

24.901/931, 2026

Introduction to Phonology

Lecture 17

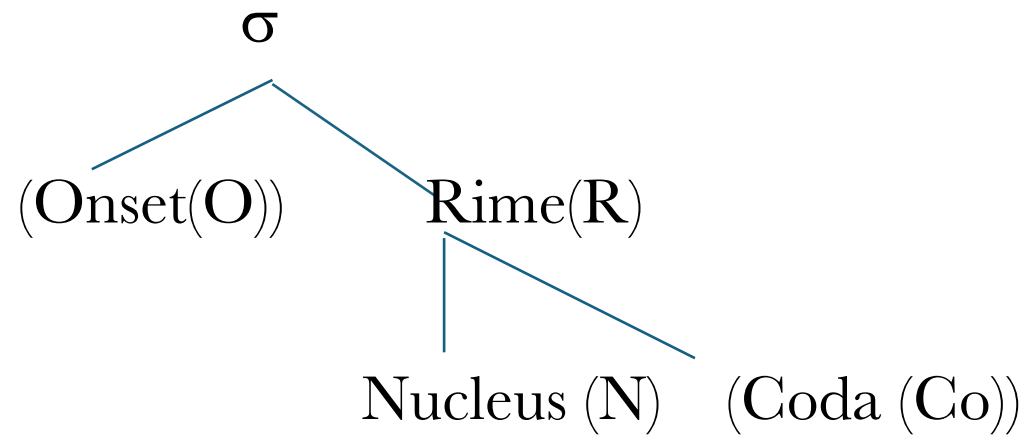
- Problem set 5 due Saturday
- Updated Afar material: in *OT Basics*.
- Same readings

Slides 58 to end

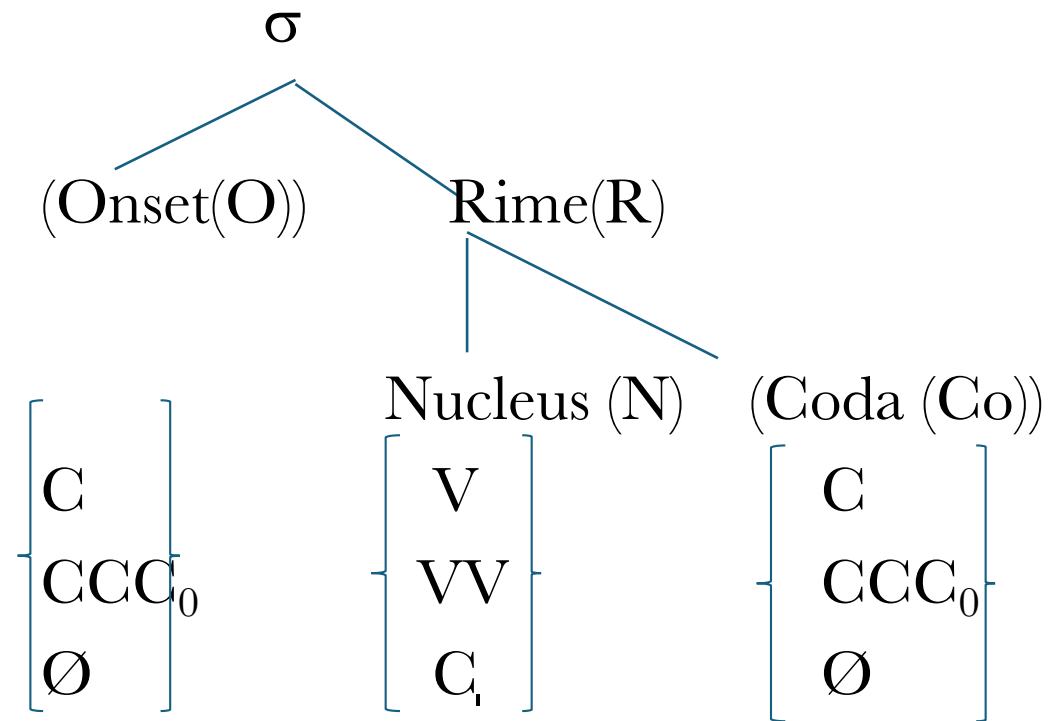
- A comment on correspondence relations
- Addresses earlier questions about correspondence
- Unrelated to the rest.

Syllable basics

Syllable constituents



Syllable constituents



Initial evidence for these units

Syllables:

- people count them reliably, without prior instruction, in producing stress, verse
- writing systems use them, in syllabaries and hyphenation.
- forms of *speech disguise* flip them: French Verlan (*l'envers* 'backwards' [lɑ̃.vɛʁ])
(*cigarette* [si.ga.ʁɛt → ga.ʁɛt.si, ʁɛt.si.ga, ...], *problème* [pʁo.blɛm → [blɛm.pʁo])
'.' = syllable boundaries

Onsets, rimes:

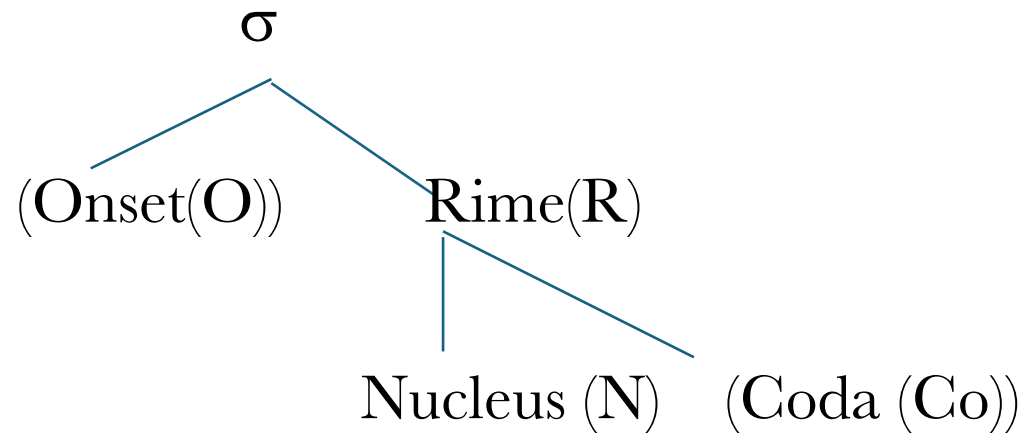
- syllables attract stress and *ictus* (prominent positions in verse) when they are *heavy*; they tend to repel stress and ictus, when *light*.
- what counts as heavy or light depends on the contents of the rime
- rhyme in verse operates on domains that begin with a rime (*gl* | *ea*.*ming* / *str* | *ea*.*ming*)
- alliteration operates on onsets.

Syllabic scripts

- Syllabary: writing system where each grapheme corresponds to one syllable
- Cypriot Greek (6th BC): Each symbol has a (C)V value
- Final C is written <Ce>; coda nasals are omitted
- CC clusters broken into CV-signs, *based on likely division into syllables*
- *Glaukos* (name) glau.kos <ka-la-u-ko-se>, *<ke-la-u-ko-se>
- *aristos* 'best' a.ris.tos <a-ri-si-to-se>, *<a-ri-so/se-to-se>
- *ant^hropos* 'man' an.t^hro.pos <a-to-ro-po-se>, *<a-ta-ro-po-se>
- Divisions confirmed by hyphenations in alphabetic Greek inscriptions
- Other syllabaries: Cherokee, Mayan, Igbo; Linear B (Mycenaean Greek)
- A feature-based script, Korean Hangul, mid 15th cent AD, groups C- and V-like graphemes into visual units corresponding to syllables.

	a	e	i	o	u
	✱	✱	✱	✱	✱
j	◊	•		∨	
k	↑	✱	Ÿ	Λ	✱
l	∨	8	∠	+	Λ
m	Ÿ	✱	Ÿ	U	✱
n	⌒	Ÿ	Ÿ	Ÿ	Ÿ

- Repeated invention of syllable-based writing conventions, and of meter/rhyming/alliteration systems, suggests that speakers are aware of units larger than 1 phoneme, containing one V-like element each.
- Assume for now these units are syllables, as taught in schools.



Syllable weight and the onset/rime division

- *Stress* (position of greater prominence in a word) tends to fall on *heavier* syllables: louder and/or longer than others.
- Difference between heavier and lighter syllables: *weight*.
- One subunit of the syllable determines its weight: the *rime*.
- Not only stress: quantitative meter (rhythm based on alternating lighter and heavier syllables; not on stress) also uses weight distinctions.
- Untrained, frequently illiterate people compose and evaluate such meters fluently; an ability reflecting knowledge of syllable structure.

Syllable structure and Latin stress

Antepenult stress		Penult stress	Gloss of root
• cre.dí.bi.lis, cre.di.bí.li.ter		cre.dén.dum, cre.du:.li.tá:.tem	‘believe’
• fá.ci.lis fá.ci.at		fa.ci.én.tis, fac.tú:.ra:s	‘make’
• há.be.o: há.bi.lis		ha.bén.tis, ha.bé:.re:s	‘have’
• tú.e.or tu.é:.mi.ni:		tu.én.da, tu.é:.ri	‘see’
• á:.cri.ter a:crimó:.ni.a		a:.cér.bus, a:.cri.tú:.do:	‘sharp’
• á.li.o:s a.li.é:.ni.ta:s		a.li.é:.nus	‘other’

Divisions reflect hyphenations
in inscriptions and weight in stress and verse

Where is Latin stress?

(a) On the penult, iff penult contains

(i) a long V:

ha.bé:.re:s, a.cri.tú:.do:, re.fé:.ci:, re.fec.tó:.rum, tu.é:.ri:

(ii) a diphthong:

the.sáu.rus

(iii) a V + CCs, CC $\neq$ stop-liquid:

ha.bén.tis, a.cér.bus, tu.én.da, Me.náec.mi:, co.a.lés.ko:

(b) On the antepenult, otherwise.

(i) ré.fí.cit, mul.tí.plex, té.ne.brae, fá.ci.at

Stress-attracting penults vs. others

Penults that attract stress		Penults that don't	
re.fec. <u>tó</u> :.rum	tu. <u>é</u> :.ri	ré. <u>fi</u> .cit	há. <u>be</u> .at
ha. <u>bén</u> .tis	tu. <u>én</u> .da	múl. <u>ti</u> .plex	tú. <u>e</u> .or
fa.ci. <u>en</u> .tis	a:..cri. <u>tu</u> :.do:	á:.. <u>cri</u> .ter	á. <u>li</u> .o:s

Stress-attracting penults vs. others

Penults that attract stress		Penults that don't	
re.fec. <u>tó</u> :.rum	tu. <u>é</u> :.ri	ré. <u>fi</u> .cit	há. <u>be</u> .at
ha. <u>bén</u> .tis	tu. <u>én</u> .da	múl. <u>ti</u> .plex	tú. <u>e</u> .or
fa.ci. <u>en</u> .tis	a:. <u>cri</u> .tu:. <u>do</u> :	á:. <u>cri</u> .ter	á. <u>li</u> .o:s
<pre> graph TD sigma --> O sigma --> R O --> X0 R --> X X --> X X --> X0 </pre>		<pre> graph TD sigma --> O sigma --> R O --> X0 R --> X </pre>	

Syllable weight, beyond Latin

- Heavy syllables: typically longer rimes, in Xs; V's may count for more
- The presence or size of onset is typically irrelevant to weight.

Heavy syllable	Light syllable
at least XX in rime	one X in rime
C ₀ VV, C ₀ VC, C ₀ VCC, C ₀ VVC, ...	C ₀ V, incl. CCCCCV

Similarly in English

Penults that attract stress		Penults that don't	
a.gén.da	a.ró.ma [roʊ]	A.mé.ri.ca	Mìn.ne.á.po.lis
pa.rén.tal	hi.a.tus [eɪ]	sá.cri.lege	ál.ge.bra

Stressless syllables mostly contain a reduced V, schwa or [ɪ] in SR: [ə'meɪəkə], ['sæ.kɪə.lɪdʒ], ['æl.dʒə.bɪə], [ˌmɪni'æpələs]. Stressless Vs are reduced on the surface *because they're stressless*. They didn't get stress because they are light, C₀V, not because they are underlyingly reduced.

Evidence: a syllable that surfaces as reduced [ə/ɪ] in one word can have full stressed V in related word: ['æɾəm], [ə'tɔ]mic; 'pærənt], [pə'ren]tal, etc. V-quality and flapping are consequences of stress, and change when stress shifts, as suffixes are added. They don't reflect directly UR qualities.

Syllable divisions: English facts and general laws

Checking if speakers' judgments of syllable division converge:
if they do, we want to discover the basis of these shared judgments, to model them.

Fact: no audible markers of syllable boundaries. No direct observation yields judgments of syllable division. More likely, an inference process is their source.

(There may be subtle articulatory correlates of C/Vs being in same syllable, but doubtful that they produce these judgments.)

Summary of English syllable division judgments

experimental work e.g. Treiman & Zukowski 1990 JML, Derwing & Eddington 2011 ML

- $V_1C.CV_2$ iff $CC \neq$ stop-liquid, C-glide; regardless of stress
séis.mic, seis.mólogist *ac.tívi.ty, ác.tor*
- $V_1.CC_0V_2$ iff $CC_0 =$ stop-liquid, C-glide, or just one C **and**
if V_1 is long, as in:
co.bra [oʊ], *ze.bra* [i:], *du.plex* [u:], *se.cret* [i:]; *se.quence* [i:], *le.nient* [i:] **or**
if V_1 is schwa, as in:
so.brí.e.ty [ə], *se.quen.tial* [ə]
- V_1CV_2 variably divided, if V_1 stressed and lax; also $V_1.CC_0V_2$ CC_0 stop-liq, C-glide
lémon [ɛ]: *le.mon*, *lem.on* or *m ambisyllabic* (in both syllables; or uncertain)
cárry [æ]: [ɹ] in coda, or onset, or ambisyllabic
secretary [ɛ]: [k] in coda, or onset, or ambisyllabic
- $V_1.CV_2$ otherwise

Tasks in syllable division experiments

- ‘Repeat first part’
 - (a) *chipmunk*: *chip-chip-munk*
 - (b) *salad*: *sal-salad*, *sa-salad*
- ‘Pause break’ task
 - (a) *chipmunk*: *chip... munk*
 - (b) *salad*: *sal...ad*, *sa...lad*
- ‘Swap first and second part’: *munk-chip*, *lad-sa*
- ‘Insert expletive between parts’: *rac-F-coon*

Stimulus	Category	Examples	VC.V	V.CV	ṾV
1. /r/					
VCV	1Str, Lax, SgSp	herald	.75	.07	.18
əCV	2 Str, Lax, SgSp	parade	.11	.75	.15
VCV	1 Str, Tns, SgSp	dowry	.05	.85	.10
V<CC>V	1 Str, Lax, DbSp	parrot	.25	.10	.65
2. /l/					
VCV	1 Str, Lax, SgSp	melon	.62 (.40/.55)	.20 (.33)	.18 (.26)
əCV	2 Str, Lax, SgSp	select	.01	.85	.14
VCV	1 Str, Tns, SgSp	pilot	.17 (.26/.37)	.77 (.58)	.07 (.15)
V<CC>V	1 Str, Lax, DbSp	gallon	.20	.12	.68
V<CC>Ṿ	2 Str, Lax, DbSp	collide	.36	.04	.60
3. Nasals					
VCV	1 Str, Lax, SgSp	lemon	.51 (.46/.64)	.37 (.29)	.12 (.24)
əCV	2 Str, Lax, SgSp	demand	.06	.86	.08
VCV	1Str, Tns, SgSp	moment	.13 (.26/.14)	.82 (.68)	.05 (.06)
V<CC>V	1Str, Lax, DbSp	tennis	.24	.20	.56
V<CC>Ṿ	2Str, Lax, DbSp	command	.02	.42	.56
4. Obstruents					
VCV	1Str, Lax, SgSp	seven	.30 (.27/.44)	.60 (.58)	.10 (.14)
əCV	2Str, Lax, SgSp	reveal	.02	.94	.04
VCV	1Str, Tns, SgSp	crisis	.13 (.17/.13)	.80 (.79)	.07 (.03)
V<CC>V	1Str, Lax, DbSp	rabbit	.06	.62	.32
V<CC>Ṿ	2 Str, Lax, DbSp	effect	.05	.61	.34

Results of pause-break task
(Derwing and Eddington 2014 *ML*)
for C₀VCVC₀ words: effects of stress,
C-quality and spelling.

In parentheses: results of 1988
experiments, oral & written tasks.

Syllable division beyond English

1. $V_1CV_2 = V_1.CV_2$
2. $V_1.CCV_2$ if CC = stop+liquid, and if such clusters occur word-initially
3. $V_1C.CV_2$ otherwise (CC $\neq$ stop+liquid, and/or CC disallowed #_); **Or**
4. $V_1C.CV_2$ for all CCs, **Or**
5. Division of V_1CCV_2 uncertain, speakers accept VC.CV and V.CCV
6. V_1CCCV_2 divided as $V_1C.CCV_2$ or $V_1CC.CV_2$ depending on CCs allowed initially/finally

Options 2-3 reported in Romance, later Greek, modern WGermanic lgs

Option 4 reported in Lithuanian, Klamath, Sanskrit, A.Greek, older Gmc., and languages lacking initial CCs. Option 5 reported for Polish.

Summary of cross-ling.data

- Variable: division of CC in V_V, both V.CCV and VC.CV ok, iff CC in V.CCV is allowed as onset cluster.
- Invariant (controlling for stress/length effects): no onset on 2nd syllable.
 $*V_1C.V_2$, $*V_1C_0C.V_2$

Source of the invariant effects?
How is the variability analyzed?

Syllabic preferences (Jakobson 1941; Prince & Smolensky 1993)

- Inferred from observed patterns of cross-linguistic variation
 - Onsets preferred: $CVC_0 \succ VC_0$ (explains $*VC.V$; systems with no V-initial words)
 - Codas dispreferred: $C_0V \succ C_0VC$ (explains $*VC.V$; systems with no C-final words)
 - Complex margins (complex: CC onsets, CC codas) dispreferred: $CVC_0 \succ CCVC_0, C_0VC \succ C_0VCC$
- Languages differ on how fully they satisfy these preferences:
 - Impose absolute bans on dispreferred syllables
 - Or conditional tolerance
- Preferences reflected in
 - Typology of permitted C^*V^* sequences in words
 - Syllable divisions, seen in stress, hyphenation, experiments, morphology...

Implicational laws about syllables

(Prince and Smolensky 1993, based on Jakobson 1941 and others)

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

no VC₀ only syllables, without CVC₀ syllables

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

no C₀VC only syllables, without C₀V syllables

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

no CCVC₀ only, without CVC₀ syllables

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

no C₀VCC only syllables, without C₀VC syllables

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

no C₀ÇC₀ only syllables, without C₀VC₀ syllables

Preference laws as OT constraints on syllables

(Prince and Smolensky 1993)

- Onsets are preferred:

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

- Codas are dispreferred:

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

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

*COMPLEXONSET: one * for onset with more than one C

*COMPLEXCODA: one * for coda with more than one C

(together: *COMPLEX similar to C//V)

- Optimal nuclei: *C: one * for every [+cons] nucleus.
- Further, more specific constraints on onset/coda/nucleus.

Interpreting syllabic universals as universal preferences

- Example:

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

C coda, CC coda	C coda, but no CC coda
no C coda, no CC coda	CC coda, but no C coda

- Interpretation:
 - o C-coda violates *a proper subset* of M compared to CC-coda
 - o Then CC-coda *can* surface, if $F \gg M$, where $M = *CC$ coda
 - But then C-coda also will. ($F \gg *CC$ coda, $*C$ coda)
 - No ranking allows the CC-coda, but not C-coda, to surface.

Implicational universals as universal preferences

- 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 $F \gg M$, where M = a constraint violated by P, not Q.
- But, if P surfaces, Q also will.
- No constraint ranking will allow P but not Q to surface.

Q and P surface; P alone violates M1, and F >> M1

/P/	F	M1	M2...
$\models P$		*	*
$\neg P$	*!		

/Q/	F	M1	M2...
$\models Q$			*

/CVCC/	MAX	*COMPLEX CODA	*CODA
$\models CVCC$		*	*
CVC	*!		

/CVC/	MAX	*COMPLEX CODA	*CODA
$\models CVC$			*
CV	*!		

Q surfaces but P doesn't: only P violates M1 and M1 >>F

/P/	M1	F	M2
P	*!		*
☞ ¬P		*	*

/Q/	M1	F	M2
☞ Q			*

/CVCC/	*COMPLEX CODA	MAX	*CODA
CVCC	*!		*
☞ CVC		*	*

/CVC/	*COMPLEX CODA	MAX	*CODA
☞ CVC			*
CV		*!	

Neither Q nor P surface: both violate M2, and $M2 \gg F$

P	M2	F
P		*
$\rightarrow \neg P$	*!	

/CVCC/	*CODA	MAX
CVCC	*!	
$\rightarrow CV$		**

Q	M2	F
Q		*

/CVC/	*CODA	MAX
CVC	*!	
$\rightarrow CV$		*!

Variation emerges when the M constraints conflict: *CODA vs. *COMPLEXONSET

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

Romance
Gmc, Greek

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

A.Greek, Klamath,
Lithuanian,
Arabic, Sanskrit

Complexities:

Some cluster types (*pr-type*: stop+approximants) are more common complex onsets than others (*sp-type*, *pn-type* *rt-type*, onsets). Further gradations: $pn > pt > \dots rt$.

Invariance: *CODA and ONSET don't conflict

INVARIANT DIVISIONS

$0 \cup V, \quad V \cup 0 \cup V$

one parse harmonically bounds the other.

Variable divisions, V.CCV vs. VC.CV:

either parse can win, under some ranking

altra	ONSET	CODA
altr.a	**!	*
alt.ra or al.tra	*	*

2 conditions must be met for such invariant facts about syllable division to emerge

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*)

	1. Onsets required?		2. Codas allowed?		3. Complex Onsets?		4. 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	√	√	√	√	√	√	√	√

The difference between left and right column in each of the 4 parameters above is not constant.

In 1, 2, 4, the difference is between syllables with/without onsets.

In 3, it is the difference between syllables with and without codas.

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.

All else equal, if an onsetless syll type is ok, its counterpart with 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 only *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	√	*	*	*	√	*	*	*

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

*COMPLEX CODA ENFORCED in Spanish, which can violate *COMPLEX ONSET

	CV	V	CVC	VC	CCV	CCVC	CVCC	VCC
Spanish	√	√	√	√	√	√	*	*
Finnish	√	√	√	√	*	*	√	√
Totonaco	√	*	√	*	√	√	√	*
English	√	√	√	√	√	√	√	√

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

Better vs. worse complex onsets/codas (‘margins’)

- Not all complex onsets are equal

E.g. Stop-liquid < C Glide vs. other CC, e.g. s-Stop, sonorant-C, stop-fric.

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

- Not all complex codas are equal

act, *sixths...* but *akp*, *atk*, *akr*, *solemnn*

- We’ll use *BADONSET/*BADCODA as stand-ins for complex syllable margins that are disallowed, when others are permitted.
- Basic effect behind *BADONSET due to (a) differences in sonority ($\approx$ loudness) between Cs and (b) fact that C₂ may be masking perceptual cues to C₁ in C₁C₂.

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

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

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

Summary

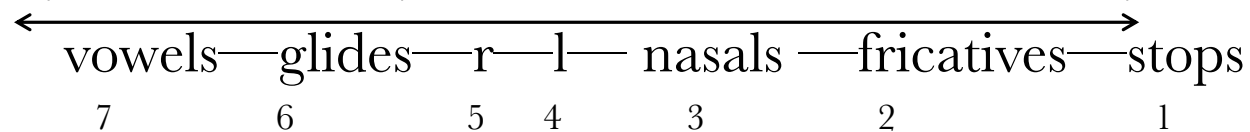
What the set of syllabic constraints + interactions achieve

- They model speaker intuitions about division into syllables
e.g. $V.CV \succ *VC.V$ emerges from the choice of constraints.
 $V.CCV \succ VC.CV$ emerges from some rankings, in some lgs.
- They model the weight of syllables; indirectly, weight effects on stress/meter
e.g. English *álgebra* = *ál.ge.bra* $\succ$ *al.géb.ra* because, in English,
 $*CODA \gg *COMPLEXONSET$. (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 $MAX\ C, DEP\ V \gg *COMPLEXONSET$
English **bno*, **gnu* bad $*BADONSET \gg MAX\ C\ or\ DEP\ V$
- They model implicational laws on syllable structure

Sonority

Sonority and sonority scale

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

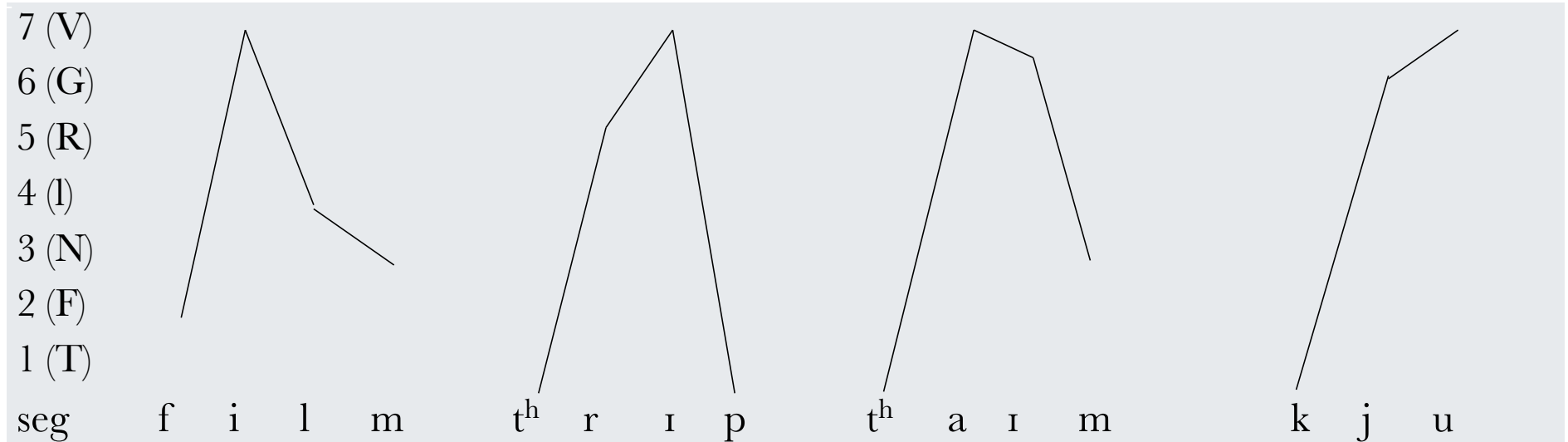


- A sonority scale: a rank order of sound classes based on avg. relative loudness.

Sonority peak

A segment that is more sonorous than any adjacent segment

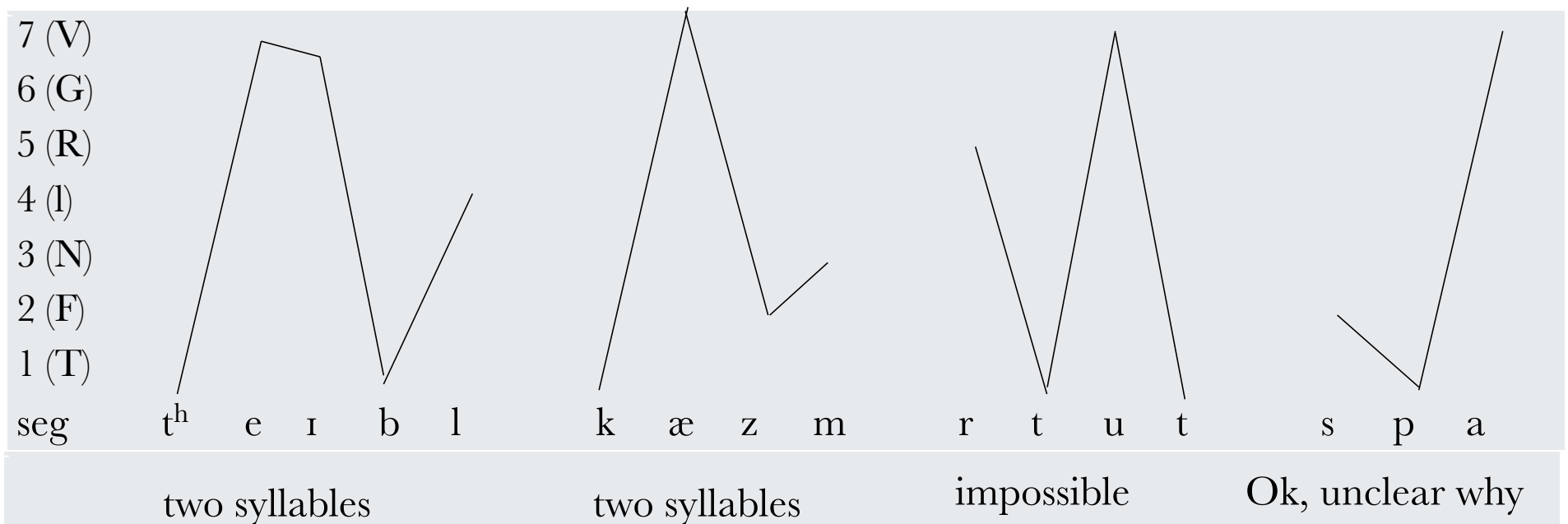
Below, the sonority peak is the same as the Nucleus of each syllable



Sonority peak

A segment that is more sonorous than any adjacent segment

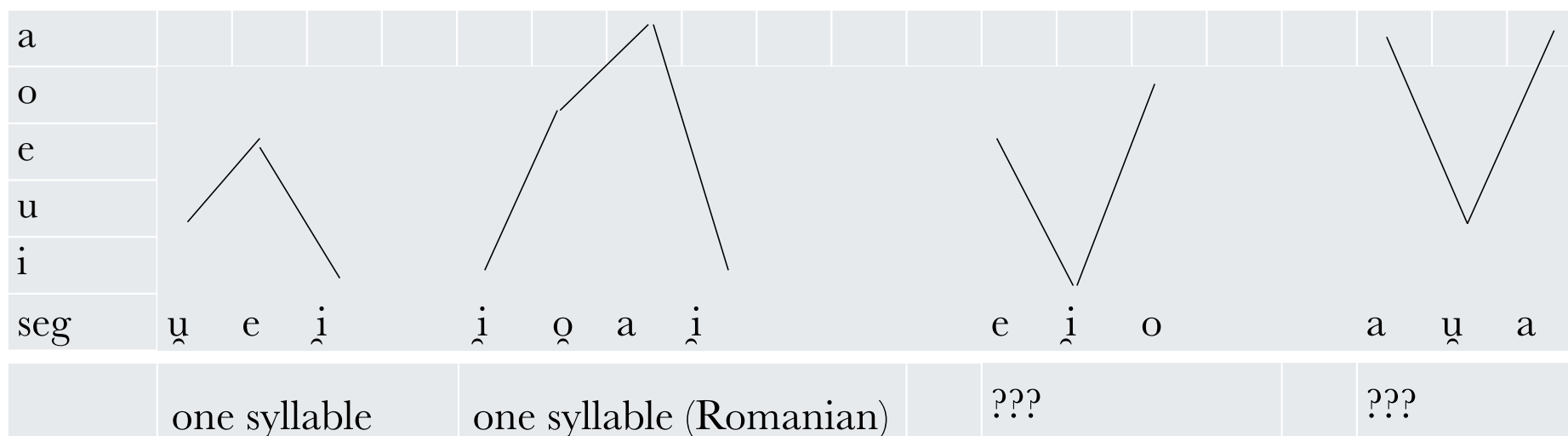
Below, each string contains two peaks. Most aren't possible sylls.



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

Sonority peak effects in 3-4V diphthongs

Recall, 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.

Sonority effects on syllable composition

- (a) Sonority Sequencing: syllables prefer to have a single sonority peak.
- (b) Optimal sonority levels for nucleus (high) and onset/coda (low).
- (c) Composition of complex onsets

Sonority Sequencing Constraints (SSC)

- a. There is only one sonority peak per syllable. One * for each extra peak.
e.g. *t^heɪbl, *k^hæzm (* if said as 1σ)
- b. The peak is in the nucleus.
e.g. *jɪ, *kɪr

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*[ɪ]-*rhyth*[ɪ]ic, *cyc*[ɪ]-*cyc*[ɪ]ic) and conjectured they are caused by the SSC]

SSC explains σ count:

SSC vs. *Ç in systems with undominated MAX / DEP

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

UR /rĩðm/	SSC (a)	*Ç	UR /film/	SSC (a)	*Ç
rĩðm	*!		ɹ̥film		
ɹ̥ rĩðm		*	film		*!

UR /rĩðm-ɪk/	SSC (a)	*Ç
ɹ̥ rĩðmɪk		
rĩðmɪk	*!	

The SSC is violable

Violated when Ç, MAX, DEP >> SSC

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

UR /ritm/	*Ç	SSC (a)	UR /film/	*Ç	SSC (a)
↗ ritm		*	↗ film		
ritm̩	*!		film̩	*!	

SSC explains aspects of σ division

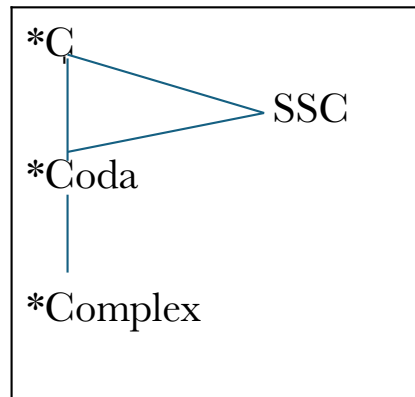
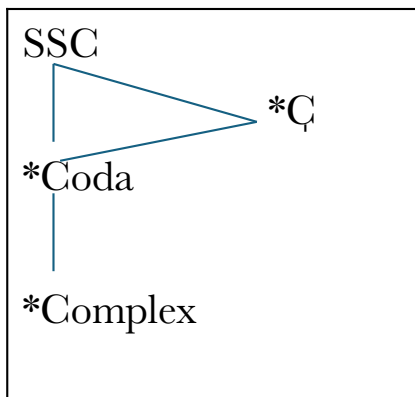
- *algebra* (3σ) in English: the SSC replaces some uses of *Bad Onset

UR /algebra/	SSC	*Ç	*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	*Ç	*Coda	*Complex
☞ al.ge.bra			*	*
a.l.ge.bra	*!			
a.l.ge.bra		*!		
al.geb.ra			**!	



Questions about correspondence

FAQ 1

Candidate (b) lost the [-voice] feature by losing /k/
Isn't this a violation of Ident [$\pm$ voice]?

We use MAX (no deletion), DEP (no insertion), IDENT F (no F change) constraints.
Is IDENT F violated if a UR segment *deletes*? Example:

/pækz/		*TD#	MAX	IDENT $\pm$ VOICE
a.	pækz	*!		
b.	pæk		*! (z- $\emptyset$)	? 
 c.	pæks			*

Answer: No, not given the definition of Ident.

IDENT $\pm$ F: one * for every UR-SR pair of *correspondent* segs, x-x',
iff x is [α F] and x' is [- α F]

FAQ 2

But *why* is Ident defined in terms of correspondent segments?

WHY NOT THIS:

IDENT α F: one * for every UR [α F] feature that is not present in SR

Because we want to also describe processes in which a segment deletes rather than change some of its features. That corresponds to IDENT F $\gg$ MAX.

/ae/		*VV	IDENT +LOW = UR [+LOW] NOT IN SR	MAX
a.	ae	*!		
!  b.	je		* (a-j)	
 c.	e		* (a-Ø)	*! (a-Ø)

Candidate c is harmonically
bounded by b

If losing segment violates IDENT, **in addition** to MAX, analysis becomes more complex.

FAQ 3

Q: How do I know that [s] in *packs* is the correspondent of /z/?
What guarantees that?

A: Phonological representations include record of correspondence relations

/p ¹ a ² k ³ z ⁴ /		*TD#	MAX	IDENT VOICE
a.	p ¹ a ² k ³ z ⁴	*!		
b.	p ¹ a ² z ⁴		*! (k ³ -Ø)	
c.	p ¹ a ² k ³ s ⁴			(*z ⁴ -s ⁴)

Co-superscripts indicate correspondence.

s⁴ = the SR correspondent of UR z⁴.

FAQ 4

Q: What mechanism assigns the co-superscripts?

Conjecture: They're randomly assigned.

F violations render all but a few of the random assignments unviable.

Random assignments of correspondence

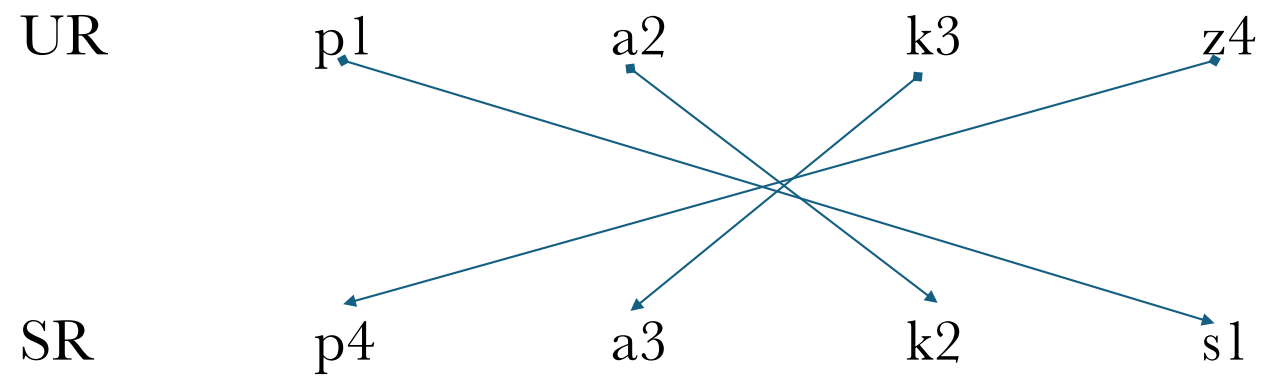
/p ¹ a ² k ³ z ⁴ /		MAX	ID ±F ≠voice	LINEARITY	DEP	ID ±VOICE
a.	p ¹ a ² k ³ s ⁴					* (s ⁴ -z ⁴)
b.	p ⁴ a ³ k ² s ¹		n* (p ⁴ -z ⁴) q* (a ³ -k ³)	6*		* (p ⁴ -z ⁴) 2* (a ³ -k ³ , k ² -a ²)
c.	p ¹ a ² k ³ s ⁵	*(z ⁴)			*(s ⁵)	
d.	p ¹ a ² k ³	*(z ⁴)				

Candidate (b) has a superset of (a)'s violations. It is harmonically bounded by (a).

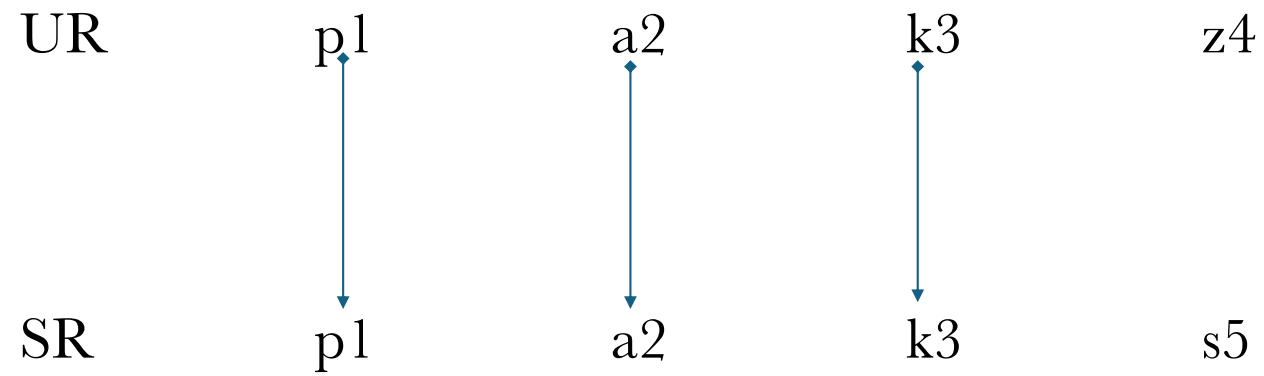
Candidate (c) has a superset of (d)'s violations, because /z/ drops and an unrelated [s] appears.

Candidate (c) is harmonically bounded by (d)

Candidate b



Candidate c



Upshot

- Random assignments of correspondence are probably harmless.
- Correspondent pairs unmotivated by M are harmonically bounded by (more) faithful ones.
- Rule of thumb: unless there's a M reason to think otherwise, assume that the UR-SR correspondent pairs are
 - (a) the most similar pairs segments, and/or
 - (b) those pairs whose members have identical precedence relations (=identical positions in the sequence of segments)

FAQ 5

Q: What about the candidate (d) where *s doesn't* correspond to *z*?

/pakz ⁴ /		*TD#	MAX	DEP	IDENT VOICE
a.	pakz ⁴	*!			
b.	pak		*! (z ⁴ -Ø)		
c.	paks ⁴				*
d.	paks ⁵		*! (z ⁴ -Ø)	* (Ø-s ⁵)	

A: It violates DEP, in addition to MAX; it's harmonically bounded by (b)

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