Class 20
Syllabic Consonants

3/30/2022

1 Review: Markedness and Faithfulness

- Last time, I introduced terms for the two main types of constraints in OT: **Markedness** and **Faithfulness**.

1.1 Faithfulness constraints

⋆ Faithfulness constraints penalize **changes** between the input and the output.
  - In other words, they are what is violated by applying a phonological process.
  - They work by *comparing* the input to the output, and assigning a violation if the two are different in the relevant way.

- The inclusion of faithfulness constraints in the theory mirrors the fact that in rule-based theories, the only aspects of the input that change are the ones called for by the rules of the language.

- Deletion, epenthesis, and feature change are the three main types of processes. There is a separate faithfulness constraint for each one:

(1) a. **Max:** Don't delete.
  b. **Dep:** Don't epenthesize.
  c. **Ident[F]:** Don't change the value of feature F.

- Let's say that a language doesn't allow voiced obstruents at the ends of words (like German). Each of these processes could fix the problem:

(2) How to fix an underlying stop in would-be coda position

	/bet/	NoFinalVoicedObs	Max	Dep	Ident[voice]
a.	[tag]	* ([g] in coda)			
b.	[ta]		* (/g/ → Ø)		
c.	[ta.gə]			* (Ø → [ə])	
d.	[tak]				* (/g/ → [t])

- The process that the language chooses to apply will be the one whose corresponding faithfulness constraint ranks the lowest in that language.
- If the markedness constraint NoFinalVoicedObs ranks below all the faithfulness constraints, then no process will apply; this will be a language that tolerates stop codas.

- We can identify a faithfulness violation by looking at what changes in the corresponding rule:

(3) **German:** /−son, $\boxed{+\text{voice}}$/ → $\boxed{[-\text{voice}]}$ / _#

→ This *devoicing* process violates Ident[voice], because it changes the feature [±voice].

1.2 Markedness constraints

⋆ Markedness constraints penalize particular structures, configurations, sequences, etc. in the output.
- Markedness constraints *trigger* the application of a process.
- These constraints only look at the candidate outputs; they don't care about what was in the input.

• In the German example, NoFinalVoicedObs is the relevant markedness constraint.
- It penalizes outputs where a voiced obstruent is in word-final position.

• We can identify markedness constraints from the corresponding rules, if we change the format of rules.
→ Consider what happens when we format the rule to capture the entire underlying sequence and the entire surface sequence:

(4) Traditional rule format

/−son, +voice/ → [−voice] / _#

(5) Alternative rule format

$\underbrace{[-\text{son}, +\text{voice}]\#}_{\textbf{Structural Description}} \rightarrow [-\text{son}, -\text{voice}]\#$

• Markedness constraints (generally) correspond to the "**structural descriptions**" of rules.
- Markedness constraints reflect problems with a particular sequence of sounds that the grammar wants to fix.
- In rules, the structural description is what the grammar wants to change.

⋆ Processes are triggered by having a markedness constraint outrank a faithfulness constraint.

∗ Syllable structure constraints are a unique type of markedness constraint:
- Syllable structure is absent in the input, so syllabification in the output doesn't seem like a process (it's not changing something that already existed), but it is.

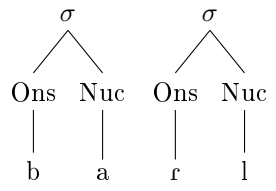
2 OT and the typology of syllabic consonants

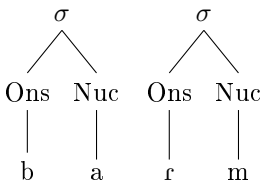
• So far, we've seen that syllables are usually built around a vowel. However, this is not always the case.

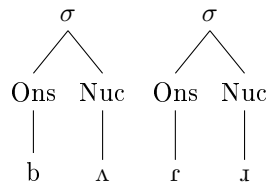
• Recall these facts from English, where *sonorant consonants* function as **syllabic consonants**:
- Syllabic consonant represented as [C̩] (e.g. "syllabic n" = [n̩]).

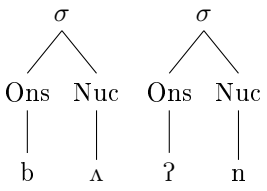
(6) Syllabic consonants

bottle	['ba.ɾl̩]	*bottom*	['ba.ɾm̩]
butter	['bʌ.ɾɹ̩]	*button*	['bʌ.ʔn̩]



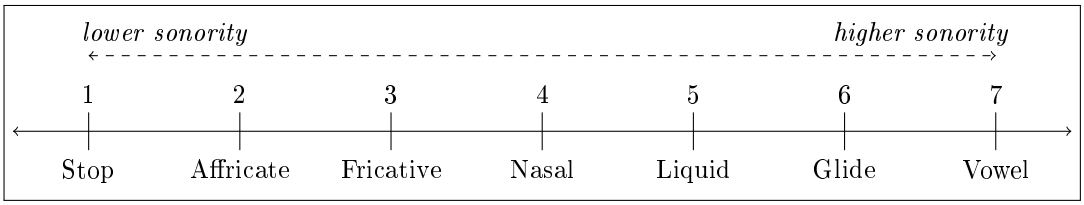






- Most languages that do allow syllabic consonants place serious restrictions on what consonants can be syllabic and under what circumstances. The most common restriction is one based on **sonority**.

(7) General sonority scale



- By and large, the more sonorous the consonant, the better it is as a syllabic consonant.

⇒ This gives us the typology of permissible syllabic consonants (i.e. nuclei) within a language in (8).

⋆ **Typology:** the distribution of patterns across languages.

(8) Typology of permissible syllable nuclei (gray cells = impermissible; white cells = permissible)

Potential nucleus					
Stop	Fricative	Nasal	Liquid	Vowel	
pt̩	ps̩	pn̩	pr̩	pa	Spanish, French, etc.
pt̩	ps̩	pn̩	pr̩	pa	Bulgarian, Czech, Sanskrit, etc.
pt̩	ps̩	pn̩	pr̩	pa	English, Gothic, etc.
pt̩	ps̩	pn̩	pr̩	pa	Yavapai
pt̩	ps̩	pn̩	pr̩	pa	**Tashlhiyt Berber**

∗ I leave out glides because glides are usually just [−syllabic] instances of high vowels.

⋆ Many languages allow (at least some) sonorant consonants to be syllable nuclei, but only one allows stops to be syllable nuclei: *Tashlhiyt Berber*.

- We can reframe the generalization about which kinds of sounds a language will allow to function as a syllable nucleus as an **implicational universal**:

(9) **Implicational Universal about Possible Nuclei**
If a language allows a consonant to function as a syllable nucleus, it will also allow any sound which is ***more sonorous*** to function as a syllable nucleus.

- One way to formalize this universal in OT is to define a set of constraints against particular sounds functioning as nuclei and institute a *fixed ranking* according to their sonority level (lowest sonority on the top, highest sonority on the bottom).[1]

(10) a. ***Nuc(T):** Don't have a syllabic **stop**.
b. ***Nuc(F):** Don't have a syllabic **fricative**.
c. ***Nuc(N):** Don't have a syllabic **nasal**.
d. ***Nuc(L):** Don't have a syllabic **liquid**.
e. ***Nuc(G):** Don't have a syllabic **glide**.
f. ***Nuc(V):** Don't have a syllabic **vowel**.

(11) **Fixed ranking:**
*Nuc(T) ≫ *Nuc(F) ≫ *Nuc(N) ≫ *Nuc(L) ≫ *Nuc(G) ≫ *Nuc(V)

- This fixed ranking needs to interact with a constraint that will prefer syllabifying consonants as nuclei under certain conditions. For now, we'll use Dep:

(12) **Dep** (∼*don't epenthesize*): Don't insert a vowel.

- When your input has a long string of consonants, in order to get a syllable nucleus, you can either insert a vowel (and violate Dep) or turn one of the consonants into a syllabic consonant (violating one of the *Nuc constraints).
  → Which option you choose will depend on where Dep fits into the fixed ranking in (11).

- The relative ranking of Dep can freely vary by language.
  → This is what generates the typology in (8).

- In a language like Spanish, which doesn't allow any syllabic consonants, Dep ranks *below all* of the *Nuc constraints.
  → It is worse to make any consonant syllabic than to insert a vowel.

(13) Spanish-type language (no syllabic consonants)

i. Liquids

	/prka/	*Nuc(T)	*Nuc(F)	*Nuc(N)	***Nuc(L)**	**Dep**
a.	**pr̩.ka**				***!**	
b. ☞	**par.ka**					*****

ii. Nasals

	/pnka/	*Nuc(T)	*Nuc(F)	*Nuc(N)	*Nuc(L)	Dep
a.	pn̩.ka			*!		
b. ☞	pan.ka					*

[1] Another way to do this is by defining the constraints "stringently": each *Nuc penalizes all sounds which are less than or equal to some sonority value. Namely:

(i) a. ***Nuc(T):** Don't have a syllabic nucleus whose sonority is less than or equal to that of a **stop**.
b. ***Nuc(F):** Don't have a syllabic nucleus whose sonority is less than or equal to that of a **fricative**.
c. ***Nuc(N):** Don't have a syllabic nucleus whose sonority is less than or equal to that of a **nasal**.
d. ***Nuc(L):** Don't have a syllabic nucleus whose sonority is less than or equal to that of a **liquid**.
e. ***Nuc(G):** Don't have a syllabic nucleus whose sonority is less than or equal to that of a **glide**.
f. ***Nuc(V):** Don't have a syllabic nucleus whose sonority is less than or equal to that of a **vowel**.

iii. Fricatives

	/pska/	*Nuc(T)	*Nuc(F)	*Nuc(N)	*Nuc(L)	Dep
a.	ps̩.ka		*!			
b. ☞	pas.ka					*

iv. Stops

	/ptka/	*Nuc(T)	*Nuc(F)	*Nuc(N)	*Nuc(L)	Dep
a.	pt̩.ka	*!				
b. ☞	pat.ka					*

- In a language like Sanskrit, which allows only syllabic liquids, Dep ranks *between* *Nuc(N) and *Nuc(L).
  → It is worse to insert a vowel than to make a liquid syllabic, but it is worse to make any other consonant syllabic than to insert a vowel.

(14) Sanskrit-type language (only syllabic liquids allowed)

i. Liquids

	/prka/	*Nuc(T)	*Nuc(F)	*Nuc(N)	**Dep**	***Nuc(L)**
a. ☞	**pr̩.ka**					*
b.	**par.ka**				***!**	

ii. Nasals

	/pnka/	*Nuc(T)	*Nuc(F)	*Nuc(N)	Dep	*Nuc(L)
a.	pn̩.ka			*!		
b. ☞	pan.ka				*	

iii. Fricatives

	/pska/	*Nuc(T)	*Nuc(F)	*Nuc(N)	Dep	*Nuc(L)
a.	ps̩.ka		*!			
b. ☞	pas.ka				*	

iv. Stops

	/ptka/	*Nuc(T)	*Nuc(F)	*Nuc(N)	Dep	*Nuc(L)
a.	pt̩.ka	*!				
b. ☞	pat.ka				*	

- In a language like English, which allows only syllabic liquids and nasals (but not stops or fricatives), Dep ranks *between* *Nuc(F) and *Nuc(N).
  → It is worse to insert a vowel than to make a liquid or a nasal syllabic, but it is worse to make a stop or fricative syllabic than to insert a vowel.

(15) English-type language (syllabic liquids and nasals allowed, but not stops or fricatives)

i. Liquids

	/prka/	*Nuc(T)	*Nuc(F)	Dep	*Nuc(N)	*Nuc(L)
a. ☞	pr̩.ka					*
b.	par.ka			*!		

ii. Nasals

	/pnka/	*Nuc(T)	*Nuc(F)	**Dep**	***Nuc(N)**	*Nuc(L)
a. ☞	**pn̩.ka**				*	
b.	**pan.ka**			*!		

iii. Fricatives

	/pska/	*Nuc(T)	*Nuc(F)	Dep	*Nuc(N)	*Nuc(L)
a.	ps̩.ka		*!			
b. ☞	pas.ka			*		

iv. Stops

	/ptka/	*Nuc(T)	*Nuc(F)	Dep	*Nuc(N)	*Nuc(L)
a.	pt̩.ka	*!				
b. ☞	pat.ka			*		

- Finally, in a language like Berber, which allows only any consonant to be syllabic, Dep *outranks all* the *Nuc constraints.
  → It is worse to insert a vowel than to make any consonant syllabic.

(16) Berber-type language (any consonant can be syllabic)

i. Liquids

	/prka/	Dep	*Nuc(T)	*Nuc(F)	*Nuc(N)	*Nuc(L)
a. ☞	pr̩.ka					*
b.	par.ka	*!				

ii. Nasals

	/pnka/	Dep	*Nuc(T)	*Nuc(F)	*Nuc(N)	*Nuc(L)
a. ☞	pn̩.ka				*	
b.	pan.ka	*!				

iii. Fricatives

	/pska/	Dep	*Nuc(T)	*Nuc(F)	*Nuc(N)	*Nuc(L)
a. ☞	**ps̩.ka**			*		
b.	**pas.ka**	*!				

iv. Stops

	/ptka/	**Dep**	***Nuc(T)**	*Nuc(F)	*Nuc(N)	*Nuc(L)
a. ☞	**pt̩.ka**		*			
b.	**pat.ka**	*!				

⋆ By implementing the fixed ranking of *Nuc constraints according to their level of sonority, we ensure that the implicational universal in (9) will always be true.

3 Tashlhiyt Berber

- In the typology of syllabic consonants, the Tashlhiyt dialect of Berber is a unique outlier: it is the only(?) language that we know of which allows *syllabic stops*.
  - But exactly this sort of language is predicted to exist by the universal in (9) and our analysis using *Nuc constraints.

- I'll first show you some of the crazy data from Tashlhiyt Berber, and then show you how we can extend our analysis to capture everything.[2]

3.1 Data

- Tashlhiyt Berber has only a single phonemic vowel: /a/.
- It has two other surface vowels [i,u], but these are always the result of underlying /j,w/ surfacing in a position where they need to be syllabic (i.e. |j̩| = [i], |w̩| = [u]).
- It has a normal inventory of sonorants /j,w,l,r,m,n/ and lots of stops and fricatives (voiced and voiceless).

- We can observe syllabicity alternations in related forms of verbs:

(17) 3rd singular perfective forms (Dell & Elmedlaoui 1985:106, ex. 3)

Syllabic C	Masc. /j-/	Fem. /t-/	
/l/	il.di	tl̩.di	'pull'
/r/	ir.ba	tr̩.ba	'carry on one's back'
/n/	in.da	tn̩.da	'shake (milk)'
/m/	im.da	tm̩.da	'be worn out'
/z/	iz.di	tz̩.di	'put together'
/ʒ/	iʒ.la	tʒ̩.la	'get lost'
/ʁ/	iʁ.za	tʁ̩.za	'dig'
/ɦ/	iɦ.da	tɦ̩.da	'give (gift)'
/s/	is.ti	ts̩.ti	'select'
/f/	if.si	tf̩.si	'untie'
/χ/	iχ.si	tχ̩.si	'go out (fire)'
/ħ/	iħ.ba	tħ̩.ba	'cover'

- You can see similar alternations in the second syllable of these other related verb forms:

(18) Other verb forms (Dell & Elmedlaoui 1985:106, ex. 4)

/t-...-t/	/t-...-a-s/	
tr̩gl̩t	tr̩glas	'lock'
ts̩kr̩t	ts̩kras	'do'
tχ̩zn̩t	tχ̩znas	'store'
tz̩dm̩t	tz̩dmas	'gather wood'
tr̩ks̩t	tr̩ksas	'hide'
tn̩ʃf̩t	tn̩ʃfas	'graze'
tm̩sχ̩t	tm̩sχas	'transform'
tl̩bz̩t	tl̩bzas	'step into'

[2] For data and analyses, consult: Dell & Elmedlaoui (1985, 1988), Prince & Smolensky ([1993] 2004), Ridouane (2008, 2014), among others.

• Some additional data where some of the generalizations seem to break down (but we can deal with it):

(19) Some additional data points (Dell & Elmedlaoui 1985:108–111)

a.	/sawl-x/	→	[sa.wl̩x]	'I spoke'
b.	/t-jwn-t-a-s/	→	[ti.wn̩.tas]	'you climbed on him'
c.	/ra-j-mmʁj/	→	[ra.jm̩m.ʁi]	'he will grow'
d.	/ra-j-rz/	→	[ra.jr̩z]	'it will be broken'
e.	/ħawl-tn/	→	[ħa.wl̩.tn̩]	'make them (m.) plentiful'
f.	/t-jzrwal-in/	→	[ti.zr̩.wa.lin]	'those (f.) from Tazrwalt'

• And the *piece de resistance* — syllabic stops:

(20) Forms with syllabic stops (Dell & Elmedlaoui 1988:1)

a.	Voiced stop:	[**bd̩**.dl̩]	'exchange!'
b.	Voiceless stop:	[tf̩.**tk̩**.ts̩t:]	'you sprained it (f.)'

3.2 Analysis

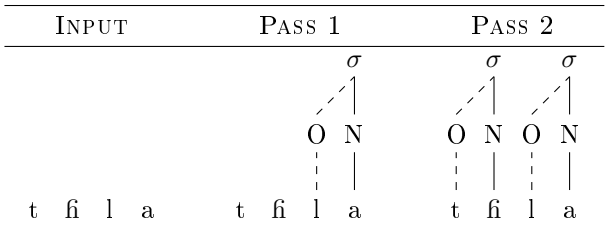
• First, let's think about it descriptively.

• The syllabification procedure basically works like:

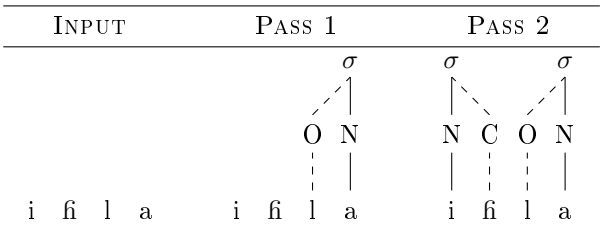
(21) **Step 1:** Find any /a/'s. Have them project a syllable nucleus. Associate the preceding consonant to that syllable as an onset.
Step 2: Find any glides (/j,w/) that have not yet been syllabified. Have them project a syllable nucleus. Associate the preceding consonant to that syllable as an onset.
Step *n*: *...and so on until everything's been syllabified.*

• Using some of the more basic examples from (17), we can visualize it like the following:

(22) /t-fila/ → [tf̩i.la]



(23) /j-fila/ → [if̩i.la]



⋆ Since the language allows any consonant to be syllabic, why bother with onsets and codas?

- The language doesn't like to have adjacent syllabic nuclei (= *hiatus*).

(24) ***V.V:** Don't have adjacent syllabic nuclei.

(25) /j-fila/ → [ifi̩.la] (N.B.: i = i̩)

	/j-fila/	*V.V	*Nuc(T)	*Nuc(F)	*Nuc(N)	*Nuc(L)	*Nuc(G)	*Nuc(V)
a. ☞	ifi̩.la						*	*
b.	jfi̩.la			*!				*
c.	i.fi̩.l̩.a	*!**		*		*	*	*

(26) /t-fila/ → [tfi̩.la]

	/t-fila/	*V.V	*Nuc(T)	*Nuc(F)	*Nuc(N)	*Nuc(L)	*Nuc(G)	*Nuc(V)
a.	tfi̩.la		*!					*
b. ☞	tfi̩.la			*				*
c.	t.fi̩.l̩.a	*!**	*	*		*		*

- *V.V also explains why we get lower sonority syllabic consonants in (19) than we might expect:

(27) /sawl-x/ → [sa.wl̩x] (N.B.: u = w̩)

	/sawl-x/	*V.V	*Nuc(T)	*Nuc(F)	*Nuc(N)	*Nuc(L)	*Nuc(G)	*Nuc(V)
a.	sa.ulx	*!					*	*
b. ☞	sa.wl̩x					*		*
c.	saw.lx̩			*!				*

- Under the right circumstances, we can even get syllabic stops — basically, only when you have three in a row, or two at a word edge.
- We'll need some additional syllable structure constraints to get everything to work just right:

(28) a. ***Complex:** Don't have onsets or codas with more than one consonant.
b. **Onset:** Don't have syllables with no onsets.
c. **NoCoda:** Don't have syllables with codas.

(29) /bddl/ → [bd̩.dl̩]

	/bddl/	*Complex	*Nuc(T)	*Nuc(L)	Onset	NoCoda
a. ☞	bd̩.dl̩		*	*		
b.	b̩d.dl̩		*	*	*!	*!
c.	b̩.dd̩l		**!		*	*
d.	bddl̩	*!		*		

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