l" that's in the first consonant will become voiced. So it changes from [NON-ENGLISH SPEAKING]-- so "You two are investigating it" to [NON-ENGLISH SPEAKING].

Do these rules remind you of anything other than the Navajo that we've just gone through? So we have one rule that says if you have a "sh" followed by two consonants, get rid of the first consonant, and another rule that says, if you have an "h" followed by two consonants, get rid of the "h" but devoice the first consonant, and then another rule that says, if you have a "d" followed by two consonants, get rid of the "d," oh, but voice the first consonant. Yeah?

AUDIENCE: I might be barking up the wrong tree, but was there a language that disallowed [INAUDIBLE]?

NORVIN RICHARDS: There was indeed. You're not barking up the wrong tree. You're barking up the correct tree. It's not something I've ever had to say before, but it's true. You are barking up the Yawelmani tree. So we were talking about Yawelmani before, and for Yawelmani, similarly, we had a whole bunch of phonological phenomena, and we said we could write rules to handle all of these facts and maybe we should. In Yawelmani, it was like, if you have three consonants in a row and one of them is an "h," get rid of the "h." If you have three consonants in a row and none of them is an "h," you insert a vowel.

There are various things that Yawelmani does to avoid having three consonants in a row. Navajo is doing the same thing, you're right-- the same thing in the sense that Navajo and Yawelmani both dislike sequences of three consonants in a row. None of these rules would handle anything in Yawelmani. So this is not what Yawelmani does to deal with three consonants in a row.

But if we're willing to think of-- we're willing to think of phonology the way I've been advertising, which is languages have certain problems, and then they have means to deal with the problems, then we can see Yawelmani and Navajo as having something in common. They have a kind of problem that they both care about. They don't like sequences of three consonants. They deal with it in different ways, but we can see them as having that property in common. Yes?

AUDIENCE: Is this a property that's been observed in other Indigenous languages of the Americas, or [INAUDIBLE]?

NORVIN RICHARDS: I think it's not specific to Indigenous languages of the Americas. I think it's cross-linguistically not uncommon for languages to dislike sequences of three consonants.

And we talked a little bit earlier on about the fact that some of your best cues for the value of a consonant is its effects on the nearby vowel. So I think we played around with [INAUDIBLE], showed you some spectrograms from me saying "bab" and "dad" and "gag." I showed you that during the stop itself, you can't hear a whole lot. It's what the stop does to the vowel that's nearby. If you have three consonants in a row, then at least the one in the middle is not next to a vowel, and so that could be a reason why it's bad to have three consonants in a row.

It's perfectly possible there are languages out there that are fine with three consonants in a row. English is one of them for example. So we have words like "strengths"-- long strings of consonants. Plenty of other languages like that. But yeah, this is a kind of thing that languages do. And we're seeing it in Yawelmani and Navajo.

So this is one virtue of the approach to phonology that I was advertising before, where we say, yeah, languages have things they dislike, and then, on the other hand, they have techniques for dealing with what they dislike. Yawelmani and Navajo have a property in common, namely the property of disliking three consonants in a row. They deal with that problem in different ways, but they have that property in common, at least.

And so there's some kind of insight that we're gaining by being willing to think about phonology that way. If we didn't think about phonology that way, if we just made these rules, Navajo and Yawelmani would seem not to have any properties in common at all. We'd obscure that fact about them. That make sense?

So what have we done today-- we've looked at a variety of phenomena. I tried to introduce you to the idea of autosegmental representation, this idea that a single feature can get spread across different places in a word, and we've just gone back to talking about this idea of what are called ranked constraints, this idea that languages might have a number of goals in life, and the way to talk about differences between languages might just be in terms of how they prioritize their different goals.

So that was an important part of how we talked about Finnish, where the rules seem to be do vowel harmony, oh, but don't create non-Finnish vowels. So the most important thing is don't create vowels that Finnish doesn't have, but modulo that, make all your vowels the same for whether they're front or back.

And similarly, we just convinced ourselves that Navajo and Yawelmani, although they look different in lots of other ways, might have a high-ranking constraint in common, namely, don't have three consonants in a row.

So what I want to do now is show you another domain in which people have fruitfully made use of this idea of ranked constraints-- that is, of languages having a bunch of comparatively simple conditions on what makes a word a well-formed word that interact with each other to give behaviors which can be quite complicated.

And this all has to do with stress. So we've already talked some about stress. It was part of the flapping rule. So when we were dealing with how to deal with the difference in the pronunciation of the "t" in these two words, "atom" and "atomic," we said the rule that converts "t" to a flap needs to be sensitive to where stress is, so it only happens after stress, doesn't happen before stress. And that's why we get it in "atom" but not in "atomic."

Stress often has effects on vowel quality. So if I were actually writing "atom" and "atomic," it would look something like that. You can see that "atom" and "atomic," if we ignore the "-ic," "atom" and "atomic" have almost nothing in common apart from an "m." So the two vowels are different and the sound that's spelled with a "t" is different in the two words. I think I referred to things like this when I was talking about the one good thing about English spelling, which is that a given morpheme is typically spelled more or less the same way, even if it's pronounced quite differently.

Stress is also important for intonation. We won't have time to talk seriously about intonation in this class. We probably won't have time to talk about it at all. Intonation is the study of the rules for how the pitch of your voice rises and falls as you speak, which, as you can imagine, is a really complicated topic, and it's really interesting.

One kind of thing for which-- here's a quick and easy example of stress being important for intonation. There's a kind of-- it's called evocative chant. It's used in various circumstances, but one is when you are calling. I especially think of it as when you're calling a child-- like you're a parent trying to get the children to come home. You say things like-- you say their name and you say "Lau-ra." There's a tune to that. If I were putting the tune here, you might say yeah, there's a higher note, "Lau-," and a lower note, "-ra." That's the way to call Laura's name. You use that when you're calling children.

You use it when you're selling hot dogs. So if you're in the ballpark, you say "hot dogs, popcorn, peanuts." There's this high-low tune that you sing when you're doing things like that. How do you call Pierre? "Pierre." It isn't "Pi-erre," yeah? It's "Pierre." So its high goes here. And then maybe also a low. And over here there's, I don't know, a low. "Pierre."

What's the difference between Laura and Pierre? I mean, Laura is a girl and Pierre is a boy. But what else?

AUDIENCE: Stress is on the end in "Pierre." It's on the first syllable with "Laura."

NORVIN   Yeah, so the high-- we were just talking about how you do the vocative chant. The high is on the first syllable of
RICHARDS: Laura. The high is on the second syllable of Pierre. Why? Let's chant some other names, longer names.

               Genevieve. "Genevieve." Is that right? "Genevieve," I think. Maybe this is the low here at the end. "Genevieve," hi
               ho. Yeah. If you're selling vegetables at the ballpark along with hot dogs--

AUDIENCE: "Asparagus."

NORVIN   "Asparagus," I think. This is low.
RICHARDS:

AUDIENCE: "Cucumbers."

NORVIN   "Cu--"
RICHARDS:

AUDIENCE: "-cumbers."

NORVIN RICHARDS: "Cucumbers." Think is it-- wait, is it "cucumbers?" Or is it "cucumbers"?

AUDIENCE: No, that sounds good. Yeah.

NORVIN RICHARDS: Cucumbers. Yeah, so this is high and this is low, Yeah? Let me do one more. Suppose you're selling jalapenos.

AUDIENCE: "Jalapenos."

NORVIN RICHARDS: "Jalapenos." Here's the high. Forget about the lows for a second. Where does the high go? Yes.

AUDIENCE: The stressed syllable.

NORVIN RICHARDS: The stressed syllable, yeah? So it goes on "Genevieve," "Laura," "Pierre," yeah. "Cucumbers," "asparagus," and "jalapenos," that's where the high starts, yeah. And before that high you have lows. Yeah.

AUDIENCE: There are some situations where we keep the high for a few syllables.

NORVIN RICHARDS: Yeah.

AUDIENCE: After the "s."

NORVIN RICHARDS: Yeah, like where?

AUDIENCE: "Cu"-- wait, oh, "Genevieve."

NORVIN RICHARDS: "Genevieve."

AUDIENCE: And "asparagus."

NORVIN RICHARDS: And "asparagus." No, "asparagus." Yeah, so for those you've just get an "l" at the end and it's high until that. Maybe in all of these, you get an "l" at the end, right? Even in Pierre, where there's a high at the end, there's also a low. I think you don't say Pierre, right? It's Pierre. You have to go back down to low.

So the vocative chant goes put a high on the stressed syllable, put a low at the end, yeah? And then what's the difference between "cucumbers" and "asparagus"? Or between "Genevieve"-- wait, do we want "Genevieve"? No, we don't want "Genevieve." Sorry, Genevieve.

My sister's name is Genevieve. Nobody tell her that I said that. What's the difference between "cucumbers" and "asparagus"? Yeah.

AUDIENCE: Well, we haven't learned syllable division yet.

NORVIN RICHARDS:	Yeah.
AUDIENCE:	Singing "cucumbers" added part of that second syllable.
NORVIN RICHARDS:	Yep, yep, that's probably right.
AUDIENCE:	Whereas in "Genevieve" that is not part of the second syllable. Same with "asparagus."
NORVIN RICHARDS:	Mm-hmm. Yeah. Yeah, that's probably right. Yeah, yeah, that's probably true. Does it?
AUDIENCE:	We have some data like you're high until you hit an obstruent. And then--
NORVIN RICHARDS:	Ooh, oh, gosh. You're high until you hit an obstruent.
AUDIENCE:	So low until they stress. And then--
NORVIN RICHARDS:	Oh, man. Let me try to think of some more examples. That can't possibly be right, but it covers the data that we've got so far. Yes. [LAUGHS].
AUDIENCE:	The last one.
NORVIN RICHARDS:	The last one has to be low, yeah. So the last one has to be low. That's right. And the high goes on the stressed syllable. And then you stay high maybe, so far. For most of these what happens is that you stay high until you hit a low, right? So it's "Genevieve." The "vieve" is at the end, or it's "asparagus" or it's "jalapenos." And these are low.
	So you're low before you get to the high. And the real question is, what's the difference between "cucumbers" and "asparagus," where this high spreads and this high just stays here? Why is this low not just-- why is there a low not just here, but also here?
	And I think that's true, right? We agreed that it is "cucumbers." It isn't "cucumbers." Let me try to think of another word.
AUDIENCE:	"Endocrinology."
NORVIN RICHARDS:	"Endocrinology." What's a better word? That's a good word. I'm sorry. I'm trying to think of another word that has the property that I'm looking for. Lend a, "interdisciplinary." "Interdisciplinary. Interdisciplinary. Interdisciplinary." Yeah, no. "Interdisciplinary." So suppose I'm selling interdisciplinary.
	[LAUGHTER]
	Or suppose I've named my child "Interdisciplinary." It's "Interdisciplinary," is that right? Yeah, I think that's right. So my-- that's a nice name for a child. I mean, "Interdisciplinary." It's low here, yeah? Man, so let me tell you what I think is going on.

	We've talked about words as though they only have one stress, "cucumber," "asparagus," "Genevieve." Let's take "interdisciplinary." How many stresses are there in "interdisciplinary"? Where's the main stress in "interdisciplinary"?
AUDIENCE:	It's "dis" here.
NORVIN RICHARDS:	Yeah, it's "dis," it's here, where the high is. So the high goes on the main stress. What other syllables in this are stressed?
AUDIENCE:	"-nary."
NORVIN RICHARDS:	"-nary." There's another stress. And maybe here, I don't know.
AUDIENCE:	Really, OK.
NORVIN RICHARDS:	Yeah.
AUDIENCE:	Is this high on the main stress and then it stays high until it reaches the next like substress?
NORVIN RICHARDS:	I think it's something like that. So it's high and it stays high until you get to the next stressed syllable. The next stressed syllable is where the low starts. Yeah. And there's always a low at the end.

So for the difference between "cucumbers" and "asparagus," I think, is that "cucumber" has a secondary stress on the second syllable, whereas "asparagus" only has one stress. It's here. Yeah, and that might be related to your observation. This has a closed syllable here and closed syllables are often associated with stress.

This will not be on the final exam. There is no final exam. Yeah. But here's an example of stress being useful for understanding a phenomenon, in this case, the phenomenon of the vocative chant. All of you are about to be invited to come up with a research topic, something to work on. This is something you could try working on with the person that you're working with.

Ask them how they call their children, right? And also how they sell things. And find out whether there's a special tune for that, because in many languages there is. It would be interesting to see, yeah. OK, all right.

So, yeah, this was all an attempt to convince you that it might be interesting to think about stress. It's relevant for various types of phonological phenomenon. It was relevant for the flapping rule in English. We've just seen it's relevant for the rules for vocative chant.

I'm going to leave those on the board just so future classes can wonder what the heck we were doing. In languages where words have one fixed position for stress-- so there are languages out there where the position of stress is always fixed. These are data from a database called WALS, the world atlas of language structures, which is free and accessible. I recommend going and having a look at it.

When I got these data, there were 282 languages described in the WALS database. The WALS database describes languages with respect to a variety of phenomena, not always accurately, I have to say. So if you have a particular language you're interested in, you should double check. But it's a nice first pass, looking at a bunch of data.

In that database, you can see there are, among languages that have just one place where stress always goes, there are languages where that one place is the first syllable. That's pretty common. About a third of the languages like that, that do that. The most common type of stress for a language like that is penultimate stress. Languages like Zulu and Polish have stress on the next to last syllable.

And then you can see there are some other patterns that are less common. So the last syllable is not uncommon. And then there are some really weird systems like Hocak, which is a Native American language, has stress on its third syllable. That's quite rare. There are some languages that have stress on the antepenultimate syllable, antepenultimate, yeah, and some languages that have stress on the second syllable.

So these are all patterns that you find. As you can see, these are patterns that are best described as stressing a syllable that is counted either from the left edge or the right of the word. There are other systems that are not hard to imagine but that don't exist. And so people who are developing theories of stress typology, one of their goals, for example, is to have a theory that rules out languages with the rule, stress the syllable that's closest to the middle of the word.

It's distressingly easy to come up with a theory that predicts the existence of languages like that. And they don't exist. So you want your theory to not capture languages like that.

One way to describe this kind of pattern is to have constraints, you know, like the constraints that say things like don't have three consonants in a row, constraints that say things like put stress as far to the left or as far to the right in the word as possible. And then have that constraint interact with other constraints that say things like don't stress the last syllable or don't stress the first syllable. So for example, the quite common pattern that you get in Zulu and Polish where you stress the next to last syllable.

That's one that says put stress as far to the right in the word as you can, oh, but don't stress the last syllable. So don't stress the last syllable, that's the most important thing. But putting aside that, put stress as far to the right as you can. That means put stress on the next-to-last syllable. That's one way of describing that kind of stress system. Yeah. Yes.

AUDIENCE: Are these languages sensitive to deal with a verb which comes in the last place, anyway it felt like it was for that.

NORVIN RICHARDS: Yeah, so there are languages-- we looked at this in Lardil, that just don't like words of only one syllable. They rule them out. But you're absolutely right. So languages that have systems like these, typically it's like stress the next-to-last syllable if there is one. So in one monosyllabic word, you stress the one syllable that you've got. Yeah, that's a very good point. That's a thing that you find in these languages. Yeah, yeah, yeah.

It would be nice if there were some correlation between having a stress system that wanted to avoid final stress, let's say, and being like Lardil in not liking monosyllables, right? It would be nice if the world worked that way. As far as I know it doesn't. So it doesn't seem as though the condition that says it would be better for your words to be at least two syllables long, it doesn't seem to be motivated by these considerations.

I sure wish that it was, because it would be nice if there-- then we would have an explanation for part of that. But it's not clear to me that there is any connection between those things. Yeah. Now those, we were just talking about languages in which stress is only in one place.

But as we actually saw as we were looking at the vocative chant, it's possible for a language to have multiple stresses in a single word. English does that all the time. And there are languages out there that have patterns where you stress more than one syllable. Here are some examples from Pintupi, which is an Aboriginal language of Australia, in which the basic rule is stress the odd-numbered syllables. So stress, put stress on the first, third, fifth, seventh, and et cetera, syllables of the word.

So again, you can think of that as a little pile of constraints. Stress the first syllable, don't stress the last syllable, and don't allow yourself to have two syllables in a row that are the same, that is are both stressed or both unstressed. So, again, you don't always succeed in doing all of these things. In a language like this, whenever you have an odd-numbered of syllables in your word, you can achieve the first two-- stress the first syllable, don't stress the last syllable-- and actually the next one, don't allow two stressed syllables in a row.

But the last one, don't allow two unstressed syllables in a row, you achieve that in the words that have an even number of syllables. No, yeah, an even number of syllables, but not the ones that have an odd number of syllables. If there's an odd number of syllables, like in the second word there that has three syllables, you only stress the first syllable.

And you put up with the fact that it ends in two unstressed syllables, because there's no way to avoid that while also satisfying these higher-ranking constraints like don't stress the last syllable and don't have two stressed syllables in a row. Yeah.

AUDIENCE: How come we go through these four different rules, as opposed to just declaring stress every other syllable?

NORVIN RICHARDS: Stress every other syllable starting from the left edge, yeah. Why am I trying to decompose this into constraints like this? I guess in part it's an attempt to constrain the kinds of syllable, of stress systems that we could find, right?

So if we let ourselves say things like stress the odd-numbered syllables-- I mean first, stress the odd-number of syllables by itself doesn't actually cover this, even though it's what I said. So it's really stress the odd-numbered syllables unless you're going to stress the last syllable. Don't stress the last syllable.

So even just saying that, what I just said is best stated in terms of conflicting constraints. It's like the most important thing is don't stress the last syllable. And then underneath that there's stress the odd-numbered syllables. And then, by decomposing stress the odd-numbered syllables into stress the first syllable, don't have two stressed syllables in a row, don't have two unstressed syllables in a row, we constrain the kinds of stress systems that we could find.

So there aren't stress systems that say stress the prime numbered syllables or stress the powers of 2, right? There are certain kinds of constraints that you use for stress systems and not others. And it's one of the kinds of things we're trying to get. A good question. Other questions? Yeah.

AUDIENCE: How far would you split into three rules here, right?

NORVIN RICHARDS: Yeah.

AUDIENCE: First of all going around the two stressed syllables in a row, so I'm not sure on the second one now.

NORVIN RICHARDS: Yeah.

AUDIENCE: And don't stress the last syllable, like going to the three dot three. So I dictate, my mind goes very close somewhere.

NORVIN RICHARDS: Yes, yes, yes, I see what you mean. So we could ask ourselves, what would happen if you had-- and this is either a virtue or a flaw of this way of talking about it, what would happen if the second thing there, don't stress the last syllable, were the first constraint, or if it were the third constraint, or if it were the last constraint. We get to ask ourselves, do we get different systems if we mess with the constraints that way? And this is indeed the kind of thing people do when they're doing this kind of work, you know.

Here's another stress system. This is Passamaquoddy, in which the rules go, stress the first syllable, don't stress the last syllable. Those are the most important things. You can see that those are true in all of these examples. And don't allow two unstressed syllables in a row. And then down at the bottom of the list is don't allow two stressed syllables in a row. And it's at the bottom because, well, Passamaquoddy has two stressed syllables in a row all the time.

Impressionistically what's going on in Passamaquoddy is you stress the first syllable, and you stress every other syllable counting backwards from the end of the word. So "dirt" is "tupqan," and then "in the dirt" is "tupqanok." So you get stress on the first two syllables, more stress actually on the second one than on the first.

I wish that this were not the Passamaquoddy stress system, because I'm trying to learn Passamaquoddy. And it means that if you're trying to say something like "Let's walk around on top," you have to ask yourself, OK, is there an odd number of syllables in that word or an even number, because that's how you know whether to say "tehsahqapasultine," with stress, main stress on the next-to-last syllable, with two stressed syllables at the beginning, or not. Yeah, so it's a pain.

Yeah, or here's Tauya, where, again, we could decompose this. This is not unlike Passamaquoddy, except you're stressing the first syllable. And you are stressing the last syllable. And then you are stressing every other syllable counting backwards from the end. So you end up with bi-syllables having two stresses, unlike in Passamaquoddy, where there's only one.

That's one kind of stress system, these kinds of stress systems where you have repeated stresses. There's another kind of stress system that's going to have to include constraints that make reference to particular morphemes. So I want to give you an example of that. The classic example that I know of is from Russian. So I'm going to show you some Russian data.

English has examples like this, too. We've talked about it before, the fact that "electric" has stress on its second syllable, but that when you add the suffix "ity," you do various interesting things. You change the "k" sound at the end of electric to an "s," so you get "electricity." But also you shift the stress, so it's not "electricity," it's "electricity" with stress on what was an "ik" and is now an "is." For Russian, the basic stress rule goes something like this.

Russian morphemes get to indicate whether they want stress or not, and where they want the stress to be. And the basic rule goes, stress the first lexically-accented syllable, that is, the first syllable that is marked as saying, hey, I need stress. If there aren't any lexically-accented syllables, then you stress the first syllable of the word. Russian stress is quite intimidating if you're trying to learn Russian.

So if you're interested in trying to learn Russian, please try to remember this rule that will save you a lot of heartache. So here are some examples. The word for town, "gorod," is an unaccented word. And that means that it has stress on the first syllable, because the rule is stress the first syllable if there aren't any lexically-accented syllables. And the dative singular suffix, "-u," that's showing up for this class of nouns, is also lexically unaccented, so it doesn't do anything to the stress.

So "gorod" is the word for town, and "gorodu" is the dative singular. And again, don't worry about what dative singular means. It's a thing. It's a marker you can put on nouns.

But the dative plural suffix, putting it in a different form, is a lexically accented stress. It does require stress. And so stress shifts to that particular suffix. So you get initial stress because there's no lexical accent in gorod and gorodu, but if you add the data plural suffix, you get "gorodam," with the stress shifting to the end, because this is a suffix that demands stress.

There are also nouns that want stress on a particular syllable. So the word for nut, which is "orex," wants-- has lexical accent on its second syllable. And that means that, no matter what you add to that noun, the stress is not going to shift. So the word for nut is "orex." And if it's dative singular, if it's dative plural, you still get stress on that second syllable, because the basic rule is stress the first lexically-accented syllable.

So in the last example, the dative plural of nut, the stress is still in that second syllable. It's "orexam," even though, as we've seen, "am" attracts stress to itself. It only attracts stress to itself from nouns that don't themselves have lexical accent, yeah. There, now you know more about that-- I tried years ago to try to learn Russian. And this was one of the things that made me give up.

It was like the stress just doesn't make sense to me. I don't understand it. But now you know, so and I do too. I should go try to learn it again. So one way to think about this is you say a Russian morpheme can have a lexical accent. As part of its specification, it can have a little note saying, hey, I want stress to be here.

And then we need constraints that say things like, there's only one stress in a word. You want to stress lexical accents, and you should put your stress as far to the left as possible. So in a word like town, there aren't any lexical accents. And so the only relevant constraints, I guess, are the first and the third. There should be one stress, and it should be as far left as possible. So it's at the beginning, "gorod."

For "gorodam," the dative plural of town, there can only be one stress. You want it to be as far left as possible. But there's a lexical accent on dative plural suffix. And so you put it on "am." that's as far left as you can go, yeah. So the last constraint doesn't get to do very much.

And then for nut, there's lexical accent on the "ex," on the second syllable of the noun. And because you're putting stress as far left as possible, that's where the stress is always going to go, no matter what suffixes you add. Yeah, that's the basic picture.

OK, we will do a little bit of Kashmiri and then we'll stop, I think, for today. This actually came up when we were talking about cucumbers. There are languages that have stress systems that care about what's called syllable weight. That is, they care about whether vowels are long or short and also about how many consonants there are after vowels.

And Kashmiri is a classic example of this. And I'll show you a little bit of this and we'll see whether we can find a good stopping place somewhere in the middle. Here are some Kashmiri words. There are lots of Kashmiri words that have initial stress. Anybody here speak Kashmiri, language of Kashmir? OK.

So lots of words have initial stress. Basically, initial stress is what you get if nothing else is happening. But if there's a long vowel in the word, even if it's not the first syllable of the word, then the long vowel will get stress. So that verb, to finish, has a long vowel as its third vowel, and that's where the stress goes in that word.

A long vowel will attract stress except when it's final. So if it's the last vowel in the word, it doesn't get stressed. So the word for book has two syllables. And the second syllable has a long vowel. But the first syllable gets the stress, because Kashmiri like several other languages we've looked at, doesn't like stressing final syllables. If there are two long vowels, then you stress the first one.

And another kind of thing that attracts stress is a vowel that's followed by two consonants. So here's the word for "Friday," where the second vowel is followed by an "r" and a "v." It's the first example, I guess, that we've had of a vowel that's followed by two consonants. And a vowel that's followed by two consonants also preferentially gets stressed. It acts like a long vowel.

If you have both a long vowel and a vowel that's followed by two consonants, then you prefer the long vowel. So you're getting that in here in door. In Friday, you're not getting stress on the long vowel. That's because the long vowel is the last syllable of the word, and the more important thing is don't stress the last syllable.

So we can fruitfully think of Kashmiri stress as a bunch of ranked constraints, again, which say things like don't have more than one stress. Don't stress the final syllable. Stress your long vowels. Stress your vowels that have multiple consonants after them, and then put stress as far to the left in the word as possible. So stress long vowels, we got that in that word that had a long vowel as its third vowel.

But we also saw that outranking stress long vowels is a constraint that says don't stress the final syllable. So in this word for "book," there's a long vowel in the final syllable but you don't stress it, because it's final. And avoiding final stress is more important than stressing long vowels.

There's a rule that says don't have more than one stress. So you like stressing long vowels, but if you have a word that has multiple long vowels in it, you only get one stress. You don't get two, yeah? And the general rule is, put stress as far to the left in the word as possible.

So when you have two long vowels you stress the first one. You can't stress them both. You also don't stress the second one. You stress the first one because you want stress to be as far to the left as possible. That's also why, when there are no long vowels, and no vowels with multiple consonants after them, you get initial stress.

And then finally, stressed vowels with multiple consonants after them, that's got to be in there somewhere. And it's got to be below stressed long vowels, because when you have both a vowel with multiple consonants after it and a long vowel, you stress the long vowel and not the vowel with multiple consonants after it. So here's another place where it's possible to describe Kashmiri stress in several paragraphs of prose, in which you say things like, well, Kashmiri stress, it's on the first syllable unless there are long vowels or vowels with multiple consonants after them, except when those are final or on a Tuesday in a month beginning with "m."

It would be quite long and complicated. If we describe Kashmiri stress this way in terms of ranked constraints, the constraints themselves can all be pretty simple. They can be things like stress your long vowels. That's a pretty natural thing to do. Or avoid final stress. Or put your stress as far to the left in the word as possible.

And all of the action is figuring out what order are these constraints in, which are the most important ones and which are less important. And by ranking them that way, you end up with this quite complicated array of data, which we've now gone through quite quickly. But you'll have the slides. So you'll have a chance to go through this in your own time.

Are the questions about Kashmiri? Since we have a few more seconds here, we can talk about Kashmiri in more depth if people would like, or anything else. As I said at the beginning, I could hear people talking about the problem set. If people have questions about the problem set, we can talk about them. Yeah.

AUDIENCE: The chapter felt like-- so is, like, for like English.

NORVIN RICHARDS: Yeah.

AUDIENCE: Is there like a system like this?

NORVIN RICHARDS: Oh.

AUDIENCE: Or is it just kind of like--

NORVIN RICHARDS: So, yeah, here I am talking about stress systems. And I've talked to you about Kashmiri and I've talked to you about Passamaquoddy. I've talked to you about various languages, Russian, and I've strenuously avoided talking to you about English. English stress is quite complicated and messy.

There are books about it. It's partly, like so much about English, the product of several different languages with different stress systems interacting with each other. So there was a Germanic stress system that English inherited from its Germanic substrate. And then the French invaded in 1066 bringing their own stress system.

And one of the results of that is that English stress is the kind of thing you can write books about. So there's a reason I haven't tried to do English stress on the slide. You think Kashmiri is complicated, yeah. It's, yeah, it's complicated.

It's complicated in interesting ways. We have various places, for example, where the difference between a verb and a noun has to do with stress. So we have verbs like "perMIT" and nouns like "PERmit," right? Get a permit to do something. And there are a number of pairs like that, which is one of the kinds of things that's interesting to think about.

That's not something that we inherited. And so when people are trying to figure out how-- we talked earlier about the possibility that nouns and verbs could have different phonologies, and there are times when something like that seems to be happening, like in that kind of example. So when you write your book on English stress, that's one of the chapters you have to write is the difference between permit and permit. Yeah. Yeah.

AUDIENCE: You said, is there like some method we can use to define the like all the rules that were in this? Like adjusting rules to see what the basis is.

NORVIN RICHARDS: So what you want to do is look systematically at each vowel. Here's what I would do in your shoes. Look systematically at each vowel and make yourself notes for each vowel about the environments that they show up in. So, say you start with the vowel "a." Make yourself notes about all of the things that are around "a."

Maybe you could start with the hope that the relevant things are the consonants on either side of it, or whether it's at the beginning or the end or the first syllable or the second syllable or whatever. Make yourself notes for each word that has an "i" in it, where the "i" is showing up. And then look at your notes and hope that something jumps out at you.

That's the only thing I can think of to suggest. Sorry, that's probably what you're doing. But if that's what you're doing, you're doing well. Are there other questions? OK, all right, so I'll see you on Thursday when we will start talking about syntax.