

The formal and the functional in onset sonority constraints

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0. Introduction

Two views of phonology:

- Phonology is **functionally grounded** (Archangeli & Pulleyblank 1994)
- Phonology is an **abstract/formal/symbolic system**

Are these views incompatible? ▶ ▶ ▶ **No**, not inherently.

This talk presents an analysis of **liquid-specific onset prohibitions** in which functional grounding and formal structure are crucially **interrelated**: onset sonority constraints are **functionally grounded**, but defined with respect to **formal properties** of syllable structure.

For recent discussion of phonology as a functionally grounded but formal system, see also: Archangeli & Pulleyblank 1994, Hayes 1999, Smith 2002, Bermúdez-Otero & Börjars 2002.

(1) Overview of the argument:

- ▶ Onset sonority constraints distinguish between
 - **true onset glides** — pre-peak glides that are dominated by σ
 - **nuclear onglides** — pre-peak glides that are dominated by μ
(a distinction for which there is independent support)
- ▶ This solves a problem with typological predictions that would otherwise force us to abandon a functionally grounded approach to onset sonority effects

1. Background: Avoiding high-sonority onsets

(2) Cross-linguistically, **low-sonority onsets are preferred**

Examples:

- Sanskrit reduplication (Steriade 1982, 1988; McCarthy & Prince 1986)
- Child language (Gnanadesikan 1995; Barlow 1997)
- Pirahã may be an interesting case: The language has no codas, so all Cs are onsets. There are no sonorant consonant phonemes. (Everett & Everett 1984ab; Everett 1988)

(3) There is a **functional motivation** for this preference

- The auditory system is particularly sensitive to rapid changes in spectral patterns (Stevens 1989; Ohala 1992; Delgutte 1997; Warner 1998)
- A low-sonority onset is more distinct from the syllable nucleus than a high-sonority onset is (Delgutte 1997)

(4) Modeling this preference in terms of constraints

(a) The *MARGIN/X subhierarchy (Prince & Smolensky 1993)

- One constraint for each level of the sonority hierarchy
- A universally fixed ranking determined by the sonority scale: the constraint with the *most sonorous* margin is *highest ranked* (cf. Prince 2001, de Lacy 2002 for an alternative approach to linguistic scales)

(b) An amendment: ONSET, not MARGIN

- Codas: often *high* in sonority (Hooper 1976, Zec 1988, Clements 1990)
- Onset sonority and coda sonority should be treated separately

(5) The *ONSET/X subhierarchy assumed here

*ONS/GLIDE >> *ONS/RHOTIC >> *ONS/LATERAL >> *ONS/NASAL >>
*ONS/VOICEDOBST >> *ONS/VCLS0BST

- The sonority distinction between rhotics and laterals is important below. For more evidence see, e.g., Espy-Wilson (1992), Devine & Stephens (1994), Zec (1995).
- The sonority scale arguably includes further distinctions, including vowel height and continuancy in obstruents (e.g., Dell & Elmedlaoui 1985, 1988). These additional distinctions are not relevant for the languages discussed below, so they are set aside here.

(6) Because the *ONSET/X subhierarchy is based on the sonority scale and related to the perceptual preference for alternating sonority in the speech stream, it is **functionally grounded**

(7) How are *ONSET/X constraints formulated?

This is the main point of §3. (What is an "onset"?)
For now, we can work with an informal version:
"Onsets do not have sonority level X."

2. The question: How to handle liquid-specific onset prohibitions?

(8) Typological predictions of *ONSET/X

- (a) The constraints in the subhierarchy are in a fixed ranking
- (b) If one *ONSET/X constraint is ranked high enough to be active in a language, so is any higher-ranked *ONSET/X constraint
- (c) Consequence: A ban on onsets with a certain sonority level **implies a ban on all onsets with higher sonority**

(9) Example: (♦ DEP 'No epenthesis'; McCarthy & Prince 1995)
 *ONS/GLI >> *ONS/RHO >> **DEP** >> *ONS/LAT >> *ONS/NAS >> ...
 ▶ If rhotic onsets are avoided through epenthesis, glide onsets are too

A. A well-behaved case: Rhotic ban and glide ban

▶ The Sestu dialect of Campidanian Sardinian (Bolognesi 1998)

(10) Sestu has a ban on word-initial **rhotic and glide onsets**

- (a) Expected [r]-initial words (Bolognesi 1998:42)
- | | | | | | |
|--------|---------|-----------------------|---------|---------------|------------------------|
| arɔza | 'rose' | < Latin <i>rosa</i> | arɪu | 'river/creek' | < Latin <i>rivus</i> |
| arɔana | 'frog' | < Latin <i>rana</i> | arɪkɪu | 'rich' | < Italian <i>ricco</i> |
| arɔβɪu | 'red' | < Latin <i>rubeum</i> | arɔaɔɪu | 'radio' | < Italian <i>radio</i> |
| arɔɔða | 'wheel' | < Latin <i>rota</i> | | | |

- (b) Expected [j]-initial words (Bolognesi 1998:44)
- | | | | |
|-------------------|---------------|-----------------------------------|---|
| <i>Sestu form</i> | | <i>Other Campidanian dialects</i> | |
| ajaju | 'grandfather' | jaju | (including <i>Iglesias</i> ; see below) |
| ajaja | 'grandmother' | jaja | |
| dɔu | 'yoke' | juu | |

- (c) Initial laterals, nasals, obstruents occur (Bolognesi 1998:30, 41, 43-4)
- | | | | |
|-------|---------|---------|----------|
| luɔi | 'light' | nazu | 'nose' |
| ledɔu | 'ugly' | femina | 'woman' |
| latɪ | 'milk' | bia | 'road' |
| luɔu | 'mud' | konilɪu | 'rabbit' |

(11) For this pattern, we need a version of *ONSET/X that is positionally relativized to the initial syllable (σ₁): [*ONSET/X]/σ₁
 (see Smith 2002 for a general theory of markedness constraints relativized to phonologically prominent positions)

(12) Relevant **ranking** for Sestu — like (9) above

[*ONS/GLI]/σ₁ >> [*ONS/RHO]/σ₁ >> **DEP** >> [*ONS/LAT]/σ₁ >>

[*ONS/NAS]/σ₁ >> [*ONS/VOIOBST]/σ₁ >> [*ONS/VCLSOST]/σ₁

(ONSET 'Syllables have onsets' must also rank below [*ONS/GLI]/σ₁ and [*ONS/RHO]/σ₁. Otherwise, the creation of an onsetless syllable by epenthesis would be blocked.)

(13) Sestu examples

(i) Initial glide onsets avoided: [ajaju] 'grandfather'

/jaju/	[*ONS/GLI]/σ ₁	[*ONS/RHO]/σ ₁	DEP	[*ONS/LAT]/σ ₁
a. jaju	*!			
ɔ b. ajaju			*	

(ii) Initial rhotic onsets avoided: [arɔða] 'wheel'

/rɔða/	[*ONS/GLI]/σ ₁	[*ONS/RHO]/σ ₁	DEP	[*ONS/LAT]/σ ₁
a. rɔða		*!		
ɔ b. arɔða			*	

(iii) Initial [l] permitted: [luɔi] 'light'

/luɔi/	[*ONS/GLI]/σ ₁	[*ONS/RHO]/σ ₁	DEP	[*ONS/LAT]/σ ₁
ɔ a. luɔi				*
b. aluɔi			*!	

• Compatible with predictions in (8): **Rhotic ban entails glide ban**

B. Some not so well-behaved cases: Rhotic~liquid ban without glide ban

(14) Some languages ban rhotic or liquid onsets *but not glide onsets*

(a) **Liquid onsets** banned in **all syllables**

- Seoul Korean (except recent loans; Kim-Renaud 1986; H.M. Sohn 1994:440)
 NB. Ambisyllabic liquids, which are not exclusively onsets, are permitted.

(b) **Liquid onsets** banned in **initial syllables**

- Mongolian (Poppe 1970, Ramsey 1987)
- Kuman (Papuan; Trefry 1969, Lynch 1983, Blevins 1994)
- Guugu Yimidhirr, Pitta-Pitta (Australian; Dixon 1980)

(c) **Rhotic onsets** banned in **initial syllables**

- the Iglesias dialect of Campidanian Sardinian (Bolognesi 1998)
- Mbabaram (Australian; Dixon 1991)

(15) This appears to **violate the typological predictions** of *ONSET/X

► Iglesias Campidanian: [ar:ɔða] 'wheel', but [jaju] 'grandfather'

(i) Allowing [j] onsets should make [r] onsets possible

/jaju/	DEP	[*ONS/GLI]/σ ₁	[*ONS/RHO]/σ ₁	[*ONS/LAT]/σ ₁
☞ a. jaju		*		
b. ajaju	*!			

/rɔða/	DEP	[*ONS/GLI]/σ ₁	[*ONS/RHO]/σ ₁	[*ONS/LAT]/σ ₁
✗ a. rɔða			*	
☞ b. ar:ɔða	*!			

(ii) Banning [r] onsets should make [j] onsets impossible (=Sestu)

/rɔða/	[*ONS/GLI]/σ ₁	[*ONS/RHO]/σ ₁	DEP	[*ONS/LAT]/σ ₁
a. rɔða		*!		
☞ b. ar:ɔða			*	

/jaju/	[*ONS/GLI]/σ ₁	[*ONS/RHO]/σ ₁	DEP	[*ONS/LAT]/σ ₁
☞ a. jaju	*!			
✗ b. ajaju			*	

(16) How can we account for liquid-specific onset prohibitions?

(a) Allow the *ONSET/X constraints to be **freely ranked** in any order?

E.g., for Iglesias: [*ONS/RHO]/σ₁ >> DEP >> [*ONS/GLI]/σ₁

► **No** — we lose the relationship between this constraint subhierarchy and the perceptual preference for low-sonority onsets

(b) Propose a **new constraint** that simply bans liquid onsets?

► **No** — such a constraint has no obvious functional motivation

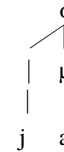
• It is true that there is a cross-linguistic preference for *some kinds* of liquids, such as taps, flaps, and trills, to be postvocalic. But crucially, liquid-specific onset bans may extend to approximant liquids as well, such as [l]. Another example: Mbabaram bans even [r] from σ₁ onsets. This liquid is realized as "a tap, a trill, **or a rhotic continuant**" (Dixon 1991:356, emphasis added).

► Both of these strategies **lose the advantage of functional grounding** inherent in the fixed-ranking *ONSET/X subhierarchy.

3. Proposal: *ONSET/X constraints are sensitive to moraic structure

(17) Possible structures for a syllable-initial glide

(a) **True onset glide**



(b) **Nuclear onglide**



(most cases)

(when heavy)

(18) Languages that motivate this structural distinction

- *French* (Kaye & Lowenstamm 1984, Rialland 1994): glides in "native" words are either true onsets or nuclear onglides, depending on the following vowel; glides in recent loanwords are true onsets
- *Spanish* (Harris 1983, Hualde 1989, Harris & Kaisse 1999): glides are true onsets when no other onset consonant is available; otherwise, they are nuclear onglides
- *Slovak* (Rubach 1998, Harris & Kaisse 1999): like Spanish
- *English* (Davis & Hammond 1995): [w] is a true onset; [j] is like Spanish

(19) Define *ONSET/X constraints to evaluate **only non-moraic segments**

- They now apply to true onset glides, but not to nuclear onglides
- **Consequence:** *ONSET/X constraints now refer to moraic structure, a **comparatively abstract phonological representation** (as opposed to something like "the leftmost consonantal segment of a syllable")
- **Advantage:** The constraints responsible for the liquid-specific onset prohibitions **remain functionally grounded** in the sonority hierarchy

(20) **New definition of *ONSET/X constraints**

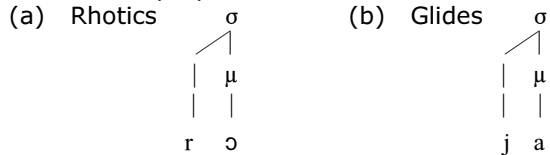
- ❖ *ONSET/X 'The leftmost pre-peak **non-moraic** segment in a syllable does not have sonority level X'

4. Liquid-specific onset prohibitions and the modified *ONSET/X

A. How the modification works: Sestu vs. Iglesias Campidanian Sardinian

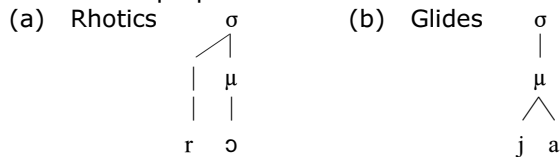
(21) **Sestu:** Rhotics and glides both prohibited

► Structural proposal: **Glide "onsets" are true onsets**



(22) **Iglesias:** Rhotics are prohibited, but glides appear

► Structural proposal: **Glide "onsets" are nuclear onglides**



(23) **Consequences** of (22) for the analysis of Iglesias (and similar cases):

- The presence of glide "onsets" in this dialect does not entail that *ONSET/GLI is violated, because the glides are nuclear onglides
- Iglesias is now **compatible with the typological prediction:** satisfaction of *ONSET/RHO implies satisfaction of *ONSET/GLI

(a) The ban on [r] onsets motivates [*ONS/RHO]/ σ_1 >> DEP

/rɔða/	[*ONS/GLI]/ σ_1	[*ONS/RHO]/ σ_1	DEP	[*ONS/LAT]/ σ_1
a. rɔða		*!		
b. ɹr:ɔða			*	

(b) Syllabifying [j] as a nuclear onglide satisfies [*ONS/GLI]/ σ_1 Notation: {X} = nucleus

/jaju/	[*ONS/GLI]/ σ_1	[*ONS/RHO]/ σ_1	DEP	[*ONS/LAT]/ σ_1
a. {ja}ju	✓			
b. ɹjaju			*!	

- No "new" constraint is needed for liquid-specific onset prohibitions
- The functionally grounded explanation based on *ONSET/X (and thus on the sonority hierarchy) can be maintained

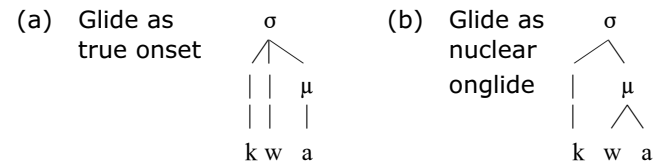
B. Supporting evidence for the Sestu/Iglesias structural distinction

(24) **Question:** Is there any evidence that Sestu and Iglesias use different syllabification strategies for "onset" glides?

- **Yes**, because they treat glides differently in another context as well: Iglesias allows **rising diphthongs (CGV)**, but Sestu does not

"Rising diphthongs...are normally prohibited in Sestu... [T]he 'Standard' Campidanian word 'kwaɖu ('horse') is realized as ku'ɑɖu in the Sestu dialect: /u/ is short and unstressed, but distinctly longer than the corresponding glide." (Bolognesi 1998:24)

(25) CGV syllables — Possible structures



(26) **Iglesias:** Allows [CGV...] σ ► Must allow (25a) and/or (25b)
Sestu: No [CGV...] σ ► Must ban both (25a) and (25b)

- Confirmation that Sestu bans nuclear onglides
- Evidence compatible with the use of nuclear onglides in Iglesias

(27) Microvariation in Campidanian Sardinian

Sestu	Iglesias
1. Bans rhotic onsets in σ_1 and bans glide onsets in σ_1	2. Bans rhotic onsets in σ_1 but glides appear
3. Bans [C{GV}...] syllables	4. Allows [CGV...] syllables
► Both 1. and 3. are predicted if glides are true onsets	► Both 2. and 4. are predicted if glides are nuclear onglides

Note: Sestu allows complex onsets, as in [t̪ɔnu] 'thunder' (Bolognesi 1998:31).

Therefore, an additional explanation is needed for why a glide cannot be the second consonant in a CC onset, producing the structure [CG{V}]. However, this question is separate from the claim made here, which is that *if* the nuclear onglide structure {GV} is allowed, *then* the structure [C{GV}] should also be allowed.

C. Another example (?): Korean (Seoul and other South Korean dialects)

- (28) ▶ Liquid onsets banned in all syllables (Kim-Renaud 1986; H.M. Sohn 1994)
- Ambisyllabic liquids are exempt (NB. not "exclusively" onsets; dominated by μ from preceding σ ?)
 - ▶ Glide "onsets" allowed
 - ▶ Glides are independently claimed to be nuclear (H.S. Sohn 1987, Kim & Kim 1990; but cf. B.G. Lee 1982, Y. Lee 1994)

5. Concluding remarks

Liquid-specific onset prohibitions receive a **functionally grounded** account if the *ONSET/X constraint subhierarchy is defined with reference to **formal** distinctions in syllable-internal phonological structure.

Implications:

- Although the ranked and violable constraints of OT sometimes allow us to simplify our assumptions about formal phonological structure, there is still a role for formal structure to play in our understanding of sound patterns in language
- A functionally grounded constraint is not necessarily one that is created directly from functional considerations. Instead, it can (must?) be a formally defined constraint that **is compatible with** functionally determined criteria (see "Inductive Grounding", Hayes 1999)

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