Looking into Segments

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Main Idea: Presenting many different phonological cases mainly in Q Theory such as complex consonants and complex vowels.

Introduction

- This paper advocates for exploding the traditional segment, or 'Q', into a series of up to three temporally ordered subsegments 'q', where 'q' is loosely based on the concept of quantized temporal subphases of the unit phonologists call 'segment'.

(1) Q(q1 q2 q3)

Contour segments in Q Theory

- In Q Theory, each vowel and consonant is subdivided into three quantized 'q' subsegments, in which 'Q' and 'q' vary over 'consonant' and 'vowel'.
- A 'c' subsegment is one comprised of traditionally consonantal features, while a 'v' subsegment is comprised of the features traditionally assigned to vowels.
- We use the term 'C' for 'Q' segments consisting entirely of 'c' subsegments; and 'V' for 'Q' segments consisting entirely of 'v' subsegments.
- By virtue of positing three potentially unique subsegments for each segment, Q Theory is designed to be able to represent contour segments.

(2)

a. C(n^1 t^2 ʃ^3) prenasalized affricate

b. C(t^1 ʃ^2 h^3) aspirated affricate

c. V(e̯^{1} a^2 i̯^{3}) triphthong

d. V(à^1 á^2 à^3) a vowel with rising-falling tone

Contour segments in Aperture Theory

- Aperture Theory posits two internal phases closure (C) and release (R) for stops.
- Continuants, including fricatives and vowels, have only one internal position each.
- Aperture Theory thus has the potential to represent (bipartite) contour segments in a manner similar to Q Theory.

(3) a. nasal stop: C_{nas} R_{nas}

prenasal stop: C_{nas} R

postnasal stop: C R_{nas}

b. plain oral stop: C R

preaspirated stop: C_{asp} R

postaspirated stop: C R_{asp}

(4) a. plain oral stop: C R

b. fricative: F(ric)

c. affricate: C F

- Because of its limitation to a maximum of two aperture positions, Aperture Theory has difficulty capturing tripartite consonants such as prenasalized affricates, e.g. ^{n}dʒ, while Q Theory can easily represent it.

Segment-internal alignment contrasts within a language

- Hungarian postalveolar affricates have a longer closure than alveolar affricates do.

(8)

	/ts/	/tʃ/
Pycha (2010):	[t_{x} s_{x}]	[t_{xx} $ʃ_{x}$]
Q-Theory:	C(t^{1} s^{2} s^{3})	C(t^{1} t^{2} $ʃ^{3}$)

- In Kualan, prenasalized consonants, postoralized consonants, and preoccluded consonants are distinctive. These distinctions can be translated in Q Theory.

(9)

a.	Fully plain consonant:	C(p p p)	/cirup/	[cirup]	‘grass’
	Fully nasal consonant:	C(m m m)	/tonam/	[tonãm]	‘plant’

b. Prenasalized consonant:	C(n t t)	/roɲẽt/	[roɲẽn͡d]	‘sky’
Postoralized consonant:	C(m m b)	/m͡bo/	[m͡bo]	‘elder sibling’
Preoccluded consonant:	C(d n n)	/dien/	[died͡n]	‘3pl’

Q-internal diversity

- *Flap: just two subsegments?*

  - The ballistic nature of flaps has not been easy to represent using traditional phonological features.

  - Flaps are difficult to classify as either continuants or stops.

  - While the feature [+tap] tags them as unique, ideally a phonological representation would capture the inherently short nature of flap closure.

  - Q-theoretic representations offer a natural solution: flaps lack a steady-state target, and consist only of transitional subsegments.

(37) betting [bɛɾɪŋ] V(ɛ ɛ ɛ) C(ɾ ɾ) V(ɪ ɪ ɪ) C(ŋ ŋ ŋ)

  - Flaps lack target subsegment that belongs to one syllable or another.

  - If syllabification operates on strings of q subsegments rather than over Q segments, it is possible to propose that the transition into a consonant is part of the preceding syllable, thus yielding syllabifications like the following, for ‘antic’ (with full, aspirated /t/) and ‘carry’ (with full sonorant /ɹ/ vs. ‘betting’ (with flap).

(38) ‘betting’ (b b b ɛ ɛ ɛ ɾ)$_\sigma$(ɾ ɪ ɪ ɪ ŋ ŋ ŋ)$_\sigma$
‘carry’ (k k h ɛ ɛ ɛ ɹ)$_\sigma$(ɹ ɹ i i i)$_\sigma$
‘antic’ (ae ae ae n n n t)$_\sigma$(t t^h ɪ ɪ ɪ k k k)$_\sigma$

- *Excrescent vowels: a single subsegment?*

  - Moroccan Colloquial Arabic a /tb/ cluster is produced as [t^{ə}b], with a very short intervening schwa-like vowel.

  - Excrescent vowels are, by definition, shorter than other vowels; unlike full epenthetic vowels, they are, by definition, never stressable.

- Q Theory can capture this relatively short duration by assigning epenthetic vowels a single subsegment.

(39) katb [kat^{ə}b] ‘to write’ C(t t t)V(ə)C(b b b)

➢ *Contextual subsegment reduction*

- Steriade (1993, 1994), in discussions of Aperture Theory, analyzes the neutralization of laryngeal contrasts in Korean coda obstruents to loss of the Aperture release node, which dominates the relevant deleted features [constricted glottis] and [spread glottis].

- In Q Theory, this same insight is captured through the elimination of c^3 from a syllable-final, unreleased consonant (40a).

(40a) t, t^h → t $C(t^1\ t^2\ h^3) \rightarrow C(t^1\ t^2)$

- Gafos (2002) analyzes the loss of open transitions between consonants, due to the constriction gesture of the second consonant beginning before the release of the constriction gesture for the first consonant.

- This loss of trapped transition can be modeled as the deletion of c^3 and the following c^1 (40b).

(40b) ‘robbed’ $...C(b^1\ b^2\ b^3)(d^1\ d^2\ d^3) \rightarrow C(b^1\ b^2)(d^2\ d^3)$

- Polish geminate affricates can be realized either as doubly articulated (with each affricate separately released), or as singly articulated (with longer closure).

(41) (t$^{!}$ t^{2} **ɕ^{3}**)(**t^{1}** t^{2} ɕ^{3}) → (t$^{!}$ t^{2} **ɕ^{3}**)(**t^{1}** t^{2} ɕ^{3}) doubly articulated geminate affricate
   (t$^{!}$ t^{2} **ɕ^{3}**)(**t^{1}** t^{2} ɕ^{3}) → (t$^{!}$ **t^{2}**)(**t^{2}** ɕ^{3}) singly articulated geminate affricate

Q Theory, gestural overlap, and Articulatory Phonology

➢ *Intrusive consonants in Articulatory Phonology*

- The [t] phone is the result of gestural alignment in /ns/ clusters. It is called intrusive [t].

- Comparing the Q Theoretic representation of intrusive [t] in (42) to the Articulatory Phonology representation in (43).

(42) (n n n)(s s s) → (n n t)(t s s)

(43)

<table>
<tr><td>TT</td><td colspan="2">TT/closed</td><td>TT/critical</td></tr>
<tr><td>Vel</td><td>open</td><td colspan="2">closed</td></tr>
<tr><td>GL</td><td></td><td colspan="2">wide</td></tr>
</table>

n *t* *s*

Q Theory	Articulatory Phonology
○ Q Theory is, eponymously, quantal; it divides all, or most, segments into three sequential phases, each internally uniform. ○ Q Theory operates on the categorial phonologization of these representations. ○ Because it is more discrete, Q-Theory is more easily injectable into standard segment-based phonological theories.	○ Articulatory Phonology is inherently more gradient. However, we are struck by the importance of the articulatory ‘landmarks’ described by Gafos (2002) as ‘onset of movement, achievement of target, and release away from target’. ○ Insofar as the gestural coordination within a segment is anchored to these points, Articulatory Phonology is diagnosing the same split into three internal phases that are reified in Q Theory. ○ Articulatory Phonology is aimed at a slightly different level of analysis, the more gradient, somewhat more speech rate-dependent coordination of phonologically specified gestures. ○ Insofar as Q Theory is informed by substance, a close link to Articulatory Phonology must be closely maintained.

Length

- A major question for Q Theory is whether the subdivision of Q segments into q substrings has any bearing on the phonological representation of contrastive length (long vs. short vowels, singleton vs. geminate consonants).

- We have mentioned above the possibility of using fewer than three q subsegments for intrinsically short-duration segments such as intrusive consonants, excrescent vowels, and even ballistic segments like flaps.

- However, nothing in Q theory changes the fact that phonologically lengthening a segment preserves its internal makeup. This was mentioned, above, in the case of Hungarian, in which Pycha (2010) demonstrates that the relative internal timing differences between alveolar and post-alveolar affricates in Hungarian are preserved under gemination.

- We assume the standard approach to phonological length, namely the association of more than one abstract phonological timing (or weight) unit with a long segment.

- If that unit is the mora, then a long vowel has the same representation in Q theory as it does in theories in which segments are atomic (Table 1):

	atomic segments	Q(q q q)
Short vowel	[a]$_{\mu}$	V(a a a)$_{\mu}$
Long vowel	[a]$_{\mu\mu}$	V(a a a)$_{\mu\mu}$
Singleton consonant	[t]	C(t t t)
Geminate consonant	[t]$_{\mu}$	C(t t t)$_{\mu}$
Singleton Hungarian alveolar affricate	[ts]	C(t s s)
Geminate Hungarian alveolar affricate	[ts]$_{\mu}$	C(t s s)$_{\mu}$
Singleton Hungarian post-alveolar affricate	[tʃ]	C(t ʃ ʃ)
Geminate Hungarian post-alveolar affricate	[tʃ]$_{\mu}$	C(t ʃ ʃ)$_{\mu}$

Table 1

Note: The use of moras to represent consonant length **is not universally accepted**. 😊😉

- Q Theory simply provides granularity below the level of the segment.

- It does not affect how timing or weight units are assigned to segments.

- q subsegments are not themselves units of duration.

- They simply represent (potentially) featurally different temporally ordered subphases of a segment (consecutive vertical chunks of speech).