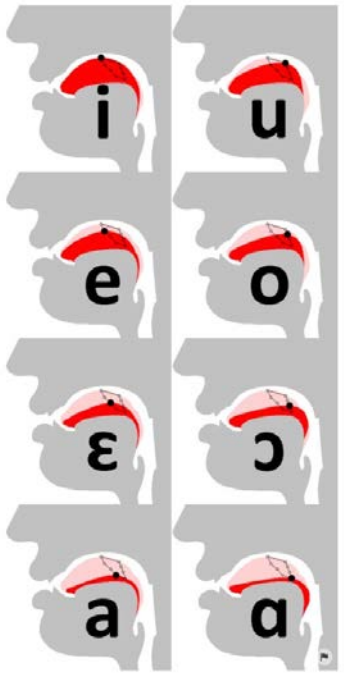


24.901/931, 2026
Introduction to Phonology

Lecture 18

- Problem set 6: Miya (Chadic) syllables.
  Due 4-28.
- Quiz 2 May 5th

Reminders on syllable structure

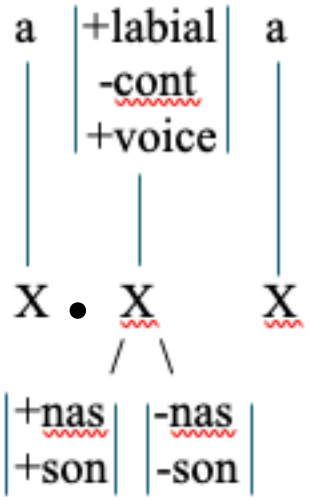
- Sub-syllabic constituents:
  Onset; Rime, composed of Nucleus + Coda.

- The size of the Rime determines the weight category of the syllable:
  light iff rime contains one X, **heavy** otherwise.

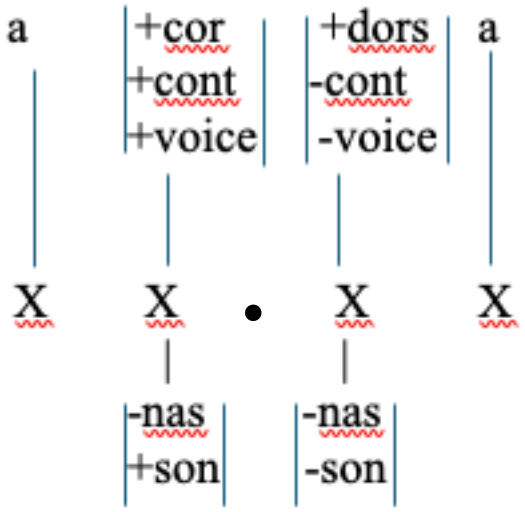
- Heavy syllables attract stress and ictus (= prominence in metrical verse).
  Light syllables do not.

A note on PS 6: X's and syllable division

- Some Cs written as CC (ts, mb, tl or t^s, ^{m}b, t^l) are analyzed as single Cs
- Sometimes referred to as *contour segments* (cf. *contour tones*).
- They're shorter than other CCs, suggesting one X. Most Fs are shared.
- Tend to occur in all positions in the word, unlike other CCs



A representation of a^mba



A representation of *arka*

Syllables are defined over Xs.
One X must belong to one syllable.
Two Xs can belong to different syllables.
Or the same one.

Reminder on what varies in syllable division

- Certain VCCVs (where CC= typically stop-sonorant) vary in their division

  (a) VC.CV Sanskrit, A.Greek, older Germanic, Klamath; Arabic,...

  (b) V.CCV modern Germanic, modern Romance

  ((c) either option: Russian, Polish, perhaps others)

...and what is invariant in syllable division

a. If some C_1C_2 does not occur initially, VC_1C_2V is divided $VC_1.C_2V$
b. No VC_0CV sequences are divided as $VC_0C.V$

[Set aside the VC.V division in English cases like *melon:*
limited to a subset of VC sequences whose V can't occur at end of word.]

What is the source of the invariant effects?
How is the variability analyzed?

Syllable preferences (Jakobson 1941; Prince & Smolensky 1993)

- Cross-linguistic syllabic preferences:
  - Onsets preferred: $CVC_0 \succ VC_0$
  - Codas dispreferred: $C_0V \succ C_0VC$
  - Simple onset, coda preferred: $CVC_0 \succ CCVC_0$, $C_0VC \succ C_0VCC$
  - V nuclei preferred to C: $C_0VC_0 \succ C_0C_0C_0$
- Languages differ on how fully they satisfy these preferences:
  - There are absolute bans on dispreferred syllables
  - Or conditional tolerance, in some contexts but not all.
- Evidence for preferences in:
  - Typology of permitted C*V* sequences in words
  - Syllable divisions (in stress, meter, hyphenation, experiments)
  - Morphology: choices among equivalent morphemes (e.g. *a/an*)

Syllable preferences reflected in *implicational laws*

(Prince and Smolensky 1993, laws based on Jakobson 1941, Greenberg 1961)

A language that allows **onsetless syllables** allows syllables with onsets too.

no language with only VC_0 syllables, without CVC_0 syllables

A language that allows **closed syllables** (codas) allows open syllables too

no language with only C_0VC syllables, without C_0V syllables

A language with **complex onsets** allows simple onsets too.

no language with only $CCVC_0$, without CVC_0 syllables

A language with **complex codas** allows simple codas too.

no language with only C_0VCC syllables, without C_0VC syllables

A language with **consonantal nuclei** allows vocalic nuclei too.

no language with only $C_0C_iC_0$ syllables, without C_0VC_0 syllables

The implicational laws correspond to M constraints
(Prince and Smolensky 1993)

- Onsets are preferred: absence is penalized

  ONSET: every syllable has an onset (one * for each onsetless σ)

- Codas are dispreferred: presence is penalized

  *CODA: no syllable has a coda (one * for each □ with a coda)

- Syllable parts (onset, coda, nuc.) differ in how much complexity they allow.

  *COMPLEX ONSET: one * for onset with more than one C

  *COMPLEX CODA: one * for coda with more than one C

  (together: *COMPLEX; similar to C//V: every C is V-adjacent)

- Optimal nuclei: *C̩: one * for every [+cons] nucleus.

Implicational laws modeled in OT as constraint choices

- E.g.

  Complex coda (e.g. *act*) **surfaces only if simple coda** (e.g. *at*) **also does.**

C coda, CC coda	**C coda, but not CC coda**
not C coda, not CC coda	~~**CC coda, but not C coda**~~

- OT interpretation:
  - C-coda violates *a proper subset* of M constraints compared to CC-coda
  - Then CC-coda *can* surface, if Faith >> M, where M = *CC coda

    In that case, C-coda also will. (F >> *CC coda ...*C coda)
- No ranking of these constraints allows CC-coda, but not C-coda, to surface.

CVCC allowed: F >> all M

CVCC	MAX	*COMPLEX CODA	*CODA	CVC	MAX	*COMPLEX CODA	*CODA

CVCC prohibited, CVC allowed: specific M >> F

CVCC	*COMPLEX CODA	MAX	*CODA	CVC	*COMPLEX CODA	MAX	*CODA

Neither CVC nor CVCC allowed: general M >> F

CVCC	*Complex Coda	*Coda	Max		CVC	*Complex Coda	*Coda	Max

CVCC without CVC cannot emerge under any ranking

Generalizing

- Most proposed universal laws of language structure take this form:

  P implies Q: structure P surfaces *only if* structure Q also does.

Q, P	**Q, not P**
not Q, not P	~~**P, not Q**~~

- The OT interpretation:
  - Q violates *a proper subset* of the M constraints that P violates.
  - P *can* surface, if F >> M, where M = a constraint violated by P, not Q.

  But then, if P surfaces, Q also will.

  No constraint ranking will allow P to surface, without Q.

Back to variation and invariance in syllable divisions

Variation across languages when M constraints conflict: *CODA vs. *COMPLEXONSET

zebra	*CODA	*COMPLEX ONSET
zeb.ra	*!	
☞ze.bra		*

Romance
M. Germanic
M. Greek

zebra	*COMPLEX ONSET	*CODA
☞zeb.ra		*
ze.bra	*!	

Homeric Greek, Klamath Lithuanian, Arabic, Sanskrit

Conflicting constraints can be ranked differently, with observable results

Invariance: *CODA and ONSET don't conflict

ata	*CODA	ONSET
at.a	*!	* *
☞a.ta		*

ata	ONSET	*CODA
at.a	* *!	*
☞a.ta	*	

Invariant divisions – V.CV, *VC.V; VC_0.CV, *VC_0C.V – arise because one parse (= one division candidate) harmonically bounds the other.

Variable divisions, V.CCV vs. VC.CV arise when either parse can win, under different ranking.

2 conditions must be met to model invariance

1. Some constraints must be shared by all languages:

   e.g. *CODA, ONSET, *COMPLEX (CODA, ONSET)

2. Others must be impossible in every language:

   e.g. **CODA** (one * for every open σ), ***ONSET** (one * for every onset)

- If **CODA** is possible, VC.V can emerge from **CODA** >> ONSET.
- If ***ONSET** is possible, VC.V can emerge from ***ONSET** >> CODA.

A survey of σ inventories (data from Blevins 1995 in Goldsmith (ed.) *HPT*)

	Onsets required?		Codas allowed?		Complex Onsets?		Complex Codas?	
	(C)V		(C)VC		CCV(C)		(C)VCC	
	CV	V	CVC	VC	CCV	CCVC	CVCC	VCC
Hua	√	*	*	*	*	*	*	*
Cayuvava	√	√	*	*	*	*	*	*
Cairene	√	*	√	*	*	*	*	*
Mazateco	√	*	*	*	√	*	*	*
Mokilese	√	√	√	√	*	*	*	*
Sedang	√	*	√	*	√	√	*	*
Klamath	√	*	√	*	√	√	√	*
Spanish	√	√	√	√	√	√	*	*
Finnish	√	√	√	√	*	*	√	√
Totonaco	√	*	√	*	√	√	√	*
English	√	√	√	√	√	√	√	√

Onset

	Onsets required?		Codas allowed?		Cplex Onsets?		Cplex Codas?	
	(C)V		(C)VC		CCV(C)		(C)VCC	
	CV	V	CVC	VC	CCV	CCVC	CVCC	VCC
Hua	√	*	*	*	*	*	*	*
Cayuvava	√	√	*	*	*	*	*	*
Cairene	√	*	√	*	*	*	*	*
Mazateco	√	*	*	*	√	*	*	*
Mokilese	√	√	√	√	*	*	*	*
Sedang	√	*	√	*	√	√	*	*
Klamath	√	*	√	*	√	√	√	*
Spanish	√	√	√	√	√	√	*	*
Finnish	√	√	√	√	*	*	√	√
Totonaco	√	*	√	*	√	√	√	*
English	√	√	√	√	√	√	√	√

Yellow rows: languages that enforce ONSET. Aside from those languages, if an onsetless syllable type is ok, then all else equal, its counterpart *with* an onset is also ok

*Coda

	Onsets required?		Codas allowed?		Cplex Onsets?		Cplex Codas?	
	(C)V		(C)VC		CCV(C)		(C)VCC	
	CV	V	CVC	VC	CCV	CCVC	CVCC	VCC
Hua	√	*	*	*	*	*	*	*
Cayuvava	√	√	*	*	*	*	*	*
Cairene	√	*	√	*	*	*	*	*
Mazateco	√	*	*	*	√	*	*	*
Mokilese	√	√	√	√	*	*	*	*
Sedang	√	*	√	*	√	√	*	*
Klamath	√	*	√	√	√	√	√	√
Spanish	√	√	√	√	√	√	*	*
Finnish	√	√	√	√	*	*	√	√
Totonaco	√	*	√	*	√	*	√	*
English	√	√	√	√	√	√	√	√

Yellow rows: languages that enforce *CODA
All else equal, if closed syll type is ok, its open counterpart also ok

Complex onsets

	Onsets required?		Codas allowed?		Cplex Onsets?		Cplex Codas?	
	(C)V		(C)VC		CCV(C)		(C)VCC	
	CV	V	CVC	VC	CCV	CCVC	CVCC	VCC
Hua	√	*	*	*	*	*	*	*
Cayuvava	√	√	*	*	*	*	*	*
Cairene	√	*	√	*	*	*	*	*
Mazateco	√	*	*	*	√	*	*	*
Mokilese	√	√	√	√	*	*	*	*
Sedang	√	*	√	*	√	√	*	*
Klamath	√	*	√	*	√	√	√	*
Spanish	√	√	√	√	√	√	*	*
Finnish	√	√	√	√	*	*	√	√
Totonaco	√	*	√	*	√	√	√	*
English	√	√	√	√	√	√	√	√

Yellow rows: languages that enforce *COMPLEX ONSET

Complex codas

	Onsets required?		Codas allowed?		Cplex Onsets?		Cplex Codas?	
	(C)V		(C)VC		CCV(C)		(C)VCC	
	CV	V	CVC	VC	CCV	CCVC	CVCC	VCC
Hua	√	*	*	*	*	*	*	*
Cayuvava	√	√	*	*	*	*	*	*
Cairene	√	*	√	*	*	*	*	*
Mazateco	√	*	*	*	√	*	*	*
Mokilese	√	√	√	√	*	*	*	*
Sedang	√	*	√	*	√	√	*	*
Klamath	√	*	√	*	√	√	√	*
Spanish	√	√	√	√	√	√	*	*
Finnish	√	√	√	√	*	*	√	√
Totonaco	√	*	√	*	√	√	√	*
English	√	√	√	√	√	√	√	√

Yellow rows: languages that enforce *COMPLEX CODA

Mutual independence of syllabic M constraints

*CODA is enforced in languages that can violate ONSET: Cayuvava.

	Onsets required?		Codas allowed?		Complex Onsets?		Complex Codas?	
	(C)V		(C)VC		CCV(C)		(C)VCC	
	CV	V	CVC	VC	CCV	CCVC	CVCC	VCC
Hua	√	*	*	*	*	*	*	*
Cayuvava	√	√	*	*	*	*	*	*
Cairene	√	*	√	*	*	*	*	*
Mazateco	√	*	*	*	√	*	*	*
Mokilese	√	√	√	√	*	*	*	*
Sedang	√	*	√	*	√	√	*	*
[illegible]								
Totonaco	√	*	√	*	√	√	√	*
English	√	√	√	√	√	√	√	√

*COMPLEX ONSET enforced in Finnish, which can violate *COMPLEX CODA.
*COMPLEX CODA enforced in Spanish, which can violate *COMPLEX ONSET

ONSET enforced in languages that can violate *CODA: Cairene.

Summary: interacting σ constraints do these things

- They model speaker intuitions about division into syllables
  e.g. V.CV ≻ *VC.V emerges from choice of constraints.
  V.CCV ≻ *VC.CV emerges from some rankings, in some lgs.

- They model the weight of syllables; and indirectly, weight effects on stress/meter
  e.g. Latin, English *álgebra* = *ál.ge.bra* > *al.géb.ra* because, in these systems,
  *CODA >> *COMPLEXONSET. (Opposite ranking yields Arabic *al.géb.ra*)

- They model the range of permissible C_0V_0 sequences in the language.
  e.g. English *bro* ok, because MAX C, DEP V >> *COMPLEXONSET
  English **bno, *gnu* bad *BADONSET (below) >> MAX C *or* DEP V

- They model implicational laws of syllable structure
  e.g. If CCV is ok, CV is also ok: that emerges from the choice of constraints

Not yet explained:

better vs. worse complex onsets/codas ('margins')

- Not all complex onsets are equal

  E.g. stop-liquid vs. all other CC, e.g. s-Stop, sonorant-C, stop-fricative

  supply (V.CCV) vs. *suspect, surmise, success* [ks], *subject* [bʤ] (VC.CV)

- Not all complex codas are equal

  *act, sixths…*are ok; but * *akp, *atk, *akr, *solemn*

- Preliminary: *BADONSET/*BADCODA as stand-ins for complex syllable margins that are disallowed, when others are permitted.

UR: /bro/	DEP	*COMPLEX ONSET
☞ bro		*
bəro	*!	

UR: /gnu/	*BADONSET	DEP	*COMPLEX ONSET
☞ gənu		*	
gnu	*!		*

(*BADONSET excludes CC onsets other than stop-liquid)

Sonority and syllables

The nucleus of the syllable can be

- A vowel (any language)
- A rhotic: *saber* [saɪbrɻ̩]
- A lateral: *able* [eɪbl̩]
- A nasal: *rhythm* [ɹɪðm̩]
- A fricative: not English, but in Berber, imagine 2syll *fax* [fæks̩]
- A stop: not English, but in Berber, imagine 2syll *locked* [lɔkt̩]
- All these options can coexist, but in constrained ways.

Distribution of syllabic Cs (C̩s) across languages

Languages that allow syllables w. consonantal nuclei fall into just 4 classes:

~~pt~~	~~ps~~	~~pn~~	~~pr~~	pa,... pi	French
~~pt~~	~~ps~~	~~pn~~	pr	pa,... pi	Czech
~~pt~~	~~ps~~	pn	pr	pa,... pi	English
~~pt~~	ps	pn	pr	pa,... pi	Yavapai
pt	ps	pn	pr	pa,... pi	Berber

Stop Fric. Nasal Liquid Vowel

Implicational laws of coexisting Cs

Languages that allow syllables w. consonantal nuclei fall into these classes:

~~pt~~	~~ps~~	~~pn~~	~~pr~~	pa	French
~~pt~~	~~ps~~	~~pn~~	pr	pa	Czech
~~pt~~	~~ps~~	pn	pr	pa	English
~~pt~~	ps	pn	pr	pa	Yavapai
pt	ps	pn	pr	pa	Berber
pt	ps	~~pn~~	~~pr~~	pa	Unattested
pt	~~ps~~	~~pn~~	pr	pa	Unattested
~~pt~~	ps	~~pn~~	pr	pa	Unattested

Stop Fric. Nasal Liquid Vowel

Several implicational laws

- If syllabic stops (T) are ok then syllabic fricatives (F) are ok too
- If syllabic fricatives (F) are ok then syllabic nasals (N) are ok too
- If N, then syllabic liquids (L)
- If L, then V

These observations don't look unrelated to each other.
If they are related, what is the connection?
Short answer: preferred nuclei are louder or *more sonorous*

The relation betwen all these implicational laws is that
all refer to values on the same dimension: sonority

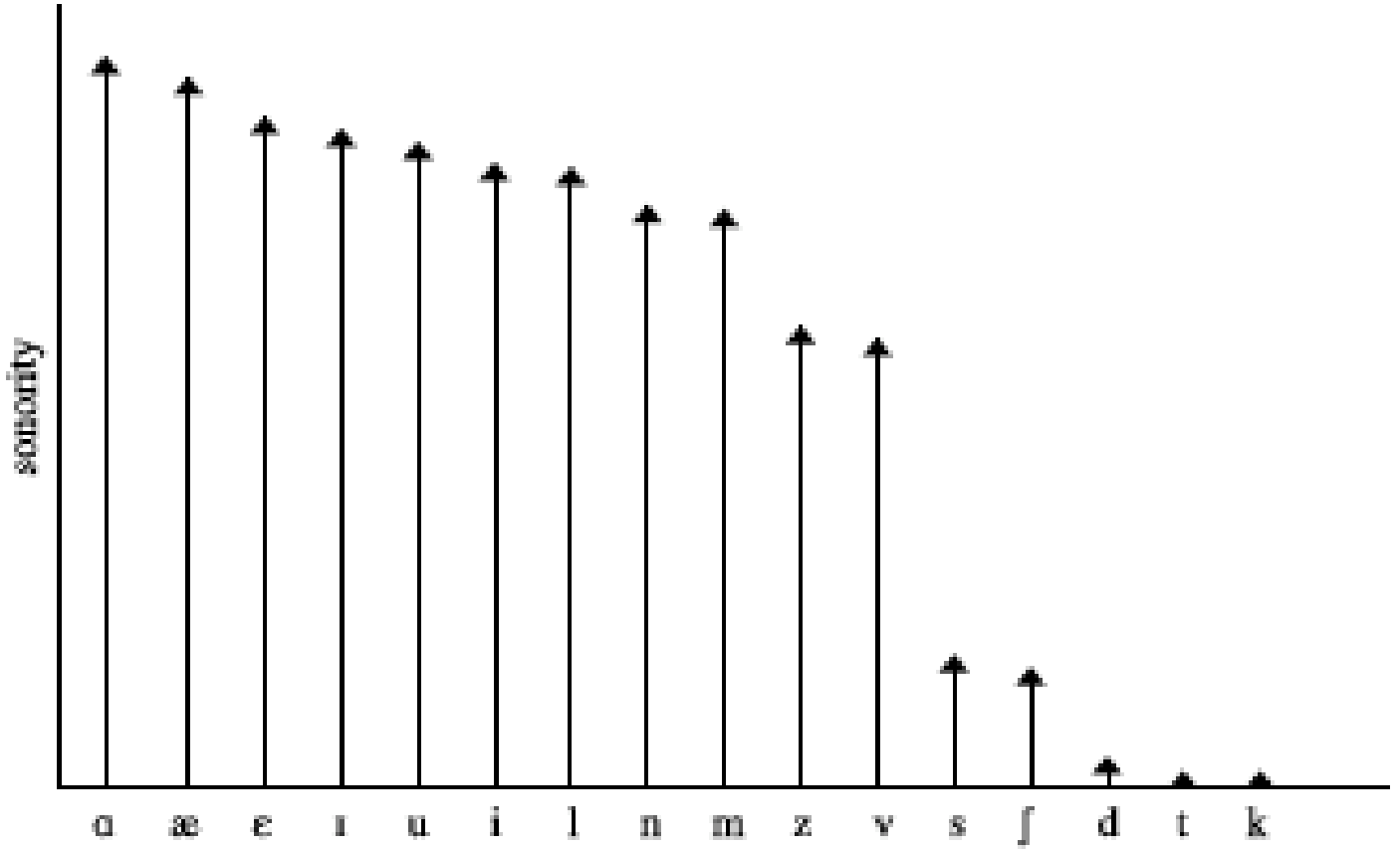
Sonority and sonority scale

- A phonological property reflecting relative sound loudness (intensity)
- Louder (more sonorous) Less loud (less sonorous)

- A sonority scale: a rank order of sound classes based on avg. *relative* loudness.
- Each class gets an index: its position relative to other classes. dB values vary.
- The scale above is widely used. Slightly different scales also in use.
- Some scales use finer loudness distinctions, or coarser ones.
- Among Vs, a comparable scale: lower (louder) – higher (less loud)

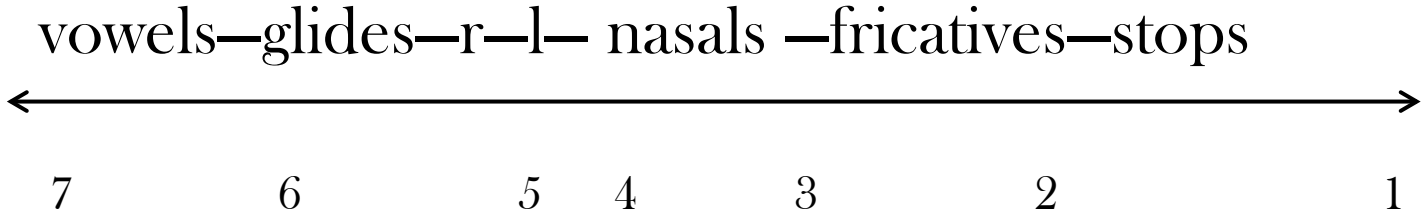
From Ladefoged and Johnson (p.246), English

dialect unspecified, subjects/recordings unspecified;
'sonority' here = sound intensity (energy transmitted) relative to a reference value



Connection to syllables

Within a syllable, sonority (i.e. intensity) tends to increase, onset to nucleus, and then decrease, nucleus to coda.



Raw amplitude scales: English & Spanish (Parker 2008 *JPhon*).

Author(s)	Date	Language	Speakers	Repetitions	Sound level scale
Ladefoged	1975	English	?	?	æ ɔ o ʊ ɪ i l ɹ m n w j s ʃ f θ h p t k
Fry	1979	English	?	?	o ɔ ɑ ʌ æ ʊ ɛ ɪ i u w j ɹ l ʃ ŋ m tʃ n ʒ dʒ z s g t k v ð b d f p θ
Kennedy et al.	1998	English	?	1	ŋ m n s z ʃ d g ð v b t k θ p f
Lavoie	2000	English	5 men	5	ɹ l n m ð ʒ v z dʒ d b g tʃ θ ʃ t s p f k
Lavoie	2000	Spanish	4 men	5	j ɲ l n m r β ð ɣ ɾ v x s tʃ p t f k
Parker	2002	English	4 men	3	u ʊ o ʌ ɑ ɪ e i ɛ æ ɔ ə w ɹ l j ʒ m n v h z ʃ s f ð dʒ b g t tʃ d p k θ
Parker	2002	English	4 women	3	u ɑ e ʊ ɪ ɛ o ʌ æ ɔ ə i j w l ɹ n m ʒ v ð h z ʃ d dʒ b g s f t θ p k tʃ
Parker	2002	Spanish	4 men	3	u e o ɑ i w l ɾ β ð r n m ɣ ɲ b d g dʒ h s t k p f tʃ
Parker	2002	Spanish	4 women	3	o e u ɑ i w l ɾ r β n m ɲ d b g ð ɣ dʒ h s f t tʃ k p

Sound level ≈ sonority

Raw scales don't match exactly any sonority scale (nor do they match across subject groups in same lg.)
They get close when values are averaged within a given sound class: e.g. all [-high] Vs or all frics.

Vs differ in loudness: rounded and lower Vs are typically louder than non-round and non-low Vs.
Obstruents also do: voiced ones are louder than voiceless, fricatives louder than stops

Intensity fluctuations (top line) in [pakoðijhopasoajer]

(Parker 2008 *JPhon*).

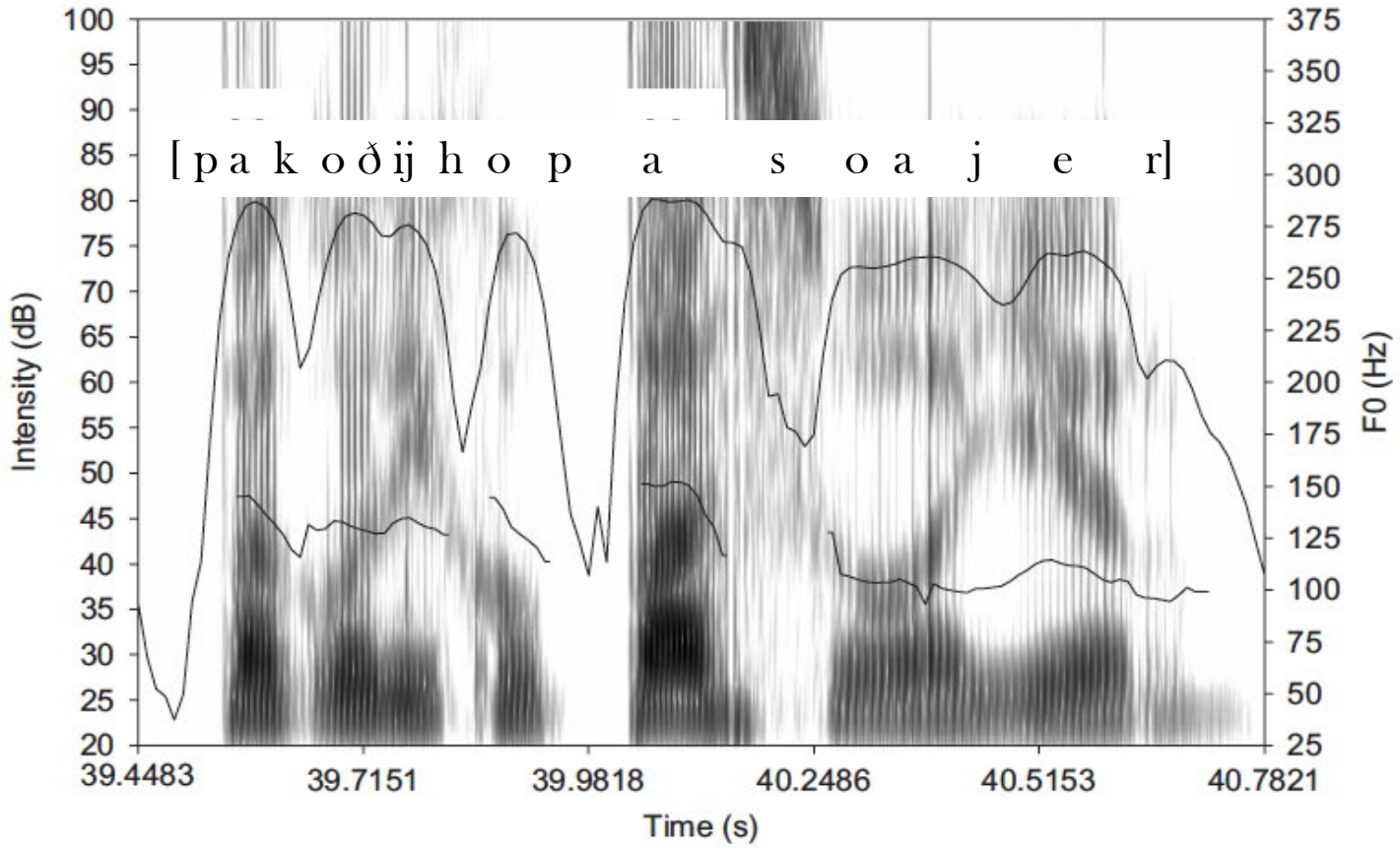


Fig. 3. Praat spectrogram of the Spanish sentence *Paco dijo "paso" ayer*, with intensity trace (above) and pitch trace (below).

Terms

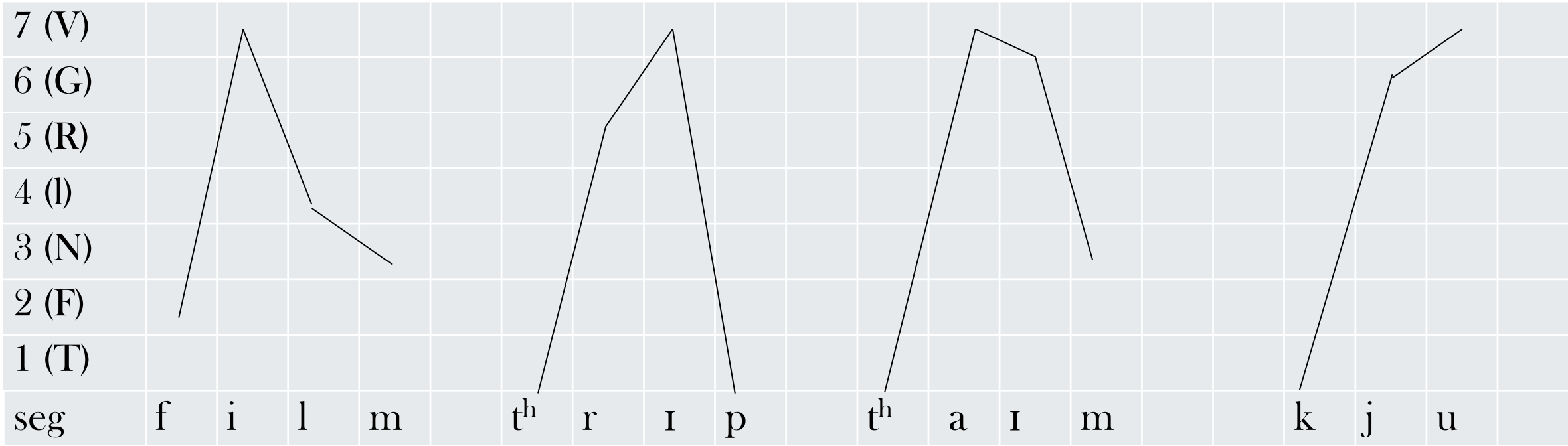
- *Intensity, loudness:* a continuous property that varies with context, stress, speaker, utterance etc.)
- *Sonority* (a categorical, abstract, hypothetical property that remains constant across contexts).
- Use *sonorous* (≠ *loud*) for any segment class that occupies a relatively high position on the sonority scale.
- E.g. 'Nasals are more sonorous than fricatives.'
- Don't use 'sonorant' if you mean 'sonorous':

  /l/ and /m/ are both [+sonorant] but /l/ is *more sonorous* than /m/;

  /p/ and /s/ are both [-sonorant] but /s/ is *more sonorous* than /p/.

Sonority peak =

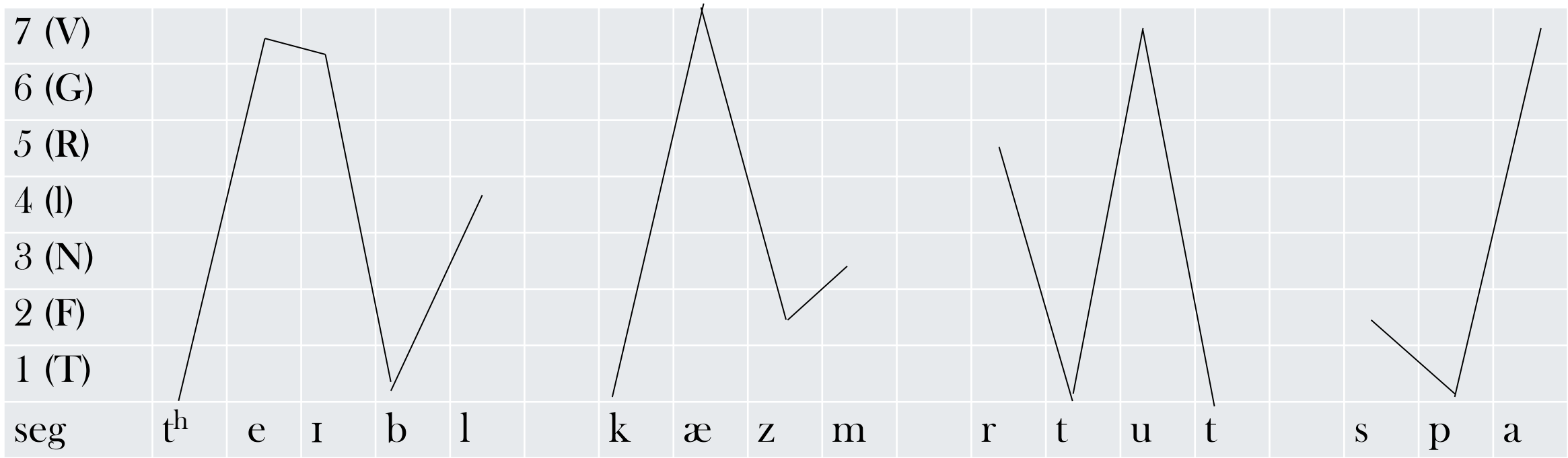
segment more sonorous than any adjacent segment



Above, the sonority peak is the same as the Nucleus of each syllable

Sonority peak

Below, each string contains two peaks



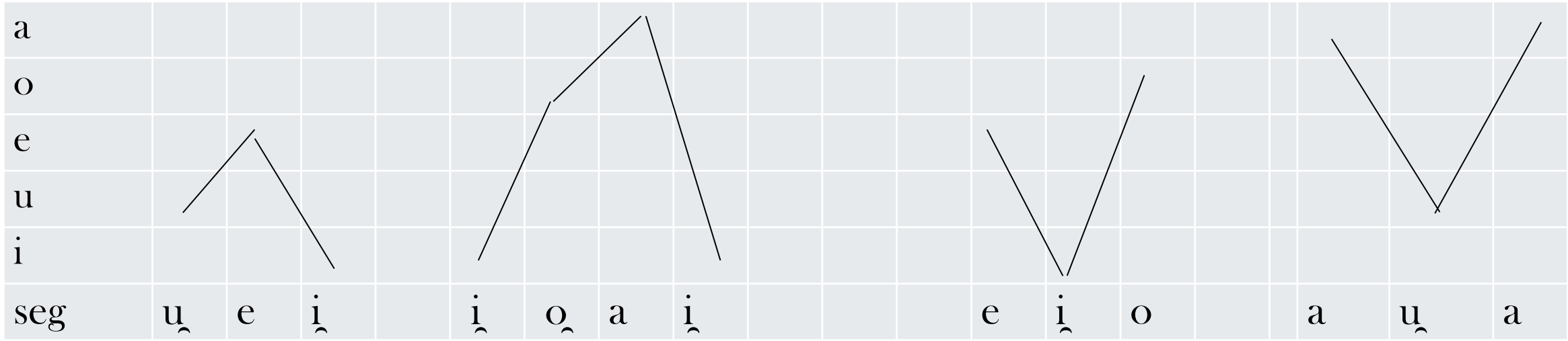
Upshot: each English syllable contains a single sonority peak but [s] deviates.

Bad Onsets and sonority

- Many Bad Onsets (e.g. *ldʒ* in *algebra*) would create a second sonority peak in their syllable and can be ruled out by requiring one-peak/syll.
- Not all Bad Onsets do: *gn, pn, ps, mr* will not create a second sonority peak, but they're still excluded as onsets in most languages.
- A stop-gap measure: better onsets are characterized by *abrupt* rises in sonority, e.g. from level 1 (*b*) to level 4 (*l*) but not to 3 (*n*). Other interpretations exist.

Sonority peak effects in diphthongs

Recall from Parker: vowels differ in loudness too: a, o > e (>) u > i



3-V diphthongs with falling-rising sonority seem to be unattested.
Perhaps because they would generate more than one sonority peak.

A sonority peak constraint: Sonority Sequencing Constraints (SSC)

a. There is only one sonority peak per syllable. One * for each extra peak.

e.g. *tʰeɪbl, *kʰæzm (* if said as 1σ)

b. The peak is in the nucleus.

e.g. *jm̩, *km̩r

SSC (a-b) favor syllables that rise in sonority from the onset to the nucleus, fall in sonority from the nucleus to the coda, and align peak with Nucleus.

[William D. Whitney (1865) and Ferdinand de Saussure (1884): observed syllabicity alternations (*rhyth[m̩]- rhyth[m]ic, cyc[l̩]-cyc[l]ic*) and conjectured they are caused by the SSC]

SSC explains σ count in English:
SSC vs. *C$_{\text{i}}$ in systems with undominated MAX / DEP

- *rhythm* (2σ) vs. *film, arm, aim* [eiṃ] (1σ), in English

UR /rɪðm/	SSC (a)	*C
rɪðm		
☞ rɪðm		

UR /film/	SSC (a)	*C
☞film		
film		

UR /rɪðm-ɪk/	SSC (a)	*C
☞ rɪðmɪk		
rɪðmɪk		

The SSC is violable
Violated if *C, MAX, DEP >> SSC

- *ritm* (1σ) and *film* (1σ), in Romanian (perhaps also Polish, Russian)

UR /ritm/	*C	SSC (a)
☞ ritm		
ritm		

UR /film/	*C	SSC (a)
☞film		
film		

SSC explains aspects of σ division

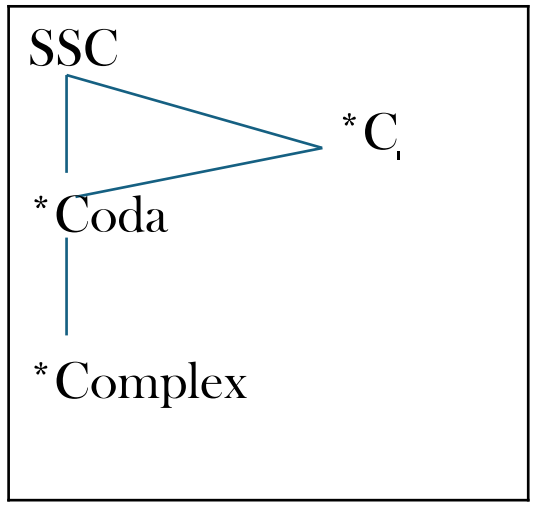
- *algebra* (3σ) in English: the SSC replaces some uses of *Bad Onset

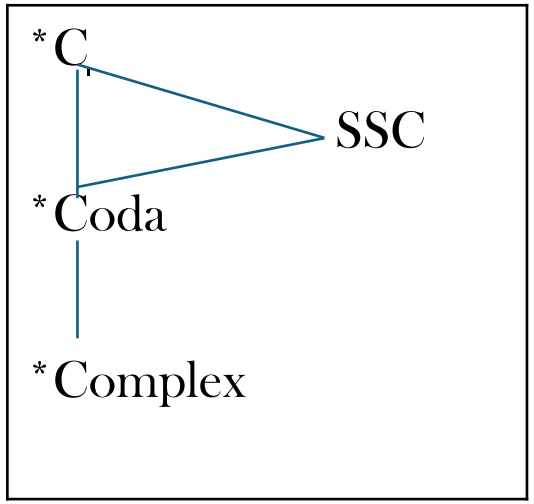
UR /algebra/	SSC (a)	*C	*Coda	*Complex
☞ al.ge.bra				
a.lge.bra				
a.l.ge.bra				
al.geb.ra				

SSC explains σ division:

- *algebra* in English *and* Romanian

UR /algebra/	SSC (a)	*C	*Coda	*Complex
☞ al.ge.bra				
a.lge.bra				
a.l.ge.bra				
al.geb.ra				





Typology of sonority in nuclei

An implicational law

If C_i of sonority level n can be syllabic, then C_j of sonority level q, q >n, also can.

~~pt~~	~~ps~~	~~pn~~	~~pr~~	pa	French
~~pt~~	~~ps~~	~~pn~~	pr	pa	Czech
~~pt~~	~~ps~~	pn	pr	pa	English
~~pt~~	ps	pn	pr	pa	Yavapai
pt	ps	pn	pr	pa	Berber
1	2	3	4	5	
Stop	Fric.	Nasal	Liquid	Vowel	

One account of these implications

(Prince and Smolensky 1993; cf. Dell and Elmedlaoui 1985)

- Take the sonority scale for Cs
- Assume each sound class C on the scale corresponds to a *C constraint

  *C : One * for each instance of a syllabic member of class C
- *Stop -- *Fric -- *Nas -- *l --*r -- *glide --
- Ranking in this constraint family is determined by sonority level of C.

  The lower the sonority of C, the higher the *C
- *Stop >> *Fric >> *Nas >> *l >> *r >> *glide
- Abbreviated below as *T >> *F >>*N ...

The *C̩ hierarchy (Prince and Smolensky1993)

1	***T̩ (one * for each syllabic stop)**	
	↓	
2	***S̩ (one * for each syllabic fric)**	
	↓	
3	***N (one * for each syllabic nasal)**	
	↓	
4	***L (one * for each syllabic lateral)**	
	↓	
5	***R (one * for each syllabic rhotic)**	

Fixed ranking reflects universal dispreference for less sonorous nuclei,
Starting with the least sonorous ones.

Languages that allow only vowel nuclei (French, Spanish…)

1	*T$_{\text{ı}}$ (one * for each syllabic stop)	
	↓	
2	*S$_{\text{ı}}$ (one * for each syllabic fric)	
	↓	
3	*N$_{\text{ı}}$ (one * for each syllabic nasal)	
	↓	
4	*L$_{\text{ı}}$ (one * for each syllabic lateral)	
	↓	
5	*R$_{\text{ı}}$ (one * for each syllabic rhotic)	
		conflicting constraints: Faith, *CODA, *COMPLEX, SSC, others

Languages that allow vowels, liquids, nasals as nuclei (English)

1	*T$_{\text{ˌ}}$ (one * for each syllabic stop)	
	↓	
2	*S$_{\text{ˌ}}$ (one * for each syllabic fric)	
	↓	Some conflicting constraints (MAX, DEP, SSC: e.g. fæks, vs. fæk.s$_{\text{ˌ}}$)
3	*N$_{\text{ˌ}}$ (one * for each syllabic nasal)	
	↓	Other conflicting constraints
4	*L$_{\text{ˌ}}$ (one * for each syllabic lateral)	(*COMPLEX: e.g. fɪlm, *fɪl.m$_{\text{ˌ}}$)
	↓	
5	*R$_{\text{ˌ}}$ (one * for each syllabic rhotic)	

Low-sonority peaks in English

- *fax* (1σ) in English compared to *rythm* (2 σ)

UR /rɪðm/	SSC (a)	*N̩	UR /fæks/	*F̩	SSC(a)
rɪðm	*!		☞fæks		*
☞ rɪðm̩		*	fæks̩	*!	

- In Romanian, Russian *no C̩'s* are ok, so more violations of SSC

UR /rɪtm/	*N̩	SSC (a)	UR /fæks/	*F̩	SSC(a)
☞rɪtm		*	☞fæks		*
rɪtm̩	*!		fæks̩	*!	

English *N, *l , r

- No direct evidence for ranking them in English
- Rather, evidence for the ranking of *C constraints comes, thus far, just from the implicational laws on syllabic segments.
- The fixed ranking explains these laws.