

Can representational complexity give us simpler constraints?

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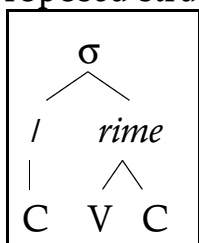
0. Introduction and background

- (1) What motivates phonologists to include complex representations in a formal model?
—> Evidence that representational complexity is needed to explain certain phonological patterns
- (2) In general, it is desirable to avoid unnecessary complexity in representations
 - From an OT perspective, to reduce representational complexity is **to restrict the parameter space for GEN**
- (3) Working in OT often allows for simplification of phonological representations
 - (a) Phenomena that require an intricate hierarchical representation in other frameworks can be recast in OT as the result of
 - **simpler representations**, interacting with
 - **violable constraints** — which are sometimes incompletely satisfied
 - (b) Incomplete satisfaction/minimal violation can cause complex patterns that, without violable constraints, have led to proposals for complex representations
- (4) Examples
 - (a) Tagalog infixation (McCarthy and Prince 1993b)
 - Location of infixation in Tagalog /um + gradwet/ —> [gr-um-adwet]
 - Analysis: Best satisfies the constraint NOCODA
 - Representational simplification: No need to posit an "Onset" constituent; the apparently constituent-like behavior of the onset consonants [gr] falls out from the NOCODA analysis
 - (b) Feature geometry (Padgett 2002)
 - Proposal: Constraints that call for the spreading of a feature class (i.e., a node) are not all-or-nothing, but can be only partially satisfied in cases where the demands of a higher-ranked conflicting constraint are at stake
 - Representational simplification: Again, not all apparent constituent-like behavior needs to come from an actual constituent in the representation; the hierarchical structure of feature geometry can be simplified
- (5) General context of this talk
 - **What kinds of syllable structure can GEN produce?**

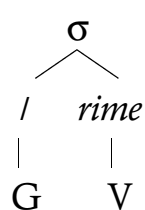
- (6) Why this is an interesting question
- (a) Do we need restrictions on GEN to account for universal facts about syllable structure? Some syllable-related universals are derivable from the constraint set via the predictions of factorial typology, but some are not
 - Universal preference for V.CV over VC.V — predicted by factorial typology (McCarthy & Prince 1993b)
 - Syllabification is never contrastive — not predicted by factorial typology (is this a restriction on GEN, or on the constraint set CON?)
 - (b) Much of the evidence in favor of various claims about syllable structure comes from research in work that did not assume violable constraints — so, is the structural complexity still motivated under OT?
- (7) Specific focus of this talk
- Do we need to distinguish two structural positions for "onset" glides?
 - (a) Pre-OT analyses have motivated this distinction
 - (b) In fact, maintaining this amount of structural complexity under OT has a positive result
 - It allows for an analysis of onset-related sonority patterns based on phonetically motivated constraints, a result that is not possible if all "onset" glides are taken to have the same structure
- (8) Outline
- §1 GEN and subsyllabic structure: Where are glides in the syllable?
 - §2 Pre-OT evidence for distinguishing two types of "onset" glides
 - §3 Complex representations, simpler constraint system
 - §4 Some further implications for syllable structure and freedom of analysis

1. GEN and subsyllabic structure

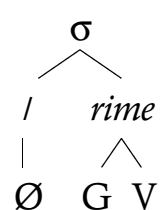
- (9) What are the possible prosodic structures for a phonetic string of the form [GV]?
 —> Depends on the model of syllable structure assumed — is there a structural distinction between onset and rime?
- (10) Proposed structure: Onset/rime distinction; different structural options for glides



(a) True onset glide



(b) Rimal onglide



- (11) Consequences for the grammar if onset glides and rimal onglides are distinguished
- (a) GEN must structurally distinguish rime and non-rime segments — examples:
 - there could be a Rime constituent
 - rime segments could be indirectly identified by their association to a mora
 - (b) GEN must have the option of placing pre-peak glides in either position
 - (c) At least some of the constraints in CON must be sensitive to the difference between rime and non-rime segments, or this structural difference would have no phonological consequences
 - (d) Comments and implications:
 - Requires a fair amount of abstract, non-surface-based structure
 - Is this like the "Onset" constituent, or complex feature geometry — can we eliminate this structural complexity with an OT approach?
 - > Claim: On the contrary, maintaining this amount of structural complexity leads to a more insightful constraint-based analysis of onset sonority restrictions
 - Can segments other than glides fill the rimal-onglide position? (§4)
- (12) Notation: {Brackets} enclose the syllable rime
- (a) True onset glide CG{V}
 - (b) Rimal onglide C{GV}

2. Pre-OT evidence for distinguishing two types of "onset" glides

2.1 Syllable weight in Spanish: G in CGV is a rimal onglide; G in .GV is not rimal

- (13) Pattern: A pre-peak glide contributes to syllable weight, unless there is no other consonant available to be parsed as a true onset
(Harris & Kaisse 1999; see also Harris 1983, Hualde 1989)

Interpretation: G in CGV is syllabified in the rime — C{GV}
G in .GV is an onset — G{V}

- (14) Stress assignment shows that CGV is heavy, GV is not
- (a) Spanish nouns and adjectives can have antepenultimate stress
 - (b) But: antepenultimate stress is impossible if penult or ultima is heavy

- (c) In all dialects of Spanish, antepenultimate stress is also impossible if penult or ultima is CGV (Harris & Kaisse 1999:149)

- (i) Final .CGV.

<i>cal.ví</i> . [sje]	'baldness'	<i>but</i> * 'CVX.CV.CGV#
<i>au.dá</i> . [sja]	'audacity'	
<i>ne.gó</i> . [sjo]	'business'	

- (ii) Penultimate .CGV.

<i>tra</i> . [βjé].so	'mischievous'	<i>but</i> * 'CVX.CGV.CV#
<i>me</i> . [ðjó].cre	'mediocre'	
<i>a</i> . [sjá].go	'ominous'	

- (d) However, GV in penult or ultima allows antepenultimate stress (Harris & Kaisse 1999: 148)

<i>o.no.ma.to.pé</i> . [ji].co	'onomatopoeic'
<i>Plé</i> . [ja].des	'Pleiades'
<i>Sá</i> . [ja].go	(surname)

• Syllable-initial glides are subject to fortition in many dialects of Spanish; see below

—> **CGV syllables behave like heavy syllables; GV syllables do not**

- (15) Syllable-template restrictions show that CGV is heavy, GV is not (Harris & Kaisse 1999: 126)

- (a) CGV can include at most one more rime segment

CGVG	[bwej]	'ox'
CGVC	[bjen]	'well'
CGVs	[pwes]	'because, then'

• Not possible: *CGVCs, *CGVGs

- (b) Compare CRV (R=liquid): allows two more rime segments

CRVGs	[klaws].tro	'cloister'
CRVCs	[trans].formar	'to transform'

Note: CR + G + V is like CGV — allows one more rime segment

CRGVC	pu.[drjen].do	'rotting'
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• Not possible: *CRGVGs, *CRGVCs

- (c) Unlike CGV, a .GV syllable can include two more rime segments

GVCS	[juks].taponer	'to juxtapose'
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—> **Pre-peak G adds to rime weight limit only when preceded by C**

• What this shows:

(16) G in CGV (actually, C*GV) is **in the syllable rime**

Argument: (i) G in CGV contributes to weight

(ii) Standard assumption: Weight-bearing elements are in the rime

(17) On the other hand, G in .GV does not contribute to weight

NB: Not all rime elements necessarily contribute to weight

- Light diphthongs; non-moraic codas

Implication: None, yet. G may or may not be in rime...

(18) .GV and fortition (Harris 1983; Harris & Kaisse 1999)

(a) In many dialects of Spanish, when there is no preceding C,

- syllable-initial /j/ may be realized as something like [ʒ] or [j̥]
- syllable-initial /w/ may be realized as something like [g^w]

Examples from Argentinian Spanish; Harris & Kaisse (1999: 118)

(i) Stem [j~ʒ]: *U.ru.[gwáj]* ~ *U.ru.[gwá.ʒo]* 'Uruguay', 'Uruguayan'
[léj] ~ *[lé.ʒes]* 'law', 'laws'

(ii) Affix [j~ʒ]: *cre.[s+jén]do* ~ *cre.+[ʒén]do* 'growing', 'believing'
cre.[s+jó] ~ *cre.+[ʒó]* 'grew-3sg', 'believed-3sg'

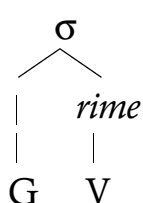
(b) This is an example of fortition, or **sonority reduction**

- unexpected in a segment belonging to the rime — nuclei, codas favor high sonority (Zec 1988; Clements 1990)
- but the preference for low-sonority onsets is quite well established (see §3.1)
- formally, glide hardening can be seen as a response to (general) *ONSET/GLIDE

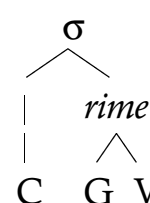
(c) Implication: G in GV is a **true onset glide**

(19) Spanish C{GV} vs. G{V} structural distinction means that both kinds of glide structures must be available as part of UG

(a) True onset glide



(b) Rimal onglide



2.2 Other proposals that distinguish G{V} and {GV} structures

(20) Slovak: Rubach (1998) argues for C{GV}, but G{V} as in Spanish

- (21) French: Different phonotactics for different glides
(Milner 1973; Clements & Keyser 1983; Kaye & Lowenstamm 1984; Rialland 1994)
- (a) Certain GV combinations ([wa, qi, wɛ]) have the phonotactics of vowels, while others have the phonotactics of CV sequences
 - (b) GV sequences in non-nativized loanwords consistently act like CV sequences
 - (c) Structural interpretation: Kaye & Lowenstamm (1984)
 - The glide in words like *whisky* is a true onset → patterns with #C
 - The glide in words like *oiseau* is part of a complex nucleus — what has been termed here a rimal onglide → patterns with #V
- (22) American English: Different structures for [j] and [w] (Davis & Hammond 1995)
- (a) Pattern:
 - V is nearly unrestricted in [jV], [wV], and [CwV]
 - V must be [u] in [CjV]
 - (b) Proposal:
 - [j] is a rimal onglide when a preceding tautosyllabic consonant is present (like glides in Spanish and Slovak)
 - syllable-initial [j] is a true onset; [w] is a true onset in [(C)wV]
- (23) **Summary:** We have seen that a structural distinction between true onset glides and rimal onglides has been motivated, at least under non-OT assumptions
- (24) **Next step:** The following section now argues for
- allowing GEN to make this structural distinction in output candidates
 - allowing constraints to be defined so as to respect this structural difference
- > Doing this allows for a **functionally grounded account of onset restrictions** to be maintained

3. Complex representations, simpler constraint system

3.1 Background: Avoiding high-sonority onsets

- (25) Cross-linguistically, **low-sonority onsets are preferred**
- Evidence from: Reduplication (Steriade 1982, 1988; McCarthy & Prince 1986)
Child language (Gnanadesikan 1995; Barlow 1997)
- (26) There is a **functional motivation** for this preference (see also Gordon 2003)
- (a) The auditory system is sensitive to rapid changes in spectral patterns (Stevens 1989; Ohala 1992; Delgutte 1997; Warner 1998; Wright 2004)
 - (b) A low-sonority onset is more distinct from the syllable nucleus than a high-sonority onset is (Delgutte 1997; Wright 2004)

(27) Modeling this preference in terms of constraints

- (a) The *ONSET/X constraint family
 - One constraint for each level of the sonority hierarchy
 - A universally fixed ranking determined by the sonority scale: the constraint against the *most sonorous* onset is *highest ranked* (see Prince 2001, de Lacy 2002 for another approach to linguistic scales)
- (b) Why ONSET, not MARGIN (as originally proposed; Prince & Smolensky 1993)
 - Codas: often *high* in sonority (Hooper 1976, Zec 1988, Clements 1990)
 - Onset sonority and coda sonority should be addressed separately

(28) The *ONSET/X **constraint family** assumed here

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

- The sonority distinction between rhotics and laterals is important below; for more evidence see 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) — not relevant for the languages discussed below, so these distinctions are set aside here (See Parker 2002, Wright 2004 for recent discussion and experimentation related to the sonority scale)

(29) 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**

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

Provisional, informal version: "**Onsets do not have sonority level X.**"

- See §3.3 below for further discussion (re: what is an "onset" here?)

3.2 The question: How to handle *liquid-specific* onset prohibitions?

(31) 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**

(32) Example:

*ONS/GLI >> *ONS/RHO >> **DEP** >> *ONS/LAT >> *ONS/NAS >> ...

(DEP = 'No epenthesis'; McCarthy & Prince 1995)

- If rhotic onsets are avoided through epenthesis, glide onsets are too

3.2.1. *Expected pattern: Rhotic ban implies glide ban*

• **Sestu dialect of Campidanian Sardinian** (Bolognesi 1998)

(33) Prohibition against word-initial **rhotic and glide onsets**

(a) Expected [r]-initial words (Bolognesi 1998:42)

[ar:ɔza]	'rose'	< Lat. <i>rosa</i>	[ar:ju]	'river/creek'	< Lat. <i>rivus</i>
[ar:ana]	'frog'	< Lat. <i>rana</i>	[ar:ik:u]	'rich'	< Ital. <i>ricco</i>
[ar:uβiu]	'red'	< Lat. <i>rubeum</i>	[ar:aðiu]	'radio'	< Ital. <i>radio</i>
[ar:ɔða]	'wheel'	< Lat. <i>rota</i>			

(b) Expected [j]-initial words (Bolognesi 1998:44)

<i>Sestu form</i>	<i>Other Campidanian dialects</i>
[ajaju]	'grandfather' [jaju]
[ajaja]	'grandmother' [jaja]

(c) Initial laterals, nasals, obstruents occur (Bolognesi 1998:30, 41, 43-4)

[luʒi]	'light'	[nazu]	'nose'
[ledʒu]	'ugly'	[femina]	'woman'
[lati]	'milk'	[bia]	'road'
[luðu]	'mud'	[konil:u]	'rabbit'

(34) Because this pattern is restricted to initial syllables (σ_1), we need a version of *ONSET/X that is positionally relativized: [*ONSET/X]/ σ_1

(See Smith 2002 for a general theory of markedness constraints relativized to phonologically prominent positions)

- Initial syllables often subject to fortition/more stringent sonority requirements

(35) Relevant **ranking** for Sestu — like (32) above

[*ONS/GLI]/ σ_1 >> [*ONS/RHO]/ σ_1 >> **DEP** >> [*ONS/LAT]/ σ_1 >>
[*ONS/NAS]/ σ_1 >> [*ONS/VOIOBST]/ σ_1 >> [*ONS/VCLSIOBST]/ σ_1

(ONSET 'Syllables have onsets' must also rank below [*ONS/GLI]/ σ_1 and [*ONS/RHO]/ σ_1 . Otherwise, the creation of an epenthetic #V. would be blocked.)

(36) Sestu examples

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

/jaju/	[*ONS/GLI]/σ1	[*ONS/RHO]/σ1	DEP	[*ONS/LAT]/σ1
i. jaju	*!			
ii. <u>a</u> jaju			*	

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

/rɔða/	[*ONS/GLI]/σ1	[*ONS/RHO]/σ1	DEP	[*ONS/LAT]/σ1
i. rɔða		*!		
ii. <u>a</u> rɔða			*	

(c) Initial [l] permitted: [luʒi] 'light'

/luʒi/	[*ONS/GLI]/σ1	[*ONS/RHO]/σ1	DEP	[*ONS/LAT]/σ1
i. luʒi				*
ii. <u>a</u> luʒi			*!	

- Compatible with predictions in (32): **Rhotic ban entails glide ban**

3.2.2 Unexpected pattern: Rhotic~liquid ban **without** glide ban(37) Some languages ban rhotic or liquid onsets *but not glide onsets*(a) **Rhotic onsets** banned in **initial** syllables

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

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

- Possible case is Seoul Korean (Kim-Renaud 1986; H.M. Sohn 1994:440)
Depends on whether certain medial liquids are ambisyllabic; if not, this is another initial-syllable example instead. Recent loanwords are exempt from the ban.

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

- Iglesias Campidanian: [a_r:ɔða] 'wheel', but [ja_ju] 'grandfather'

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

/ja _j u/	DEP	[*ONS/GLI]/σ1	[*ONS/RHO]/σ1	[*ONS/LAT]/σ1
☞ i. ja _j u		*		
ii. a _j aju	*!			

/rɔða/	DEP	[*ONS/GLI]/σ1	[*ONS/RHO]/σ1	[*ONS/LAT]/σ1
✗ i. rɔða			*	
(☞) ii. a _r :ɔða	*!			

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

/rɔða/	[*ONS/GLI]/σ1	[*ONS/RHO]/σ1	DEP	[*ONS/LAT]/σ1
i. rɔða		*!		
☞ ii. a _r :ɔða			*	

/ja _j u/	[*ONS/GLI]/σ1	[*ONS/RHO]/σ1	DEP	[*ONS/LAT]/σ1
(☞) i. ja _j u	*!			
✗ ii. a _j aju			*	

- How can we account for liquid-specific onset prohibitions?

(39) 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

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

- **No** — such a constraint has no obvious functional motivation —>

(a) Attempt #1: Liquids prefer to be post-V?

- 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, some of the liquid-specific onset bans in (37) extend to approximant liquids as well, such as [l]
- Mbabaram bans even [ɾ] from σ1 onsets. This liquid is realized as "a tap, a trill, *or a rhotic continuant*" (Dixon 1991:356, emphasis added)

- (b) Attempt #2: Glides would be avoided too, but some glide-specific faithfulness constraint intervenes?
- In Iglesias Campidanian, the initial-rhotic repair is **epenthesis**
 - This simply violates DEP, not a feature-related faithfulness constraint that might be able to distinguish between liquids/rhotics and glides
- (c) Further evidence that sonority is the relevant functional characteristic
- Flack (to appear) presents experimental evidence ruling out a "perceptibility"-based account of initial-liquid prohibitions in Australian languages, arguing for a sonority-based account instead
 - The languages listed in (37) above all have an implicational relationship that is compatible with the sonority scale: lateral bans imply rhotic bans
- (41) Both of these strategies...
- Reranking the *ONSET/X constraints
 - Proposing a new, non-grounded anti-liquid-onset constraint
- ...lose the advantage of functional grounding inherent in the fixed-ranking *ONSET/X subhierarchy

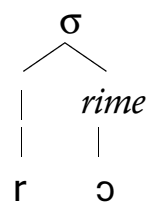
3.3 Liquid-specific onset prohibitions and rimal onglides

- (42) Proposal:
- Glides that "escape" sonority-based initial-onset restrictions are **rimal onglides**
 - Glides that are subject to these restrictions are **true onset glides**
- (43) Implementation:
- Define *ONSET/X constraints to evaluate **only non-rimal segments**
- **Consequence:** *ONSET/X constraints now refer to subsyllabic 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
- (44) **New formal definition for *ONSET/X constraints**
- *ONSET/X 'The leftmost **non-rimal** segment in a syllable does not have sonority level X'
- (one constraint for each sonority level X)

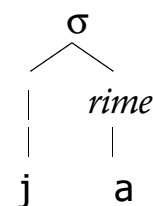
(45) **Sestu:** Rhotics and glides both prohibited

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

(a) Rhotics

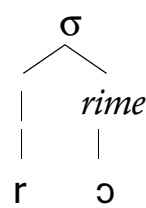


(b) Glides

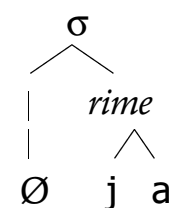
(46) **Iglesias:** Rhotics are prohibited, but glides appear

- Structural proposal: **Glide "onsets" are rimal onglides**

(a) Rhotics



(b) Glides

(47) **Consequences** of (46) for the analysis of Iglesias (and similar cases):

- The presence of syllable-initial glides in this dialect does not entail that *ONSET/GLI is violated, because the glides are rimal 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 [$*\text{ONS}/\text{RHO}$]/ $\sigma 1 \gg \text{DEP}$

/rɔða/	[$*\text{ONS}/\text{GLI}$]/ $\sigma 1$	[$*\text{ONS}/\text{RHO}$]/ $\sigma 1$	DEP	[$*\text{ONS}/\text{LAT}$]/ $\sigma 1$
i. rɔða		*!		
ii. ʔrɔða			*	

(b) Syllabifying [j] as rimal onglide satisfies [$*\text{ONS}/\text{GLI}$]/ $\sigma 1$ without violating DEP

/jaju/	[$*\text{ONS}/\text{GLI}$]/ $\sigma 1$	[$*\text{ONS}/\text{RHO}$]/ $\sigma 1$	DEP	[$*\text{ONS}/\text{LAT}$]/ $\sigma 1$
i. {ja}ju	✓		✓	
ii. j{a}ju	*!			
iii. ʔjaju			*!	

(c) Comments:

- 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

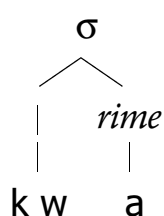
(48) **Supporting evidence** that Sestu and Iglesias syllabify "onset" glides differently

- They treat glides differently in another context as well: Iglesias allows **rising diphthongs** with an onset consonant (CGV), but Sestu does not

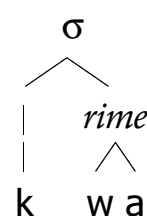
"Rising diphthongs...are normally prohibited in Sestu... [T]he 'Standard' Campidanian word 'kwaɖu' ('horse') is realized as ku'aɖu in the Sestu dialect: /u/ is short and unstressed, but distinctly longer than the corresponding glide."
(Bolognesi 1998:24)

(49) CGV syllables — Possible structures

- (a) Glide as
true onset



- (b) Glide as
rimal onglide



- (50) **Sestu:** No [CGV...]σ —> Must ban both (49a) and (49b)
Iglesias: Allows [CGV...]σ —> Must allow (49a) and/or (49b)

Sestu	Iglesias
1. Bans rhotic onsets in σ1 <i>and</i> bans glide onsets in σ1	2. Bans rhotic onsets in σ1 <i>but</i> 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 rimal onglides

- **Note:** Sestu allows complex onsets, as in [trɔnu] '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 rimal onglide structure {GV} is allowed, *then* the structure [C{GV}] should also be allowed.

4. Some further implications for syllable structure and freedom of analysis

(51) If we want to distinguish structurally between true onset glides and rimal onglides...

- What kinds of syllable structures must GEN be able to produce?
- Given the structures produced by GEN, what are the subsyllabic constituents that constraints can refer to, and how are they formally defined?
- What are the factorial-typological predictions of this system — is there a need for any further restrictions on GEN?

(52) On the formal representation of syllable structure

- (a) The claims in §§1-3 about having two structural positions for glides do not depend on the formal details of how the rime is represented
- (b) However, in order to explore the implications of freedom of analysis, it is essential to have an explicit representational proposal
 - For concreteness, the rest of this discussion assumes a version of moraic theory close to that in McCarthy & Prince (1988) and Hayes (1989), with additional assumptions about prosodic theory as in Selkirk (1978, 1995)
 - Other representational assumptions for syllable structure can and should be explored as well — which approach is empirically and conceptually best?

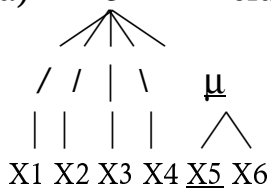
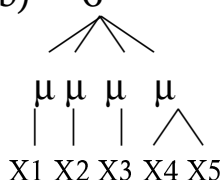
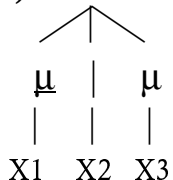
4.1 GEN and allowable syllable shapes

(53) Hypothesis: Restrictions on the syllable structures that GEN can assemble

- (a) A syllable node (σ) can dominate one or more moras (μ) and one or more segments (X)
- (b) μ can dominate one or more segments (for phonetic arguments for "mora-sharing," see Broselow, Chen, & Huffman 1997)
- (c) σ and μ are prosodic constituents and therefore have unique heads (heads are represented by underlining in diagrams where relevant)

(56) ...but structures like the following can be generated too (probably not attested)

- Note: These are structures that are problematic for *any* value of X. See below for problems specific to particular segment types.

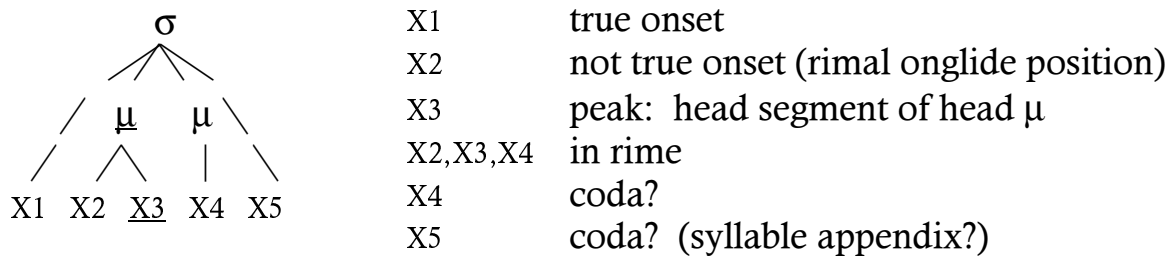
(a) σ clusters with many Xs 	Individual languages can rule this out with - sonority-distance constraints - perceptibility considerations But what about the general case? Is this an example of a gap in factorial typology with a diachronic explanation? (Myers 2003)
(b) σ with >3 μ 	There can't be a universal bimoraic limit, as superheavy syllables also attested. So why stop at 3 μ?
(c) Xs between moras 	What could possibly rule this out? Even if we recognize a rime constituent in addition to moraic structure, what would prevent X from intervening? A restriction on GEN that <i>Rime</i> node dominates only μ

4.2 GEN, CON, and subsyllabic structure

(57) Given the syllable-structure criteria for GEN specified in (53) above, what subsyllabic structures can be structurally defined/referred to by constraints?

- (a) **Peak:** The head segment of the head μ of σ is the peak of σ
- (b) **Rime:** Any segment dominated by μ is in the rime
 - Hypothesis: This includes segments that have other, non-moraic associations, and segments that are linked to μ but are not its head
- (c) **(True) onset:** Any pre-rime (and therefore non-moraic) segment is an **onset**
 - Corollary: The constraint ONSET is not actually looking for a true onset, but for the peak to be preceded by *some other segment* (Smith 2002, to appear)
- (d) **Coda:** Various possibilities; need to determine which is best supported
 - (i) Any ([+cons]?) segment aligned at the right edge of the syllable (McCarthy & Prince 1993a)
 - (ii) Any ([+cons]?) segment to the right of the peak
 - The [+cons] question: Syllable-final glides in Diola Fongny are subject to the Coda Condition (Itô 1986); see also Levi (2004) on glides that trigger vowel epenthesis when unsyllabifiable

(58) Example syllable

(59) There are no *universal* restrictions on what segment classes can be parsed as:

- (a) a syllable peak (Dell & Elmedlaoui 1985, 1988; Prince & Smolensky 1993)
 - (b) a weight-bearing coda (Hayes 1989, Zec 1988)
 - (c) an onset (possible exception of low vowel? see Rosenthal 1994 for discussion)
- Therefore, there can be no restrictions on what segments GEN can prosodify into these syllable positions

Note: there are *language-particular* restrictions on the segment classes that can fill these positions, but this can be accounted for with constraint rankings

(60) Freedom of analysis and rimal onglides

- (a) GEN has to allow for X in rimal onglide position — see X1 in (55d,e)
- (b) Can X in this position be [+cons]?
 - Rime sub-constituents (such as weight-bearing codas) and even syllable peaks can be [+cons] segments in many languages
 - This predicts that 'rimal onglides' can include consonants in some languages

(61) What might evidence for [+cons] segments in the rimal onglide position look like?

- (a) Languages where CV syllables are light, but CCV are heavy
 - Claimed not to exist
- (b) Languages where *ONSET/X constraints drive syllable-initial segments other than glides into the rimal-onglide position
 - Possible case? Davis, Manganaro, & Napoli (1987) show that Italian second-conjugation infinitive verbs treat an antepenult as heavy *if its onset is a sonorant*
- (c) Languages where *COMPLEXONSET drives the second member of a CC onset cluster into the rimal onglide position
 - Suppose the language also has restrictions on rime segments, allowing them only when high in sonority
 - Combined effect: a language with C1C2 "onset clusters" where C2 must be some high-sonority element, regardless of the sonority distance from C1
 - NB: This would be a beyond-glides counterpart to Spanish, where C1C2 "clusters" have no sonority-distance restrictions iff C2 is a glide (Baertsch 1998) — as expected, since a glide in C_V is a rimal onglide in Spanish

- (62) If [+cons] rimal onglides are universally avoided, do we need a restriction on GEN?
- A restriction on pre-peak rimal segments, that they must be [-cons]?
 - That doesn't seem right; intuitively, rimal onglides should be taken from the set of possible syllabic segments — and that set is determined by constraint interaction...

5. Conclusion

- (63) Empirical and OT-internal evidence support a model in which Gen and Con distinguish true onset glides from nuclear onglides
- (64) Complicating the representation with subsyllabic hierarchical structure, and recognizing two positions for glides, allows us to maintain grounded constraints for onset restrictions
- (65) Under freedom of analysis — based on the cross-linguistic space of possibilities for assigning segments to rimal positions in the syllable — we seem to predict consonants in the nuclear onglide position as well ... more investigation is needed

Acknowledgments

Comparison of the Sestu and Iglesias epenthesis patterns, and discussion of the usefulness of distinguishing true onset glides from rimal onglides, appear in Smith (2002, 2003). I am grateful to Patrik Bye for encouraging me to revisit this topic in connection with questions of freedom of analysis. Also, many thanks to Ian Clayton, Melissa Frazier, and Elliott Moreton for helpful comments and suggestions on this version of the project.

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