

Phonology Summary

(contains all examples from class slides, and more!)

1. Phonology vs. phonetics

- The path from memory (lexical access) to speech is mediated by **phonology**.
- Phonology** = **system of rules** that apply when speech sounds are put together to form morphemes and words.

(1) **stop consonant aspiration in English**: initial within a stressed syllable

<u>ASPIRATED</u> initial within a stressed syllable	<u>UNASPIRATED</u> after s or initial within an unstressed syllable	word-final (therefore syllable-final)
p <u>an</u>	s <u>pan</u>	n <u>ap</u>
t <u>one</u>	st <u>one</u>	no <u>t</u> e
k <u>in</u>	sk <u>in</u>	ni <u>ck</u>
u <u>pon</u>	su <u>pp</u> ing	
a <u>tt</u> ack	att <u>i</u> c	
ak <u>i</u> n	hack <u>i</u> ng	

- What English speakers know is a rule that relates a form stored in memory (in the sound field of the lexicon) to pronunciation. The rule concerns speech sounds, and therefore *involves* phonetics. But aspiration at the beginning of stressed syllables is not an inevitable part of a human language — you can have a human vocal tract and not use the rule exemplified in (1). This makes it a rule of **phonology** rather than a fact about **phonetics**.
- Speakers of Spanish, for example, do not have the English rule, which is why the syllable-initial stop consonants of a native speaker of Spanish sound "funny" to the English ear (and vice-versa). More strikingly yet, speakers of Tojolabal (a Mayan language of Mexico) have a rule that is almost the exact opposite of the English rule, aspirating word (syllable?)-final [t], but not [t] elsewhere:

(2) **aspiration of [t] in Tojolabal**: word (syllable?)-finally¹

1. tʃit ^h am	'pig'	5. tʃat ^h at ^h	kind of plant
2. mak ^h on	'a patch'	6. mut ^h	'chicken'
3. pot ^h ot'	kind of plant	7. nahat ^h	'long'
4. t ^h inan	'upside down'	8. ?inat ^h	'seed'

(t^h = unaspirated /t/)

- Speakers of English *learned* something from the data they were presented with as babies that caused them to internalize (learn) the rule exemplified in (1) — just as Tojolabal speakers learned from the data that they heard as babies, and ended up with the rule exemplified in (2).
- The English rule is real and active "on-line", governing creative linguistic behavior. A native speaker of English will apply it to new words they have never heard. The /t/ in *tib* will be aspirated, and the /t/ in *stib* (both nonsense words, I hope) will not be. Probably Tojolabal speakers will show similar behavior with respect to their rule.

2. What phonetic distinctions are made in lexical entries?

Part 1: phonological rules that eliminate distinctions from the lexicon

- English: lexicon does not need to distinguish aspirated from unaspirated stops.** There is no reason to suppose that information about aspiration forms part of the sound field of lexical entries of English words, since it is entirely predictable. Though *pan* is pronounced /p^hæn/ and *span* /spæn/, there is no reason to distinguish the aspirated and unaspirated bilabial stops in the lexical entries of the two words. **Instead, we may simply use the unaspirated version in the lexicon for both words (pæn, spæn) and let the phonological rule take care of the pronunciation difference.**
- To make the same point differently, we could not even *conceive* of two distinct words in English that differ *only* in the aspiration of a stop consonant. If you invent a product and call it "p^hæb", I could not invent a competing product and call it "pæb" to distinguish it. The second form is simply the first form with a foreign accent! The English lexicon does not even allow the aspirated and the unaspirated variants to be distinguished. It hands the job off completely to the phonology.
- This too is an English-specific fact! In some languages the lexicon *does* make the relevant distinction.** For example, Hindi, where words are often distinguished only by a contrast in aspiration for a stop consonant:

(3) **Hindi: lexicon distinguishes aspirated from unaspirated stops in the lexicon**

note the *minimal pairs*

pal	'take care of'	p ^h al	'knife blade'
tal	'beat'	t ^h al	'plate'
ʃal	'postpone'	ʃ ^h al	'wood shop'
tʃal	'turn'	tʃ ^h al	'bark'
kal	'era'	k ^h al	'skin'

¹ Source: Gleason, Henry A. (1955) *Workbook in Descriptive Linguistics*. New York:, Holt, Rinehart and Winston. Note: I only have information about [t], and don't know if the rule extends to the other stops.

- The same points can be made with other phonological rules. For example:

(4) **vowel length in English:**

V → [+long] / __ [C, +voiced]

(short and long vowels in **complementary distribution**, i.e. not distinguished in the lexical entries for English morphemes, but derived by a phonological rule)

short vowel		long vowel	
meet	[mit]	mead	[mi:d]
back	[bæk]	bag	[bæ:g]
pot	[pɒt]	pod	[pɒ:d]
loss	[lɒs]	laws	[lɔ:z]
half	[hæf]	have	[hæ:v]

made-up words

wuck	[wʌk]	wug	[wʌ:g]
nis	[nis]	niz	[ni:z]

- Nonsense words and the pronunciation of non-English words like *wuck* and *wug* show that this too is a rule. **Vowel length is not part of lexical entries in English!**
- You could not imagine, for example, /nik/ and /ni:k/ being distinguishable names for new inventions in English.
- On the other hand, many languages do distinguish vowel length in the lexicon.** Latin, for example, and many other languages, e.g. Finnish (a brilliantly demonstrated for us in class):

(5) **vowel length in Finnish:**

(short and long vowels distinguished in the lexical entries for Finnish morphemes; note the minimal pairs!)

tuli	'fire'	tu:li	'wind'
ehto	'condition'	ehto:	'evening'
sika	'pig'	si:ka	'whitefish'

(6) **[l] vs. [r] in Luganda (Bantu, Uganda)**

[source: workbook by Gleason]

[l] → [r] / [V, -back]²

[l] and [r] in **complementary distribution**, i.e. not distinguished in the lexical entries for Luganda morphemes, but derived by a phonological rule

1. òkúð'ð'ùlâ	'to be full of'	11. éfirimbí	'a whistle'
2. òkúð'ð'úlá	'to dish up'	12. éñð'álíirò	'beam'
3. òkúgúlá	'to buy'	13. èríñá	'name'
4. òkúggúlá	'to open'	14. éttúúndíró	'shop'
5. òkùléétâ	'to bring'	15. myéréèrè	'only'
6. òkútábáálâ	'to attack'	16. ñð'írí	'Gospel'
7. òmùlâlâ	'insane person'	17. òkùlíirâ	'to eat with'
8. òmùlémâ	'lame person'	18. ólúgéró	'story'
9. náálwáánâ	'fought'	19. ókúmirá	'to swallow'
10. túlègâ	'we tighten'	20. píripírí	'chili pepper'

(7) **[l] vs. [r] in Korean**

[source: workbook by Gleason]

[l] → r / V __ V

1. kal	'that'll go'	11. pulp ^h yən	'discomfort'
2. kumul	'shade'	12. silkwa	'kind of fruit'
3. mul	'water'	13. əlmana	'how much'
4. pal	'foot'	14. irum	'name'
5. p ^h al	'arm'	15. kiri	'length'
6. səul	'Seoul'	16. kurəm	'then'
7. tatul	'all of them'	17. kəriro	'to the street'
8. ilkop	'seven'	18. saram	'person'
9. ipalsa	'barber'	19. uri	'we'
10. onulppam	'tonight'	20. yərum	'summer'

([u] is a high back unrounded vowel)

(8) **[l] vs. [ɹ] in English**

distinguished in the lexical entries for English morphemes: note the minimal pairs

late	rate
lot	rot
lamb	ram
belly	berry
hail	hair
pool	poor

² The data are insufficient to tell us whether lexical entries contain [l] and a rule derives [r], or whether it is the other way around. The same is true for Korean below.

3. What phonetic distinctions are made in lexical entries?

Part 2: phonological rules that do *not* eliminate distinctions from the lexicon

Russian Consider the following pairs of forms from Russian. I call the forms in the left column "zero-ending forms" and the forms in the left column "-a forms", though the meaning and use of the two forms actually varies widely among the examples. Assume that the -a form contains two morphemes: a root and a suffix -a (brought together into one word by the rule Merge).

(9) Final devoicing in Russian

	<u>zero-ending form</u>	<u>-a form</u>	
a.	grɒp	grɒba	'coffin'
b.	lip	lipa	'linden tree'
c.	ʃɒpət	ʃɒpəta	'whisper'
d.	gɒrət	gɒrəda	'city'
e.	ruk	ruka	'hand'
f.	rɒk	rɒga	'horn'
g.	rɒk	rɒka	'fate'
h.	kərəndaf	kərəndafə	'pencil'
i.	ekipaf	ekipəza	'crew'
j.	ras	rasa	'race'
k.	ras	raza	'time'

- **step 1:** Comparing the two columns, we note that sometimes the -a form has a voiced consonant (stop or fricative) where the zero-ending form has the corresponding voiceless consonant. (Example: the /p/ vs. /b/ in the first example.) This already suggests that Russian has either a rule that makes voiced consonants voiceless in a certain environment, or else a rule that makes voiceless consonants voiced. Which is it?
- **step 2:** Next we notice that sometimes both columns have the voiceless alternant. (Example: the /p/ in the second example.) But there are no examples in which the zero-ending form has a voiced consonant while the -a form has a voiceless consonant.
- **Now let's add an additional fact:** No Russian word is ever pronounced so as to end with a voiced consonant (with some law-governed exceptions coming up). A Russian accent in English has this property too: an English word like [prawd] 'proud' comes out as [prawt].
- **Solution: Russian has a rule of final devoicing that devoices a voiced consonant at the end of a word.** The rule leaves consonants that are already voiceless alone.

(10) Final devoicing (first version, to be revised)³

[+consonant] → [-voiced] / ___ #

³ The symbol # indicates the boundary of the word. See the textbook for the format of phonological rules used here.

Where the zero-ending form has a voiceless consonant and the -a form has a voiced counterpart, *the lexicon contains a voiced consonant that the rule of final devoicing turns into its voiceless counterpart.*

(11) Final devoicing in Russian

	<u>zero-ending form</u>	<u>-a form</u>		<u>lexical entry for the root⁴</u>
a.	grɒp	grɒba	'coffin'	grɒb
b.	lip	lipa	'linden tree'	lip
c.	ʃɒpət	ʃɒpəta	'whisper'	ʃɒpət
d.	gɒrət	gɒrəda	'city'	gɒrəd
e.	ruk	ruka	'hand'	ruk
f.	rɒk	rɒga	'horn'	rɒg
g.	rɒk	rɒka	'fate'	rɒk
h.	kərəndaf	kərəndafə	'pencil'	kərəndaf
i.	ekipaf	ekipəza	'crew'	ekipəz
j.	ras	rasa	'race'	ras
k.	ras	raza	'time'	raz

• Important points:

1. Listing the voiced alternant in the sound field of the lexical entries for the roots of these words makes it possible to *predict* the pronunciation of both the zero-ending form and the -a form. If we were to list the voiceless alternant, we could not predict when the -a form shows a voiced consonant and when it shows a voiceless consonant.
 2. Forms with a voiced final consonant are *never* pronounced that way! So this is a case in which the lexicon makes more distinctions than those made in the spoken form of the language (a voicing contrast in word-final position) — a contrast to the previous section, in which we saw the lexicon making fewer distinctions than those made in the spoken form (e.g. with respect to aspiration in English).
- Finally, the details of Russian motivate a restriction of the rule in (10) to exclude liquids (/l/ and /r/) and nasals

(12) No devoicing of liquids and nasals

dɒm	dɒma	'house'
plən	pləna	'plan'
skəzəl	skəzəla	'said'
vɒr	vɒra	'thief'

(13) Final devoicing (final version)

$\left. \begin{array}{l} \text{(+consonant)} \\ \text{(-sonorant)} \end{array} \right\} \rightarrow \text{-voiced} / _ _ \#$

⁴ Our lexical entries ignore some irrelevant additional details of Russian phonology — for example, the fact that the schwa vowels listed here are not actually part of the lexical entries either, but are the result of rules that apply to other vowels when they are unstressed.

4. More phonology

- **Phonology vs. phonetics once more: Rules like (13) are very common in the world's languages. But not universal.** English, for example, does not have a rule of final devoicing.

Part of having a "Russian accent" when speaking English is to erroneously apply this rule when speaking English.

Another very common (but not universal) kind of rule is **assimilation**.

Voicing assimilation

- (14) **Voicing assimilation in English: the plural suffix**

- a. **plural morpheme as /s/:**
[lɪp-s, pət-s, nɛk-s, læf-s ...]
- b. **plural morpheme as /z/:**
[kæb-z, pəd-z, ɛg-z, həjv-z ...]

- (15) **Voicing assimilation in English past tense: invented words**

- a. **plural morpheme as /s/:**
[zɑp-s, wʌk-s, ...]
- b. **past morpheme as /d/:**
[zɑb-z, wʌg-z, ...]

- **The point (yet again!):** the past tense rule is not about a list of phones turning into another list. Rather it is about **an abstract property of phones in general (voiced vs. voiceless)**:⁵

- (16) **Voicing assimilation**
z → [-voiced] / [-voiced] __

Nasal assimilation

- As noted, rules like (16) — *assimilation rules* — are very common in the world's languages. One of the most common phonological processes across the world's languages is **nasal assimilation**. A nasal consonant takes on the place of articulation of a consonant that follows it.

English nasal assimilation:

Could there be a word *chinp* (vs. *chimp*)? What about /pɪnk/ (vs. /pɪŋk/)? *emd* (vs. *end*)? No, because English has a rule of **nasal assimilation**, identical to the rule also illustrated in (17) below:

- (17) **Itzá⁶ (Mayan, Guatemala): nasal assimilation**

tsʔon	'gun'	ʔintsʔon	'my gun'
kʔab	'hand'	ʔiŋkʔab	'my hand'
bat	'ax'	ʔimbat	'my ax'
pal	'son'	ʔimpal	'my son'
kol	'field'	ʔiŋkol	'my field'
siʔ	'wood'	ʔinsiʔ	'my wood'
lak	'bowl'	ʔinlak	'my bowl'
lets	'trap'	ʔinlets	'my trap'

- (18) **Nasal Assimilation Rule**

A nasal *assimilates* in place of articulation to the following consonant

- Here is an approximation at a formal statement of the rule, using the terms introduced in class for the phonetic properties of consonants:

[+nasal] → [α bilabial, β alveolar, γ velar] / __ [α bilabial, β alveolar, γ velar]

— where α, β, γ are variables that range over plus and minus values. Using the features discussed in the book, but not in class, that would be:

[+nasal] → [α labial, β coronal, γ dorsal] / __ [α labial, β coronal, γ dorsal]

Important note:

From the data given, we can't tell what the underlying form of 'my' is in Mayan. It might be *ʔin*, *ʔij* or *ʔim*.

Vowel harmony

When assimilation affects a vowel, the process is called **vowel harmony**. For example:

⁵ As came up in answer to a question, a schwa is inserted after sibilants: [kɪsəz, bʌzəz, ɛdʒəz] etc.

⁶ Data once again from the Gleason workbook cited above. Gleason calls the language "Mayan", which is actually a language family. Thanks to Robert Henderson for identifying the actual language.

(19) **Turkish vowel harmony**

singular	plural	
diɰ	diɰler	'tooth'
tʃotsuk	tʃotsuklar	'child'
asker	askerler	'soldier'
keɰi	keɰiler	'cat'
son	sonlar	'end'
masa	masalar	'table'
geɰse	geɰseler	'night'
baba	babalar	'father'
kuɰ	kuɰlar	'bird'
køj	køjler	'village'
jyz	jyzler	'face'
kuɰz	kuɰzlar	'girl'

[y], [ø] = high and mid front rounded vowels (Turkish spelling: *ü* and *ö*)
 [u] = high back unrounded vowel (Turkish spelling: dotless *ı*)

- In the plural suffix, we find a back vowel ([a]) when the root ends in a back vowel ([u], [a], [o], [u:; and a front vowel ([e]) when the root ends in a front vowel ([i], [e], [y], [ø]). This is the result of a rule of **front-back vowel harmony**.

5. Phonemes

- Question:**
 What is the **inventory** of the sounds that are found in the morphemes of a language as **they are stored in the sound field of the lexicon?**

The list of these sounds is the list of the **phonemes** of the language.

- The list of actual sounds used in the language (the phonemes, as modified by the phonological rules of the language), is the list of its **phones**.

These concepts in context

- Why did our brains in infancy go to the trouble of working out how to parse the speech stream into morphemes? Probable answer: to store information about these units in the database that we call the **lexicon**.
- When the infant acquiring language notes that two or more phones are in **complementary distribution**, he/she uses this fact to economize on the distinctions made in the lexicon. Two phones in complementary distribution are taken to correspond to only one sound stored in memory, a **phoneme** — with the variant pronunciations related to the single phoneme by **phonological rule**.
- The variant forms of phoneme that are related by rule are called its **allophones**.

- Review, in this connection, our discussion of aspiration:**

Tojolabal and English:

predictable alternation of +aspirated and -aspirated (different rules)

Spanish:

always unaspirated

Hindi:

unpredictable whether a consonant is aspirated or not

Conclusions:

Tojolabal, English: aspiration is not phonemic
 (for example, /t/ and /tʰ/ are **allophones of the same phoneme**)

Hindi: aspiration is phonemic
 (for example, /t/ and /tʰ/ are **distinct phonemes**)

- We can immediately establish that two phones are not in complementary distribution in a language if we can find a **minimal pair** of words that differ by only that phone.

The minimal pair is the gold standard of phonological analysis. but **near-minimal pairs** will often do almost as well, i.e. two words containing XaY and XbY where X and Y are the same. At least we know that a vs. b is not predictable on the basis of X vs. Y.]

6. Phonemic inventory

- The set of phonemes of a language are called its **phonemic inventory**.

record low: maybe Rotokas (S. Pacific), 11 phonemes

record high: !Xoo (Khoisan group, Botswana, Namibia), 141~160.
 80 of them are clicks!

English: about 37-41, depending on dialect and analysis

- Alphabetic writing systems** often choose represent phonemes rather than their allophones.
- Speakers of languages tend to be minimally aware or unaware of allophonic distinctions. (Were you aware of the rule governing stop aspiration in English?)
- Categorical perception for non-phonemic distinctions** seems to be suppressed in the process of language acquisition. Work done at Haskins laboratories in the 1970s and 80s (by Virginia Mann, among others) seems to show that adult speakers of English

make a categorical distinction between [l] and [r], but adult speakers of Japanese do not.

Other experiments show that *infants* -- both Japanese and American -- make the categorical distinction. So language acquisition from this perspective looks more like a process of *losing* distinctions than gaining them — *unlearning* rather than learning.

7. Distinctive features.

- Phonological processes tend to be "natural", in that they apply to **natural classes** of sounds. The environment of a rule is also generally a **natural class** of sounds, and the change effected by the rule involves a **natural class** of sounds.

What is a **natural class** of sounds? A group of sounds that have a common phonetic property. For example, for consonants: point of articulation, manner of articulation and voicing.

Other (rather sophisticated) ways of classifying sounds are discussed at length in the textbook, but were not discussed in class. Take 24.901 next Fall to learn more.

8. Rule ordering

- Lexical entries may undergo more than one phonological rule. The various rules do not seem to apply equally or all at once, but are prioritized. There is controversy within the field of phonology about the precise nature of this prioritization. (One currently popular approach, called **Optimality Theory** is not the approach taught here, but is stressed in other classes in linguistics.) For our purposes, the prioritization can be understood as an **ordering** of the rules: they apply in a serial fashion, each rule applying to the output of the preceding rule.
- The sequence of ordered rules is called a **derivation**. In class, we examined three problems that show how an ordered derivation works.

• Example 1: Tunica

In the Penutian language Tunica, formerly spoken around the Gulf of Mexico, the vowel /a/ assimilates to the backness and roundness of a preceding vowel if, either the two vowels are adjacent, or are separated only by a glottal stop:

a. <i>Infinitive</i>	<i>3rd sg. masc.</i>	<i>3rd sg. fem.</i>	<i>3rd sg. fem. pres. prog.</i>	
pó	póʔuhki	póʔɔki	póhkʔaki	'look'
pí	píʔuhki	píʔeki	píhkʔaki	'emerge'
já	jáʔuhki	jáʔaki	jáhkʔaki	'do'
ʧú	ʧúʔuhki	ʧúʔɔki	ʧúhkʔaki	'take'

Another rule of the language deletes an unstressed vowel before a glottal stop, the result of which can be seen in (b):

b. <i>Infinitive</i>	<i>3rd sg. masc.</i>	<i>3rd sg. fem.</i>	<i>3rd sg. fem. pres. prog.</i>	
hára	háʔuhki	háʔaki	hárahkʔáki	'sing'
hípu	híʔuhki	híʔɔki	hípukʔáki	'dance'
náfi	náʔuhki	náʔeki	náfihkʔáki	'lead someone'

(i) Explain how the application of the two rules derives the 3rd sg. fem. forms [híʔɔki] and [náʔeki].

(ii) What is the ordering relationship between these two rules?

Answer: Vowel harmony in the 3sg fem form precedes *unstressed vowel deletion* — which if it had applied first, would have eliminated the environment for harmony [source: Roca, Iggy and Wyn Johnson. 1999. *A Course in Phonology*]

Example 2: Shona

In the Central Bantu language, Shona, spoken in Zimbabwe, there is a rule of nasal assimilation and another which causes postnasal voiceless stops /p t k/ to lose their oral place and become [h]. Examples illustrating the results of these processes are shown below (high tones are marked with an acute accent):

ku-p-a	'to give'	m-h-a	'give it to me'
agá-ka	'little cow'	ín-ha	'cow'
uru-toki	'finger'	in-hoki	'fingers'

How must these two rules be applied in order to yield the desired results?

Answer: The output of nasal assimilation (see below) reveals the place of articulation of a following voiceless stop that has turned into [h]. So nasal assimilation must precede the stop→[h] rule, so it can see the difference between a [p], [k] or [t] that later changes to [h].

Roca, Iggy, and Wyn Johnson. *A Course in Phonology*. Blackwell Publishers, 1999.

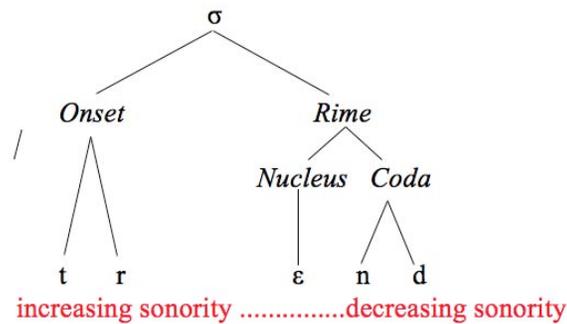
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9. Syllable structure

This is a topic that I presented very briefly, which really deserved a full class or two to itself – mainly because the next topic was writing systems, and I wanted to discuss syllables so we could later discuss syllabaries. Here's what we talked about (and there's more material in the textbook).

- Phonological segments are not arranged like beads on a string (any more than morphemes within a word are, or words within a sentence) — but are organized in a hierarchical fashion into syllables.
- Though there is some disagreement among experts (and some interesting recent work revising the model), a standard view holds that segments are grouped as in (20), where the Greek letter σ (a lowercase sigma) indicates "syllable".⁷ Note that in general, sonority increases as you move from either syllable-edge towards the nucleus.⁸

(20)



- Both *onset* and *rime* are optional, but the nucleus (containing one or more vowels, syllabic liquids or nasals) is obligatory.

Evidence for the existence of *onset* and *coda* as structural units includes:

- The existence of phonotactic constraints (constraints on co-occurrence) within the onset and within the rime, vs. the near-absence of comparable constraints that cross the coda-onset divide.

For example, in English *trent* is a possible (but not an actual) word, but **rtent* is an impossible word, since [rt] is not a possible onset (violating the principle of increasing sonority). On the other hand, [r] may immediately precede [t] even in English, so long

⁷ Linguists' spelling of *rime* is an homage to Coleridge's poem "The Rime of the Ancient Mariner" (<http://www.gutenberg.org/files/151/151-h/151-h.htm> -- in case you don't know it).

⁸ Vowels are more sonorous than consonants; nasals and liquids are more sonorous than stops; voiced consonants are more sonorous than voiceless consonants. Cross-linguistically, the behavior of sibilants is interestingly anomalous: a word like [trip] obeys the sonority generalization, but the initial consonant of [stri:p] violates it.

as the [r] can be syllabified into the coda of a preceding syllable. Thus: *airtent* is a possible word, since it is syllabified [σ ejr][σ tent].

- Branching rimes and branching codas attract **stress** in many languages, while branching onsets generally do not (i.e. there is a generalization that requires reference to these constituents within the syllable).

(continued on next page)

Example: the Latin stress rule

(21) **Latin stress: data**

*short penult*⁹

mí-se-rum 'poor' (NEU)
 dú-ci-mus 'we lead'
 ré-fi-cit '(s)he repairs'
 dó-mi-nus 'master'
 prin-cí-pi-bus 'chiefs' (ABL)

*closed*¹⁰ *penult*

a-mán-tis 'loving' (GEN)
 re-féc-tus 'repaired'
 im-pe-di-mén-ta 'baggage'
 con-sér-vat '(s)he preserves'

long penult

a-má:-vi: 'I have loved'
 a-má:-bo: 'I will love'
 du-cé:-mus 'we will lead'
 hor-tó:-rum 'gardens' (GEN)

stop+liquid

cé-le-bris 'crowded' (GEN)
 vó-lu-cris 'winged' (GEN)

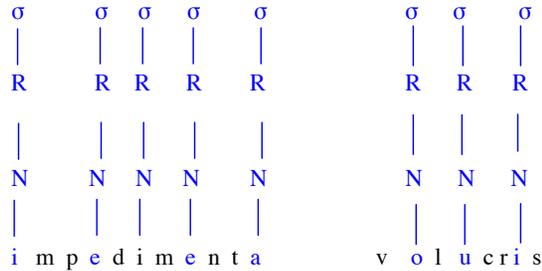
two-syllable words

té-git 'covers'
 mó-rem 'sea' (ACC)

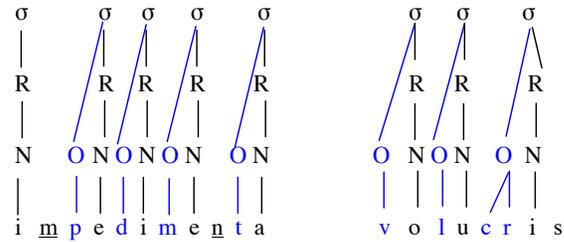
(Latin spelling: c = [k], v = [w])

Latin syllabification rules:

step 1. Link all vowels to Nucleus, project Rime and Syllable:

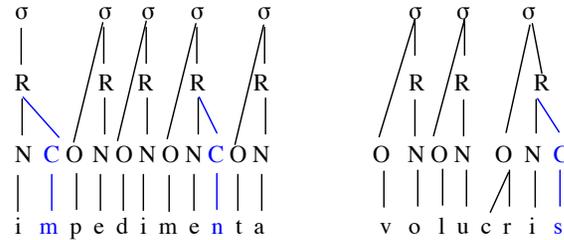


step 2. Link each consonant that immediately precedes a vowel to Onset. Add as many other consonants as possible to Onset ("maximize Onset") — *so long as phonotactics (sonority sequencing) is not violated.*



The underlined segments are not added to onsets in step 2 because of sonority. [mp] and [nt] are not possible onsets in Latin.

step 3. Link remaining (unsyllabified) consonants to Coda



Latin stress rule:

1. If the penult (second-to-last syllable) has branching structure in its rime (*is heavy*), stress the penult.
 a-mán-tis re-féc-tus
 a-má:-vi: du-cé:-mus
 im-pe-di-mén-ta (see syllable structures above)
2. Otherwise, if the word has 3 or more syllables, stress the antepenult [third syllable from end]
 prin-cí-pi-bus mí-se-rum
 dú-ci-mus
 cé-le-bris
 vó-lu-cris (see syllable structures above)
3. Otherwise, stress the first syllable
 té-git mó-rem

⁹ *Penult* = second syllable from the end of a word. *Antepenult* = third syllable from the end of the word.

¹⁰ A syllable is *closed* if it contains material in its coda (e.g. [d

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