

Preliminaries to deriving syllable phenomena from parallel representations

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1.0 Introduction

1.1 Modular Phonology

- Modular phonology espouses separation of representation and computation
- “Simply put, if the representations are right, the [computation] will follow.” (McCarthy 1988:84)
- Strongest form of modular phonology has not been developed wrt syllables in phonology
- Two contemporary asymmetrical views:
 - Segment Primary: start with segments and derive syllable structure from computation (Kahn 1976, see Blevins 1995 for overview)
 - Syllable Primary: start with syllables and then license segmental string from computation (van der Hulst 2008)
- Main proposal here is to develop a parallel model of the syllable and segment

1.2 Segmental Phonology

- Model for segmental phonology is classic generative phonology (SPE, Goldsmith 1976, Sagey 1986) augmented with precedence information (Raimy 2000) and Toronto School of Contrast (Rice 1999a,b)
- Function of segmental phonology is to provide representations that support lexical access (Bromberger and Halle 2000, Poeppel, Idsardi and van Wassenhove 2007)

1.3 Syllabic Phonology

- No syllable specific model of phonology- all contemporary models interact directly with segmental features; not strongly modular
- Starting hypothesis should adopt the best (IMHO) features of segmental phonology:
 - abstract: surface form \neq memorized form
 - derivational: end form emerges from repeated simple computation
 - embodied: not completely substance free (Hale and Reiss 1999) but not completely substance driven (see Rice 2008 for discussion), analysis by synthesis
 - contrastive: only encode some differences (TSC)
 - decompositional: units are composite entities (see Halle 2008 for discussion)

2.0 Modular Syllabic Phonology

2.1 Syllabic features

- Based on sonority (Clements 2008) and assumes rise in sonority correlates with syllable so two features are required: rise and peak
- Rise defines the start of a syllable and contrasts: $\emptyset \sim R \sim R\text{-[slow]}$ (analogous to $ʔ \sim t \sim \text{ʈ}$ structural contrast, Causley 1999)
 - ‘simple onset’ = R
 - ‘no onset’ = \emptyset
 - ‘complex onset’ = R-[slow]

- Peak defines the end of a syllable and contrasts: $\emptyset \sim [\text{heavy}]$ or $[\text{long}] \sim [\text{heavy, long}]$ (both)
 - simple rime = \emptyset
 - long rime = $[\text{long}]$ acoustic correlate is duration
 - heavy rime = $[\text{heavy}]$ acoustic correlate is ‘stress’

2.2 Parsing syllables

- Perception/processing/computation of syllables is parallel to segmental perception/processing/computation
- Model is derivational so inventory of syllable types can change, i.e. underlying syllables vs. allo-syllables
- Independence creates mismatch between syllabic and segmental representations
- Prosodic licensing effects (epenthesis and deletion, Ito 1986) result from these mismatches

2.3 Synchronizing representations

- Two synchronization processes: *offset* and *mapping*
- Offset sets how complete the mapping between syllabic and segmental representations must be
- *Offset* is parameterized for location and size
- Location: initial, medial, final
- Size: determines strictness of association between segments and syllables
 - <none> = all segments and syllables must be associated
 - <1> = one segment can be skipped between syllable associations
 - <2> = two segments can be skipped between syllable associations
 - <any> = segments do not have to be associated with syllables
- *Mapping* associates segments and syllables with number and type of associations determined from syllabic features
 - contains language specific generalizations
 - either Rise based (consonant determined) or Peak based (vowel determined)

Case study: Thao (Chang 1998)

- Chang (1998) provides sketch of Thao phonology and reduplication patterns
- Limits discussion of syllable structure to ‘surface forms’
- Raimy (2008) argues that ‘rightward reduplication’ pattern provides evidence for distinct ‘CV underlying’ syllabification
- Provides evidence for derivational view of syllabification

PHONOLOGICAL SYLLABIFICATION IN THAO

Syllable inventory (Chang 1998):

CV $[\text{R}, \emptyset] = \triangle$ CVC plus offset

V $[\emptyset, \emptyset] = \square$ VC plus offset

CCV $[\text{R-slow}, \emptyset] = \triangleleft$ CCVC plus offset

Offset: I: none, M:<1>, F:<1>

Mapping: Rise based

Rightward reduplication- phonological syllabification

ʔqi.zi	ʔu.g.qi.zi.qi.zi	‘to protect, watch over’
◁△	△x△△△△	
qu.li.u.ʃ	mi.a.qu.li.u.li.u.ʃ	‘to straighten, stretch out’
△△□x	△□△△□△□x	
ʃna.ra	pa.ʃna.ra.na.ra	‘to burn s.t. repeatedly’
◁△	△◁△△△	
ag.qtu	a.g.qtu.qtu	‘think about’
□x◁	□x◁◁	
du.t.khu.n	du.t.khu.khu.n	‘to hunch over, bend over’
△x◁x	△x◁◁x	

- No clear surface generalization on what to reduplicate (Fitzpatrick 2000)

MORPHOLOGICAL SYLLABIFICATION IN THAO

Syllable inventory:

[R, Ø] = △

Offset: I: none, M: none, F:<1>

Mapping: soft Rise and Peak based

Rightward reduplication- morphological syllabification

ʔqi.zi	ʔu.g.qi.zi.qi.zi	‘to protect, watch over’
△△△		
qu.li.u.ʃ	mi.a.qu.li.u.li.u.ʃ	‘to straighten, stretch out’
△△△x		
ʃna.ra	pa.ʃna.ra.na.ra	‘to burn s.t. repeatedly’
△△△		
a.g.q.tu	a.g.qtu.qtu	‘think about’
△△△△		
du.t.k.hu.n	du.t.khu.khu.n	‘to hunch over, bend over’
△△△△x		

- Raimy (2008) generalization appears; second to last onset

Mapping Morphological and Phonological Syllabification in Thao

△.△	◁	introduces/deletes [R-slow] feature
C. CV <->	CCV	
△.△	x.△	changes Offset-M setting (none or 1)
C . C <->	C . C	

3.0 A sample of converging evidence

3.1 Psycholinguistics

- Poeppel (2003) proposes the ‘asymmetric sampling in time’ model where language is processed bilaterally but with functional asymmetry
- Priming and frequency effects for syllables- Cholin, Levelt and Schiller (2006)
- Neighborhood effects for syllables- Carreiras and Perea (2002)
- Segmental priming- Schiller (2004)
- Linear limits on calculation- Endress, Scholl and Mehler (2005)

3.2 Phonology

- Sequential phonotactics- *tl in English onsets, etc.
- Syllable based generalizations
- Unsyllabified segments- Bagemihl (1991), Shaw (2008)
- Opacity from syllabification- Idsardi and Kim (2000)
- Phonetic vs. phonological syllabification- Czaykowska-Higgins and Willett (1997)

3.3 Phonetics

- Syllable-segment ratios- Port and Leary (2005)
- Speech rate generalizations- Salmons, Jacewicz and Fox (2008)
- Rhythmic classes and coarse parsing- Ramus, Nespor and Mehler (1999)

4.0 Challenges and future directions

- *Strong no coda position*- model only contrasts syllabified consonants and unsyllabified consonants
–is this sufficient or do we need a three way contrast of onset, coda and unsyllabified?
–‘coda constraints’ must be re-envisioned...
- *Strong no ambisyllabicity*- because of only two way contrast between syllabified and unsyllabified only classic geminate structures can be ‘ambisyllabic’
- *Syllable features*- what are the distinctive features for syllables? how are they organized? what else is the syllable representation used for?
- *Weak syllable priming, strong segment priming*- if both representations are ‘stored’, why is there a difference in the quality of evidence for priming effects?
- *Headedness/positional faithfulness effects*- parallels between segmental generalizations based on ‘headedness’ (Dresher and van der Hulst 1998) and ‘positional faithfulness’ (Beckman 1997)
- *What is syllable based? What is segment based? What is both? What is neither?*- Can we disassociate segment and syllable processing?

References

- Bagemihl, Bruce (1991) Syllable structure in Bella Coola. *Linguistic Inquiry* 22:589-646.
- Beckman, Jill (1997) *Positional faithfulness*. Ph.D. Dissertation. UMass, Amherst.
- Blevins, Juliette (1995) The syllable in phonological theory. In John A. Goldsmith (ed) *The handbook of phonological theory*. Blackwell Publishers pp. 206-244.
- Bromberger, Sylvain and Morris Halle (2000) The ontology of phonology (revised). In Noel Burton-Roberts, Philip Carr and Gerard Docherty (eds) *Phonological knowledge: Conceptual and empirical issues*. Oxford University Press. pp. 19-38.
- Carreiras, Manuel and Manuel Perea (2002) Masked priming effects with syllabic neighbors in a lexical decision task. *Journal of Experimental Psychology: Human perception and performance* 28(5):1228-1242.
- Causley, T. (1999) *Complexity and markedness in Optimality Theory*. Ph.D Dissertation. University of Toronto.
- Chang, M. Laura (1998) Reduplication in Thao. *Oceanic linguistics* 37:277-297.
- Cholin, Joana, Willem J. M. Levelt and Niels O. Schiller (2006) Effects of syllable frequency in speech production. *Cognition* 99:205-235.
- Clements, G. Nick (2008) Does sonority have a phonetic basis? In Eric Raimy and Charles Cairns (eds) *Architecture and representation in phonology*. MIT Press.
- Czaykowska-Higgins, Ewa and Marie Louise Willet (1997) Simple syllables in Nxa'amxcin. *IJAL* 63(3):385-411.
- Dresher, Elan and Harry van der Hulst (1998) Head dependent asymmetries in phonology: Complexity and visibility. *Phonology* 15:317-352.
- Endress, Ansgar, Brian J. Scholl and Jacques Mehler (2005) The role of salience in the extraction of algebraic rules. *Journal of Experimental Psychology: General* 134(3)406-419.
- Fitzpatrick, Justin (to appear) A concatenative theory of possible affix types. In A. Salanova (ed) *Papers from EVELIN I, MITWPL*. <http://web.mit.edu/jfitzpat/www/index.html>
- Goldsmith, John (1976) *Autosegmental phonology*. Ph.D. Dissertation. MIT.
- van der Hulst, Harry (2008) Syllabic structure and licensing. *CUNY Phonology Forum Conference on the Syllable*.
- Idsardi, William and Sun-hoi Kim (2000) On syllable based multiple opacities. 2000 *International Workshop on Generative Grammar*. The Korean Generative Grammar Circle. pp. 61-74.
- Ito, Junko (1986) *Syllable theory in prosodic phonology*. Ph.D. Dissertation. UMass, Amherst.
- Kahn, Daniel (1976) *Syllable based generalizations in English phonology*. Ph.D. Dissertation. MIT.
- Poeppl, David (2003) The analysis of speech in different temporal integration windows: cerebral lateralization as 'asymmetric sampling in time'. *Speech Communication* 41:245-255.
- Poeppl, David, William Idsardi and Virginie van Wassenhove (2007) Speech perception at the interface of neurobiology and linguistics. *Philosophical transactions of the Royal Society B, online*.
- Port, Robert and Adam Leary (2005) Against formal phonology. *Language* 81(4):927-964.
- Ramus, Franck, Marina Nespov and Jacques Mehler (1999) Correlates of linguistic rhythm in the speech signal. *Cognition* 73:265-292.
- Raimy, Eric (2008) Appendixitis. In Eric Raimy and Charles Cairns (eds) *Architecture and representation in phonology*. MIT Press.

- Raimy, Eric (2000) *The phonology and morphology of reduplication*. Mouton de Gruyter.
- Rice, Keren (1999a) Featural markedness in phonology: variation- part I. *GLOT International* 4(7):3-6.
- Rice, Keren (1999b) Featural markedness in phonology: variation- part II. *GLOT International* 4(8):3-7.
- Sagey, Elizabeth (1986) *The representation of features and relations in nonlinear phonology*. Ph.D. Dissertation. MIT
- Salmons, Joseph, Ewa Jacewicz and Robert Allen Fox (2008) Fast talkers vs. slow talkers: Speech rate across dialect, generation and gender. *Talk at 2008 ADS Meeting*.
- Shaw, Patricia (2008) Constraints on the sequencing and syllabification of consonants. *CUNY Phonology Forum Conference on the Syllable*.