# Introduction to Linguistics LIN101

## Lecture 6: Syllable, stress, and tone

Fall 2024, University of Toronto, St. George

Angelika Kiss

# Announcements

- Quiz 1
- This lecture: We're entering phonology!
- Homework 2 is due today. See discussion board HW2!

# What is phonology?

# What is phonology?

- The sounds of language do not combine in an entirely random way.
- If you concatenate the sounds [m], [i], and [k] together, you can form an English word [mik] written as *meek*.
- But what about the other 5 possible combinations?
- [imk], [ikm], [mki], [kmi], and [kim]
- Neither of these are English words, but for different reasons.
- The first four sound odd, the fifth could have become a word but did not
- Phonology is concerned with the underlying patterns in which sounds can combine with each other in languages.

# Syllables

# Syllables

- The words of spoken languages are built from a set of speech sounds.
- There is an additional layer between words and sounds: **syllables** .
- Every word contains at least one syllable.
- Abbreviation: σ (Greek letter sigma)
- Notation: [.] - Canada: [kæ.nə.də]
- Syllables have an inner structure.
- Every syllable must contain a nucleus



The island of Krk (Croatia)

# Syllables

## Syllable structure

- Wd = word
- σ = syllable
- Nuc = nucleus
- Every syllable has a nucleus!
- Everything outside the nucleus is part of the margins
- Ons = onset , the left margin of a syllable
- Cod = coda , the right margin of a syllable
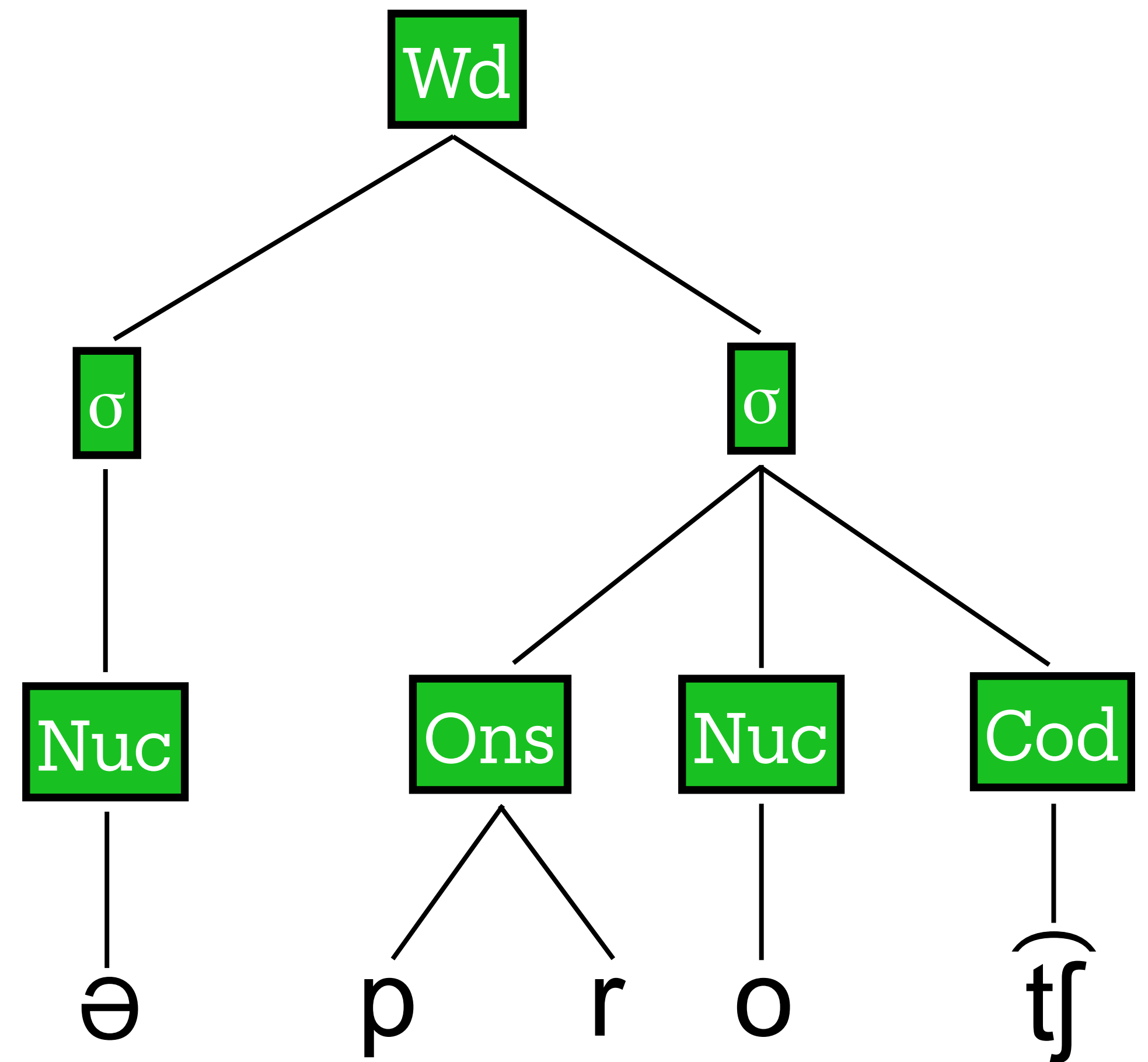- Margins can be simple or complex



complex margin

simple margin
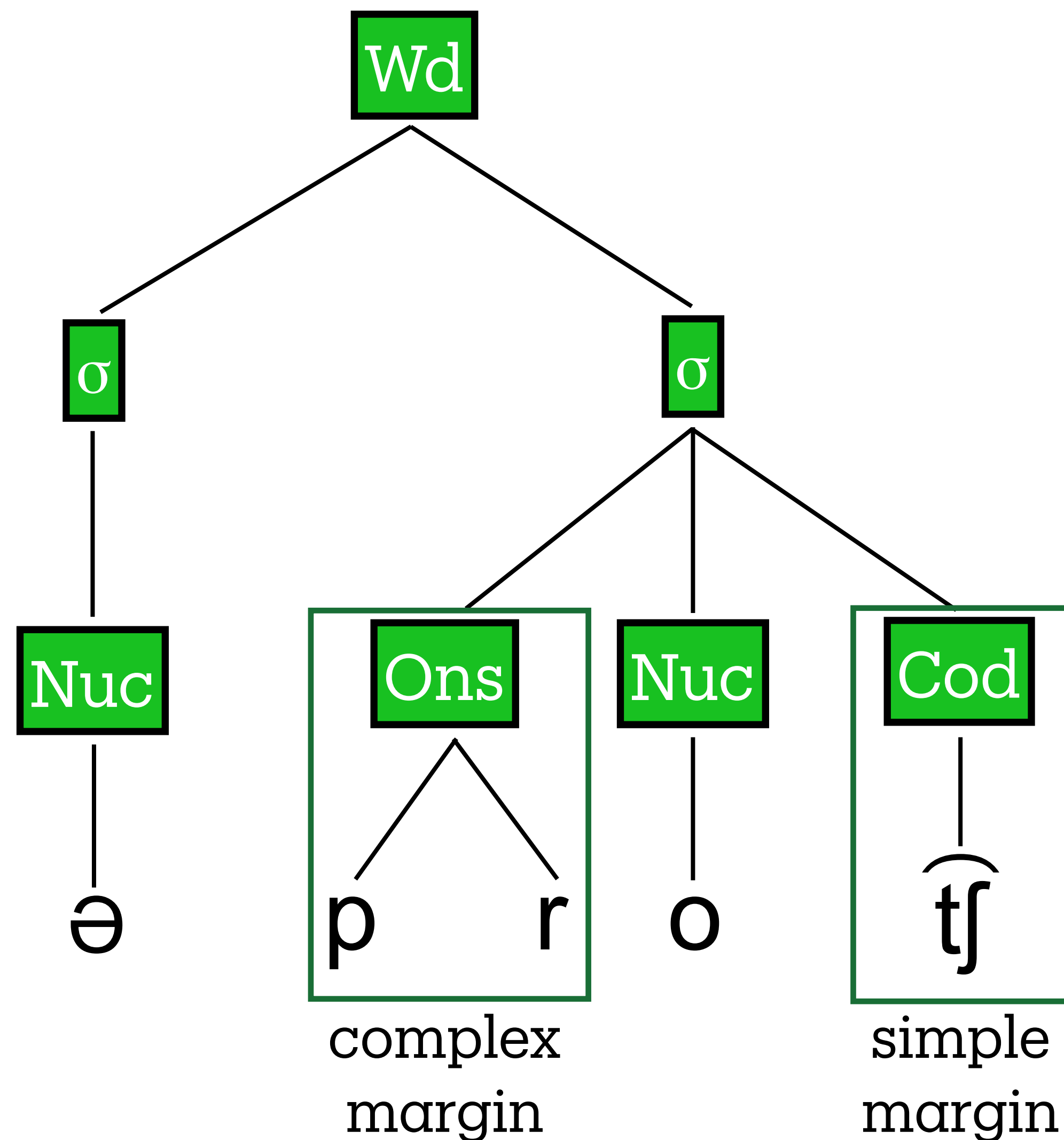
# Syllables

- Syllables can be represented as trees
- But it is also possible to use the CV-notation:
- approach [əprot͡ʃ] = V.CCVVC
- C = consonant
- V = vowel
- affricates count as single Cs
- No onset: onsetless syllable
- No coda: open syllable
- Coda: closed syllable

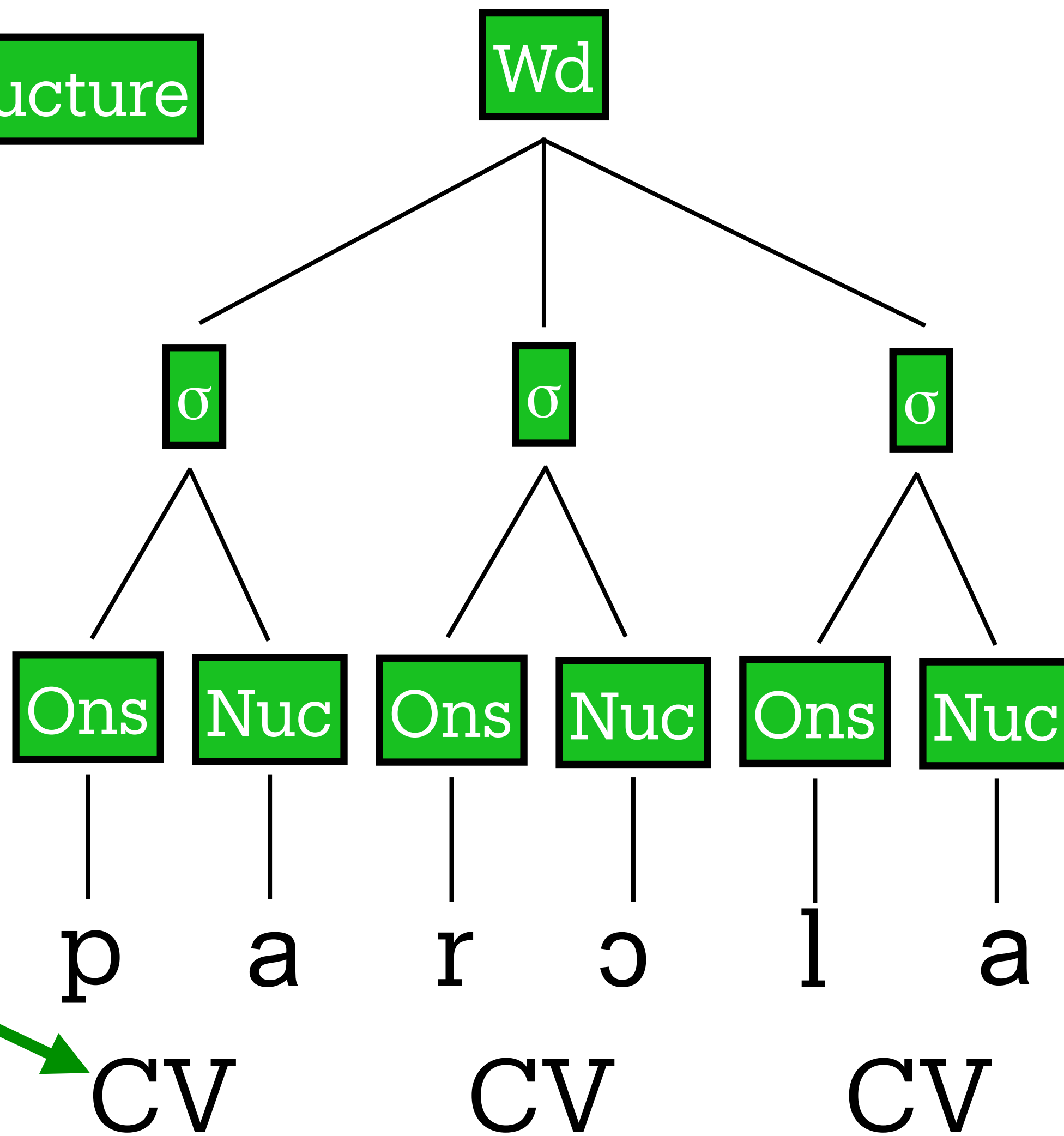Wd

σ          σ

Nuc        Ons   Nuc   Cod

ə          p  r   o    t͡ʃ

V          CCVVC

diphthongs: VV

# Syllables

Syllable structure
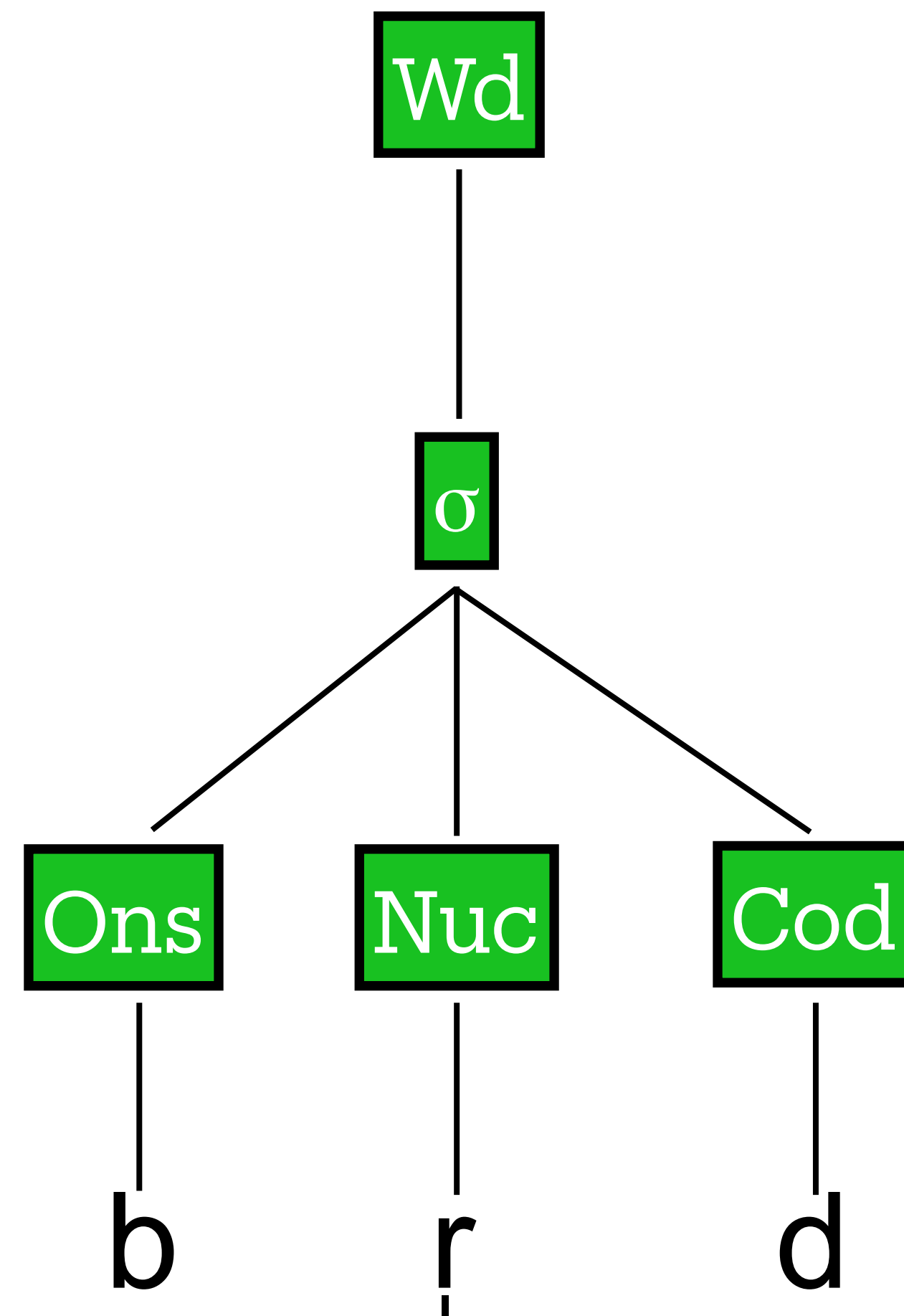


open syllable → CV

CV    CV

syllabic consonants: V

closed syllable → CVC

# Syllables

- Speakers usually have strong intuitions about the number of syllables in a word and about where the syllable boundaries are
- But there are ambiguous cases.
- hire vs. higher = [haɪr] vs. [haɪ.ɹ̩] = CVVC vs. CVV.V?
- When speakers listened to excerpts of their recorded speech, they couldn't tell *hire* from *higher*. Either they said that both have one syllable or that both had two.
- Same for hour [aʊr]/[aʊ.ɹ̩], power [paʊr]/[paʊ.ɹ̩], owl [aʊl]/[aʊ.l̩], towel [taʊl]/[taʊ.l̩], etc.
- Syllables therefore have a questionable status. They may have psychological reality without having physical reality

# Syllables

- Languages differ in what kinds of syllables they allow
- In English, German, and Croatian, it is possible to have complex onsets
- English: string [strɪŋ]
- German: streichen [ʃtʁaɪçn̩] 'to paint' } CCC onset in first syllable
- Croatian: *strížem* [striːʒem] 'I shear'
- Other languages, like Japanese, Korean or Mandarin allow at most simple onsets
- Japanese: 子供 *kodomo* [kodomo] 'child'          CV.CV.CV
  Korean: 아이 *ai* [ai] 'child'                     V.V
  Mandarin: 男孩 nánhái 'boy'                          CVC.CVV

# Syllables

• What are the possible syllable structures?

Note: only syllables with monophthongs

V   *ea-* [i]

CV  *Ca* [kæ]     CCV  *plea* [pli]      CCCV  *straw* [strɑ]

CVC  *cup* [kʌp]   CCVC  *plan* [plæn]    CCCVC  *string* [strɪŋ]

CCVCC  *crust* [krʌst]    CCCVCC  *strings* [strɪŋz]

CCVCCC  *shrinks* [ʃrɪŋks]    CCCVCCC  *strengths* [strɛŋθs]

VC  *awk-* [ɒk]    VCC  *elk* [ɛlk]      VCCC  *elks* [ɛlks]

# Syllables

- Languages differ in what kinds of syllables they allow
- There is a crosslinguistic preference for onsets and a dispreference for codas
- Common to require an onset, not common to require a coda
- Common to prohibit codas, not common to prohibit an onset
- In languages where all syllables are of the type CV(C) = an onset and a nucleus are required but the coda is optional
- There does not seem to be a mirror image language with an optional onset but a required coda at the same time - (C)VC

# Syllables

- Simple margins are preferred to complex margins
- Implicational universals: "if a language exhibits X, it also exhibits Y"
- simple codas $\not\Rightarrow$ complex codas
- complex codas $\Rightarrow$ simple codas
- simple onsets $\not\Rightarrow$ complex onsets
- complex onsets $\Rightarrow$ simple onsets

# Syllables

| onsetless σ | closed σ | complex onsets | complex codas | possible CV structures | example language (family) |
|:---:|:---:|:---:|:---:|:---:|:---|
| ✓ | ✓ | ✓ | ✓ | (C)(C)V(C)(C) | Maltese (Afro-Asiatic) |
| ✓ | ✓ | ✓ | ✗ | (C)(C)V(C) | Vietnamese (Austroasiatic) |
| ✓ | ✓ | ✗ | ✓ | (C)V(C)(C) | Turkish (Turkic) |
| ✓ | ✓ | ✗ | ✗ | (C)V(C) | Yup'ik (Eskimo-Aleut) |
| ✓ | ✗ | ✓ | ✗ | (C)(C)V | Luganda (Niger-Congo) |
| ✓ | ✗ | ✗ | ✗ | (C)V | Hawaiian (Austronesian) |
| ✗ | ✓ | ✓ | ✓ | (C)CV(C)(C) | Gitksan (Tsimshianic) |
| ✗ | ✓ | ✓ | ✗ | (C)CV(C) | Ilocano (Austronesian) |
| ✗ | ✓ | ✗ | ✓ | CV(C)(C) | Kwak'wala (Wakashan) |
| ✗ | ✓ | ✗ | ✗ | CV(C) | Karuk (Hokan) |

Sanders 2022

# Spoken language phonotactics

# Spoken language phonotactics

- **syllabification** : the way sounds are associated with their appropriate positions in syllable structure.
- This process relies on a certain hierarchy between sounds
- **sonority** : an abstract measure of a phone's inherent prominence.
- This prominence can mean loudness: [ɑ] is louder than a [t]
- But sonority can also refer to their resonance, seen in the periodicity of their waveforms
- **sonority hierarchy** : the ordering of sounds based on their sonority within the same syllable
- vowels > sonorants > obstruents
- **phonotactics** : language-specific restrictions on what kinds of sounds and combinations of sounds are allowed to occur in certain positions
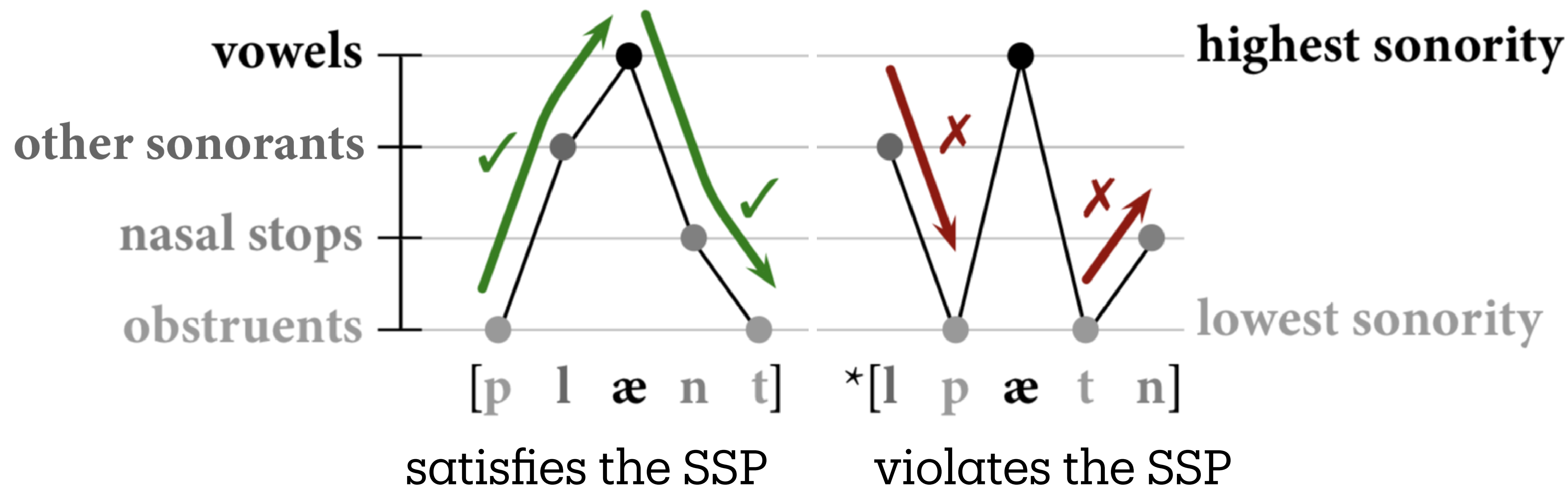
# Spoken language phonotactics

- English phonotactics does not allow [tl-] and [dl-] onsets,
- even though [tl-] and [dl-] are not unpronounceable because these are allowed in Czech, Ngizim and Hebrew.
- Not only are words with [tl-] pronounced by speakers of other languages, even speakers of English can say it without any problems
- Tlingit (an Indigenous Language spoken in Canada and Alaska)
- This suggests that some phonotactic constraints can be somewhat relaxed
- Further examples: Vladimir [vlædəmɪr] is pronounced by speakers of English without any problems even if English phonotactics does not permit/prefer it.
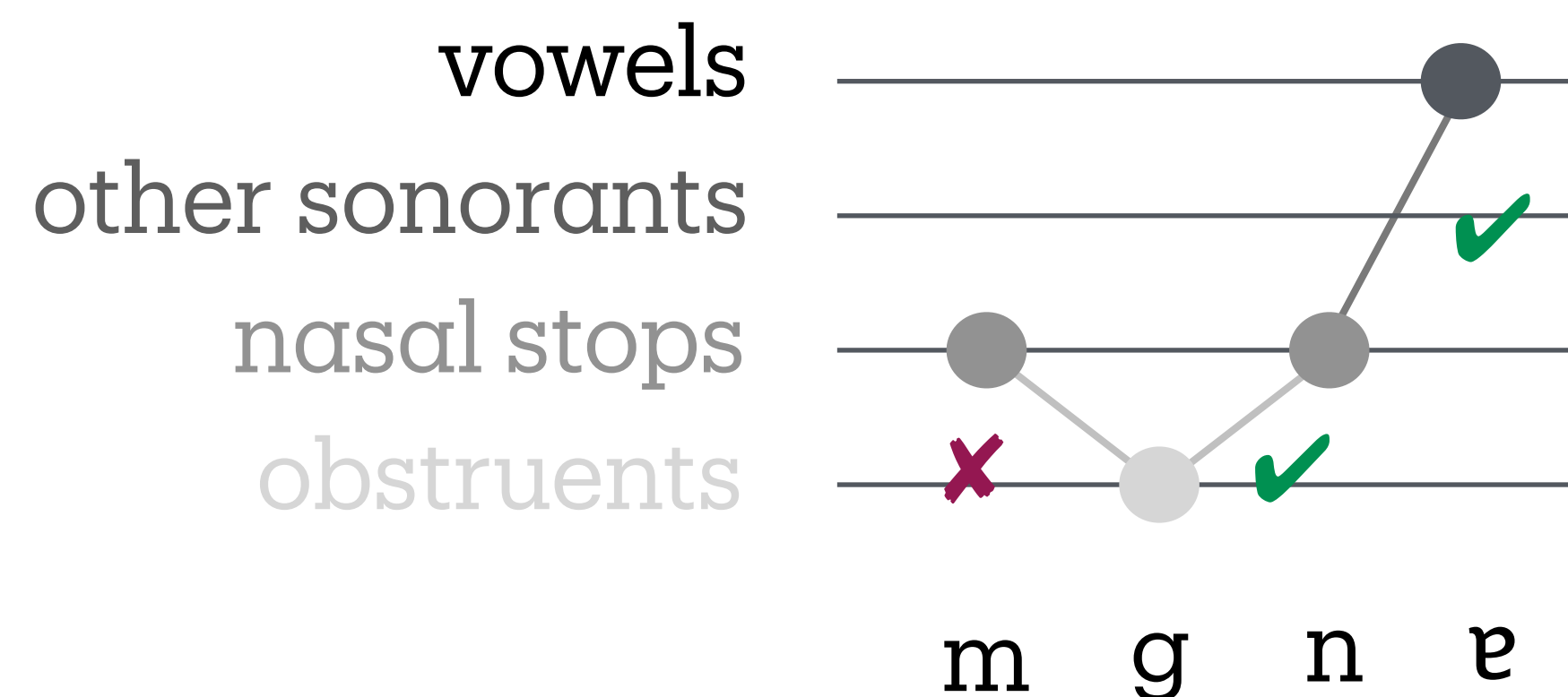
# Spoken language phonotactics

- the nucleus is the most sonorous component of the syllable
- **sonority sequencing principle** (SSP): sonority within a syllable rises through the onset, peaks at the nucleus, and falls through the coda



satisfies the SSP          violates the SSP

# Spoken language phonotactics

- Languages do violate the SSP
- A commonly observable violation: **sonority plateau**, when two adjacent sounds have the same level of sonority
- *act* [ækt]
- Some languages even allow **sonority reversal**
- *мгнавение* [mgnɐ.ve.ɲi.je] 'instant' in Russian has a complex onset, with three consonants that do not show a linear increase in sonority, they even reverse the order
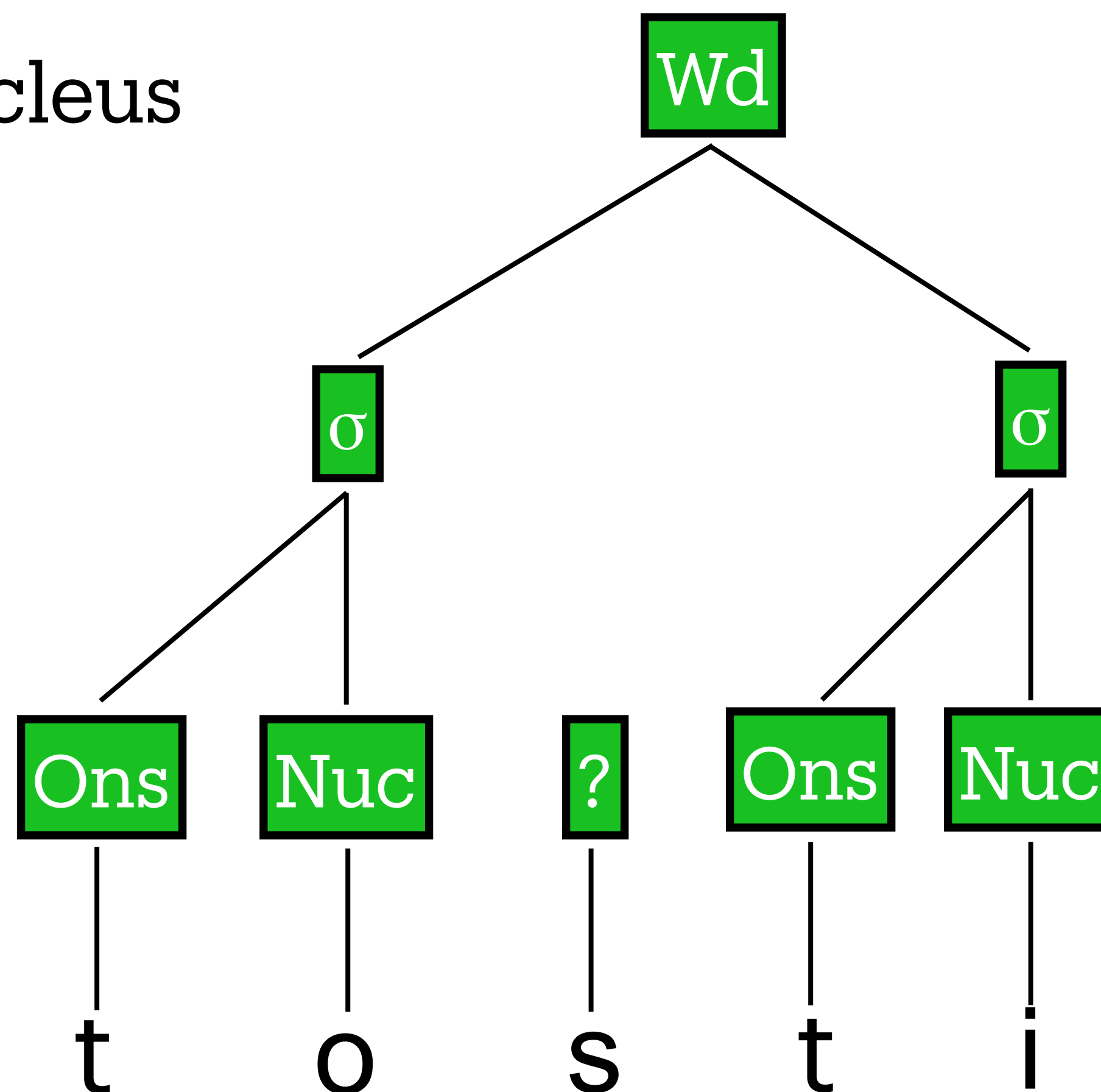
vowels
other sonorants
nasal stops
obstruents

m ɡ n ɐ

# Spoken language phonotactics

- There are multiple ways of syllabifying a word
- *toasty* [tosti]: where are the syllable boundaries?
- [to.sti] > CV.CCV > both CV and CCV are allowed in English
- [tos.ti] > CVC.CV > both CVC and CV are allowed in English
- [tost.i] > CVCC.V > both CVCC and V are allowed in English
- Which one should be chosen?
- Maximize onsets : a general principle to prefer onsets to codas whenever possible, and to put in as many consonants into onsets as possible (without violating the SSP, of course)
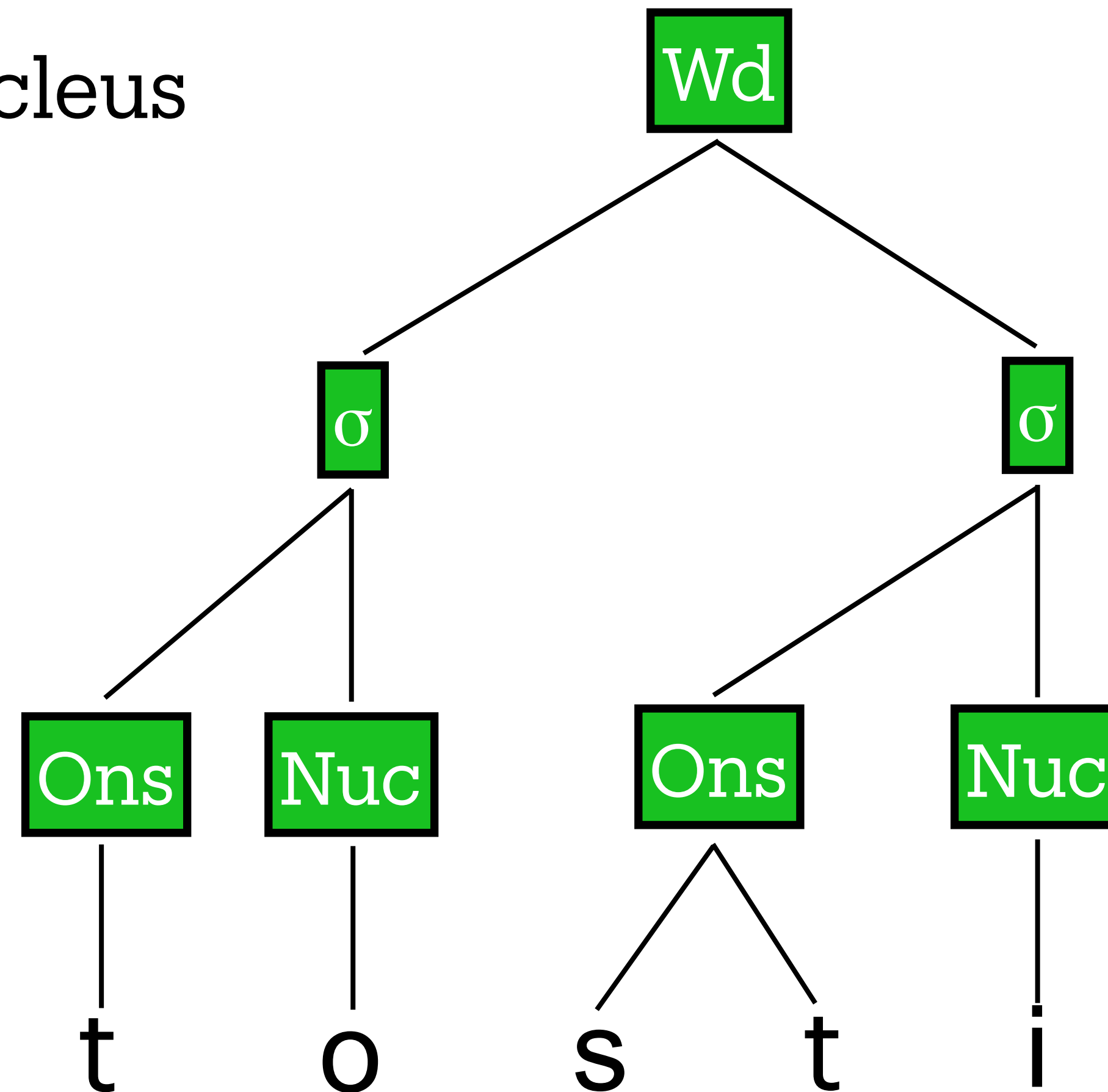
# Spoken language phonotactics

- Step 1: assign each vowel to a nucleus
- Step 2: assign as many adjacent consonants on the immediate left of each nucleus to the onset of the same syllable
- but only as long as the onset does not violate SSP
- Step 3: assign the remaining consonants to the codas of the syllables on their left

# Spoken language phonotactics

- Step 1: assign each vowel to a nucleus
- Step 2: assign as many adjacent consonants on the immediate left of each nucleus to the onset of the same syllable
- but only as long as the onset does not violate SSP
- Step 3: assign the remaining consonants to the codas of the syllables on their left

# Signed language phonotactics

# Signed language phonotactics

**Syllables**

- Signs, too, can be decomposed into syllable-like structures
- But these "syllables" have a different status compared to spoken languages
- To study the internal structure of signs, they are divided into two types of states:
- **static state** : roughly equivalent to location & orientation
- also called position, posture, or hold (H)
- **dynamic state** : roughly equivalent to the movement (M) parameter
- The exact nature of the contrast between the two varies from model to model.

# Signed language phonotactics

- According to some researchers, the dynamic unit could be regarded as "sonorous"
- The dynamic units would thus be like syllable nuclei, and
- the static units would correspond to the margins
- A prototypical sign syllable is HMH (hold - movement - hold)
- Example for such a sign is THANK-YOU

# Stress

# Stress

- Syllables organize sounds into small unit and so they play a role in the overall rhythm and flow of language
- Some syllables are **stressed** = more prominent than others
- Stress usually consists in increased loudness, longer duration, and higher pitch (or some combination of two of these)
- In signed languages, stressed syllables are produced with greater muscular tension and quicker movements
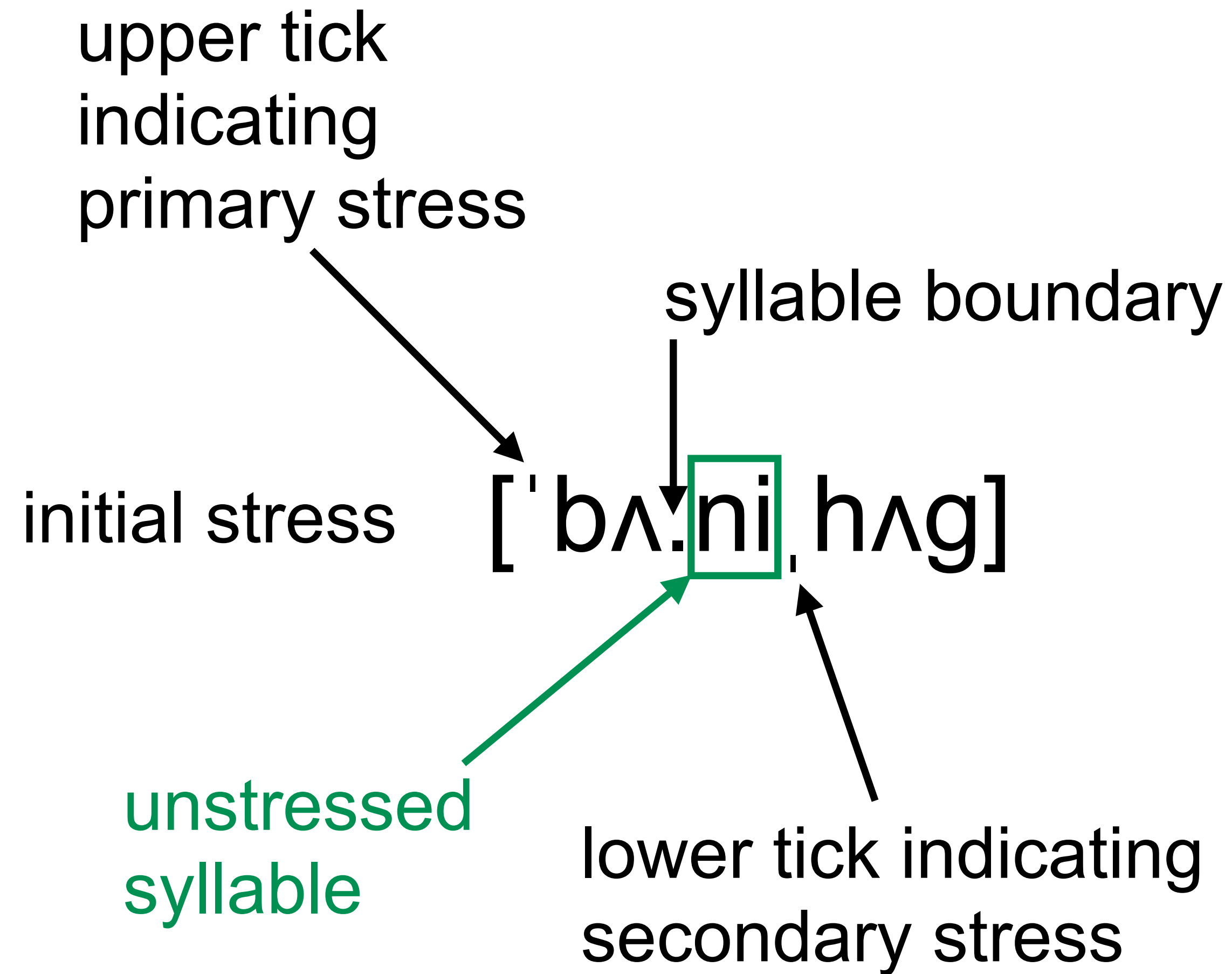
# Stress

- In most spoken languages, there's one stressed syllable per word, the rest of the syllables are unstressed
- In other languages like English, more than one syllable can bear stress in long enough words.
- If so, the stressed syllables differ in their level of prominence
- primary stress : the syllable of highest prominence in the word
- marked by ['] in IPA before the onset of the stressed syllable
- secondary stress : stressed syllables of the word that are less prominent than the one bearing primary stress
- marked by [ˌ] in IPA before the onset of the stressed syllable

# Stress

- In some languages, it's not possible to predict which syllable receives stress. Words in such languages bear `lexical stress`
- Examples from Khowar (Pakistan): [ˈtɑɾu] 'fast runner', [tɑˈɾu] 'batter; [ˈbɛɫu] 'basket', [bɛˈɫu] 'flute'
- In other languages, stress is predictable based on the structure of syllables. Words in such language bear `predictable stress`
- Examples: Slovak, French, Polish
- In Slovak, the stressed syllable is always the first one
  pravopisne 'orthographically'
- In French, it's always the last syllable
  Canada, Toronto, université

# Stress

upper tick indicating primary stress

initial stress

syllable boundary

[ˈbʌ.niˌhʌg]

unstressed syllable

lower tick indicating secondary stress

[rəˈzaɪd] ultimate stress
peninitial stress
[ˈrɛzɪdənt] initial stress
[rəzɪˈdɛnʃl̩] penultimate stress

telefonɑ antepenultimate peninitial
'call (someone)'

telefonɑmi peninitial
'call me'

telefonɑmelo peninitial
'tell me by calling me on the phone'

Italian

# Stress

- Grammatical function words (*is, was, a/an, the, on*, etc.) tend to be unstressed
  *je comprends* 'I understand' (French)
  *lo compro* 'I'll buy it' (Spanish)
  *al sayara* 'the car' (Arabic)
- Primary stress is nearly always in the first two or last two syllables in a word. There don't seem to be spoken languages that assign primary stress to their middle syllables as a rule.
- Secondary stress in longer words seems to follow a pattern, by skipping every other syllable.

# Tone and intonation

# Tone and intonation

**Pitch**

- When the vocal folds vibrate, this happens at a certain rate, which is called the **fundamental frequency**
- When we talk about our auditory perception of the fundamental frequency, we use the term **pitch**
- When we say 'high pitch' or 'low pitch', that is to be understood relative to the speaker.
- **Tone** : the manipulation of pitch at the level of syllables or words in order to change their meaning
- **Intonation** : the manipulation of pitch at the level of phrases or sentences.
- Italian, Arabic, Russian: to turn a statement into a question

# Tone and intonation

**Pitch**

- Languages in which tone can change the meaning of a word are called **tonal languages**
- Chinese languages, Vietnamese, Thai, Yoruba, Igala, Chinantec languages, etc.
- Languages with an intonation system are called non-tonal or **intonational languages**
- Indo-European languages
- This distinction does not mean that there is no intonation in tonal languages!
- Cantonese and Mandarin are tonal languages, yet there is intonation in these languages as well.
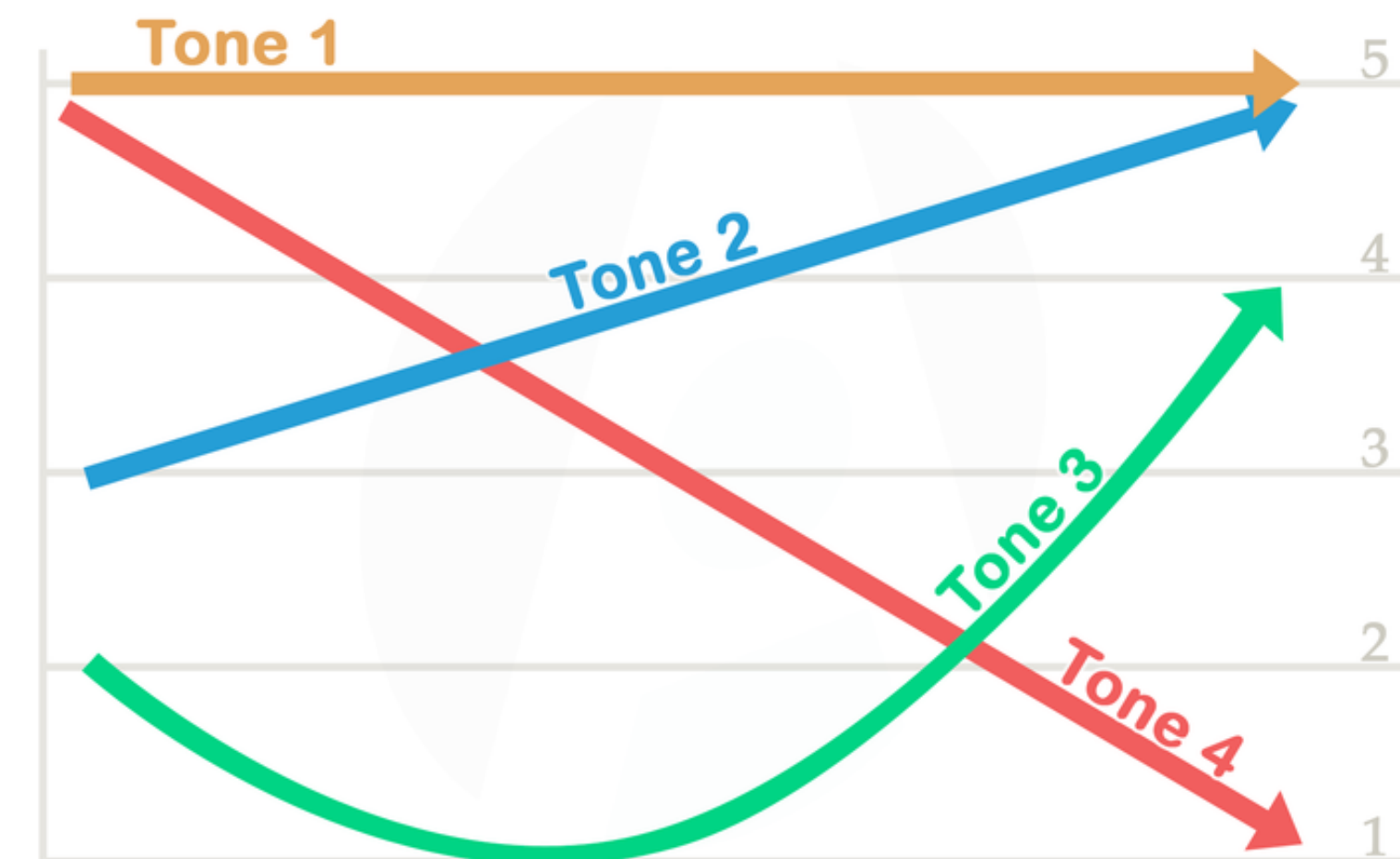
# Tone and intonation

- Tonal languages that have only two tones usually have a high tone H and a low tone L
- These can be written above the given syllables
- Tone diacritics:
- [´] the acute accent stands for high tone and
- [`] the grave accent represents the low tone
- Tone letters :
- [˥] for high tone; [˩] for low tone
- Non-IPA notation: numbered tones
  [a⁵] high tone; [a¹] for low tone

# Tone and intonation

- The particular way tone is noted in a language depends on a number of factors
- legibility ("be user-friendly")
- the complexity of the language's tone system ("represent reality")
- the purpose of transcription
- historical tradition
- Mandarin tones:
- 妈 = mā / ma$^1$ / ma$^{55}$

# Tone and intonation

| tone pattern | example with IPA tone diacritics | example with IPA tone letters | example with non-IPA tone numbers | gloss |
|---|---|---|---|---|
| LH | [kùːlá] | [kuː˩la˥] | [kuː$^1$la$^5$] | 'build' |
| HH | [βúːlá] | [βuː˥la˥] | [βuː$^5$la$^5$] | 'take' |
| HL | [péːlà] | [peː˥la˩] | [peː$^5$la$^1$] | 'give' |
| LHL | [ùkúwà] | [u˩ku˥wa˩] | [u$^1$ku$^5$wa$^1$] | 'fall' |
| LLH | [ìnùmá] | [i˩nu˩ma˥] | [i$^1$nu$^1$ma$^5$] | 'back' |
| HLH | [íŋòmá] | [i˥ŋo˩ma˥] | [i$^5$ŋo$^1$ma$^5$] | 'drum' |
| HHL | [íːntʃítò] | [iː˥ntʃi˥to˩] | [iː$^5$ntʃi$^5$to$^1$] | 'work' |

Table 3.3. Tone patterns in longer Bemba words.

# Tone and intonation

- In many languages, a mid tone (M) is also part of the inventory, which lies between H and L in terms of pitch
- Notation: macron accent [ˉ], in terms of numbers, it's [a³]
- Igala (Nigeria)

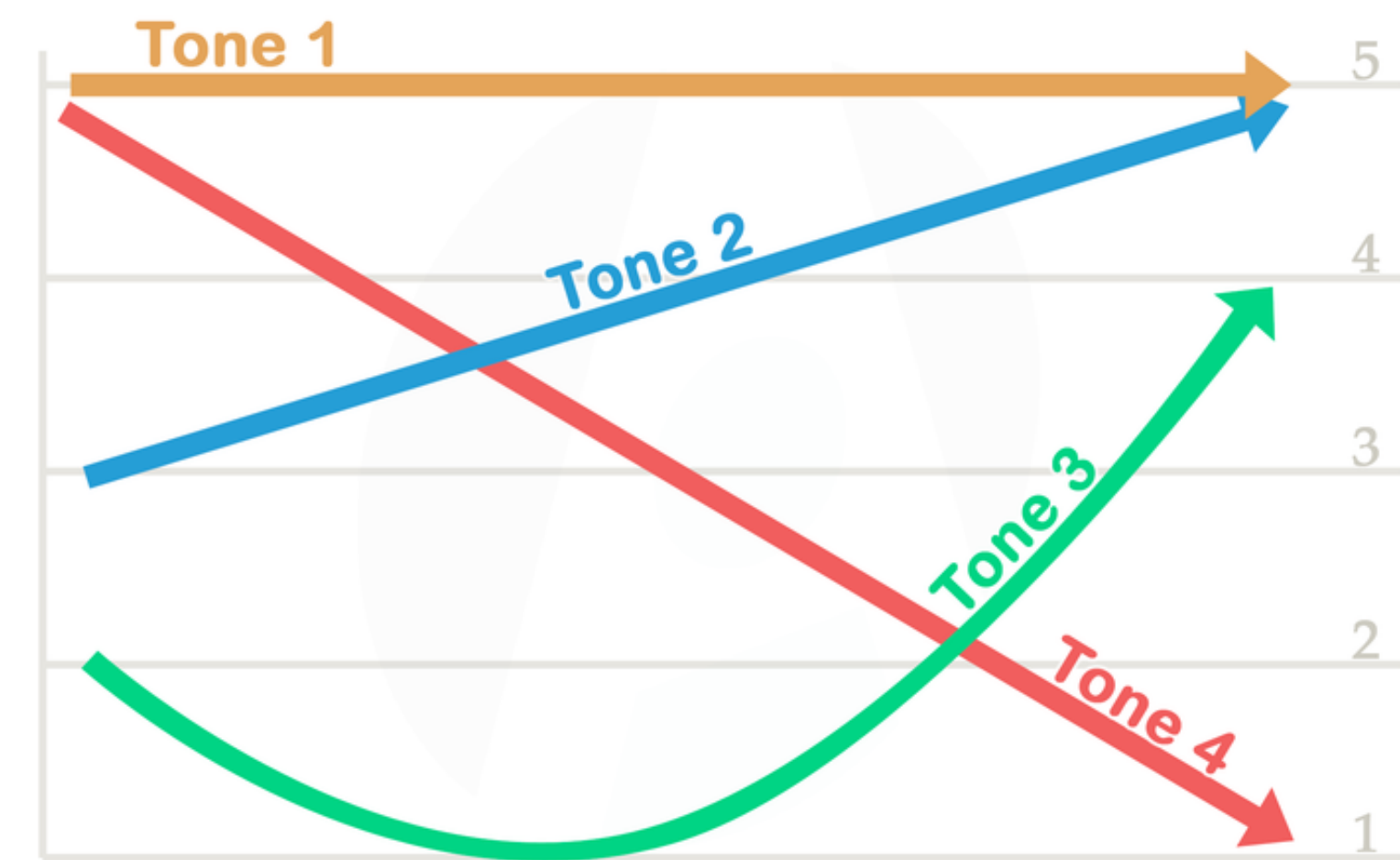| tone pattern | example with IPA tone diacritics | example with IPA tone letters | example with non-IPA tone numbers | gloss |
|---|---|---|---|---|
| LH | [àwó] | [a˩wo˥] | [a¹wo⁵] | 'slap' |
| LM | [àwō] | [a˩wo˧] | [a¹wo³] | 'comb' |
| LL | [àwò] | [a˩wo˩] | [a¹wo¹] | 'star' |

Table 3.4. Tone patterns in Igala.

# Tone and intonation

**Contour tones**

- The three tones considered so far (H, M, L) are all **level tones**
- They are produced with a relatively stable pitch from beginning to end
- But there are tones which involve a significant change in pitch, called **contour tones**
- Mandarin has one level tone (T1) and three contour tones (T2–T4)
- Falling tone (F): starts high and ends low (T4)
- Rising tone (R): starts low and ends high (T2)

# Tone and intonation

- But rising and falling are not the only options for a contour tone: fall-rise (Mandarin T3) and rise-fall also exist
- Falling tones: caret accent [â] / [ɑ˥˩] / [ɑ⁵¹]
- Rising tones: haček accent [ǎ] / [ɑ˩˥] / [ɑ¹⁵]

Awa
(Papua New Guinea)

| tone pattern | example with IPA tone diacritics | example with IPA tone letters | example with non-IPA tone numbers | gloss |
|---|---|---|---|---|
| H | [ná] | [na˥] | [na⁵] | 'breast' |
| L | [nà] | [na˩] | [na¹] | 'house' |
| F | [nâ] | [na˥˩] | [na⁵¹] | 'taro' |
| R | [pǎ] | [pa˩˥] | [pa¹⁵] | 'fish' |

Table 3.5. Tone patterns in Awa.

# Tone and intonation

Intonation

- Intonation does not modify the meaning of a word like tones, rather, it changes sentence-level meaning
- Various functions
- Sentence type

same segmental material
different intonation
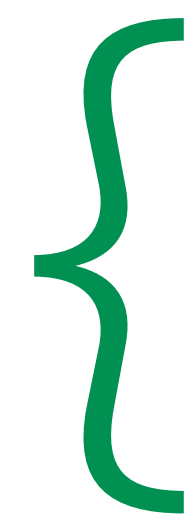
| | |
|---|---|
| This is vegetarian chili | statement |
| This is vegetarian chili? | question |
| THIS is vegetarian chili | corrective statement |
| This IS vegetarian chili | corrective statement |
| This is vegetarian chili!!! | emotional content |

End of lecture 6

# References

- Sanders, Nathan (2022). Introduction to Linguistics: Sounds. Lecture 7 slides.