

PHARYNGEAL PRESERVATION IN WEST GREENLANDIC¹

0. Introduction²

- This talk proposes a method of integrating phonetics and phonology. The purpose of this integration is to allow the phonetic details of a language to explain otherwise troublesome phonological processes. The consequence of my proposal is an analysis of previously unexplained West Greenlandic data.
- In West Greenlandic, the plural and a few other derived forms are marked by gemination of a root consonant as well as the addition of a suffix.
- A C₁Vq sequence in the singular has the form C₁V+suffix in derivatives of this kind.

(1) **talıq** *singular* (no suffix) ‘arm’
taL:it *plural* (suffix -it)

- In (1), gemination is a simple process of lengthening C₁ from the singular C₁Vq sequence, in this case [l]. (Voicing and sonorancy are neutralized in geminates in WG; [L:] is the long counterpart of [l]).
- Some instances of gemination result in a pharyngealized geminate in the output. In (2), gemination of singular [l] creates a secondarily pharyngealized geminate [L:] preceded by a pharyngealized vowel.

(2) **alıq** *singular* (no suffix) ‘harpoon strap’
əL:it *plural* (suffix -it)

- This talk aims to answer the following question:

The singular forms [talıq] and [alıq] appear to be identical (other than onset [t]). Why is pharyngealization present in derivatives of [alıq] but absent in derivatives of [talıq]?

¹ I would like to thank the following people for comments and discussion: Adam Albright, Edward Flemming, Shigeto Kawahara, Michael Kenstowicz, John McCarthy, Donca Steriade, and attendees of MIT’s Phonology Circle and the MIT-UMass Phonology Meeting in May, 2006.

² In all examples, ‘L’ is a voiceless lateral affricate and an underdot (ı) indicates pharyngealization.

Proposal:

Claim A: The underlying forms of [aliq] and [taliq] are structurally different. [aliq] is derived from an underlying representation with a final cluster, and [taliq] from a UR with a final CVC sequence.

(3)	UR	singular	plural
	/alq/	aliq	aL:it
	/taliq/	taliq	taL:it

The descriptive generalization is that pharyngealization is present in forms derived from roots with a final Cq cluster, but not from roots ending in CVq.

Claim B: There is a representation between input and output in which pharyngealization from final /q/ spreads to a preceding vowel, the Realized Input.

(4)	UR	Realized Input
	/alq/	/aḷq/
	/taliq/	/taliq/

- Preservation of pharyngealization is favored by a correspondence constraint (McCarthy and Prince 1995) IDENT_{PHAR-V}, demanding identity in [PHARYNGEAL] between corresponding vowels in the Realized Input and the output.
 - Pharyngealization is preserved from /alq/ to [aḷL:it] because /a/ is pharyngealized in the RI /aḷq/.
 - Pharyngealization is lost from /taliq/ to [taL:it] because /a/ is not pharyngealized in the RI /taliq/.

Outline:

1. Background on WG
2. Data
3. The Realized Input
4. Deriving the plurals [aḷL:it] and [taL:it]
5. Deriving the singulars [aliq] and [taliq]
6. Conclusion

1. Background

- Consonants

(5)		labial	coronal	velar	uvular
	stop	p	t	k	q
	nasal	m	n	ŋ	N
	cont	v	s, l	ɣ	r
	glide		j		

- WG has three vowels, /i, u, a/, which are lowered and retracted before uvulars and pharyngealized geminates.

(6) i → ɨ
 u → ʊ / __ [pharyngeal]
 a → ʌ

- There are no clusters in WG. Consonants may be short or long; geminates may be plain or pharyngeal. Geminates are voiceless obstruents or nasals.

(7)

	labial			coronal				velar			uvular		
singleton:	p	m	v	t	n	s	l	k	ŋ	ɣ	q	N	r
plain:	p:	m:	f:	t:	n:	s:	L:	k:	ŋ:	x:	q:	N:	χ:
pharyngeal:	p:	m:	f:	ɸ:	n:	ʂ:	ɮ:						

2. Data

- On the surface, roots can be classified into two categories (T indicates examples taken from Thalbitzer 1904, R from Rischel 1974):
 - those with pharyngealization in derived forms

(8)

<u>singular</u>	<u>derived</u>			
nim:ɨq	nɨm:a	'band'	3sg.poss	T
im:ɨq	ɨm:it	'water'	plural	T
qan:ɨq	qan:it	'mouth'	plural	T
un:ɨq	un:it	'armpit'	plural	T
san:ɨq	san:i	'bones'	3pl.poss	R
a:v:ɨq	a:f:up	'walrus'	relative	R
iliv:ɨq	ilif:it	'graves'	plural	T
al:ɨq	al:it	'harpoon strap'	plural	T
nig:ɨq	nix:up	'south wind'	relative	T

- those without pharyngealization in derived forms

(9)

<u>singular</u>	<u>derived</u>			
qim:ɨq	qim:ip	'dog'	relative	R
in:aq	in:at	'steep declivity'	plural	T
nan:uq	nan:ut	'bear'	plural	R
al:uq	al:ut	'sole of the foot'	plural	T
uL:uq	uL:ut	'day'	plural	T
tal:ɨq	tal:it	'arm'	plural	T
ukal:ɨq	ukaL:it	'hare'	plural	T
nig:aq	nix:at	'snare'	plural	T
qatig:aq	qatix:at	'back'	plural	T

- In the literature on WG (Rischel 1974, Thalbitzer 1976, Pyle 1970), the distinction between these two types of roots is left largely unexplained. I offer the following explanation (also alluded to in Cearley 1976).
- In derived forms where pharyngealization is present, the vowel in the singular is always /i/. In forms where pharyngealization is absent, all three vowels /i, u, a/ occur in the singular.
- This observation suggests that /i/ in pharyngeal preserving roots is epenthetic. The surface classification of roots in (8) and (9) can be explained by the shape of the underlying form.
 - in pharyngeal preserving roots, the UR has a /Cq/ cluster:
/alq/ → aḷ:it
 - in pharyngeal deleting roots, the UR ends in /CVq/:
/taliq/ → taḷ:it

3. The Realized Input

- Question: How does the presence or absence of an underlying vowel explain the presence or absence of pharyngealization in the output?
- This looks like some sort of opacity. How can it be analyzed in Optimality Theory (Prince & Smolensky 1993)?
- Proposal: There is an intermediate representation which is the phonetic realization of the input: the Realized Input.

3.1 Pharyngealization as gestural phasing

- In WG surface forms, pharyngealization on a consonant is always present on a preceding vowel: iḡ, iḷ:, *iḡ, *iḷ:.
- When a long vowel precedes a pharyngealized segment, Rischel (1974) reports the vowel to be partially pharyngealized (a diphthong). This observation suggests that vowel pharyngealization is a gradient, and not a categorical, effect.
- Vowel pharyngealization can be thought to occur in the phonetics. It is the result of aligning a pharyngeal gesture associated with a consonant to overlap the articulation of a vowel.
- Assume that the phonetic grammar constructs a gestural score, in the sense of Browman and Goldstein (1986), specifying the phasing (or temporal) relationships between the gestures or features that comprise the UR.

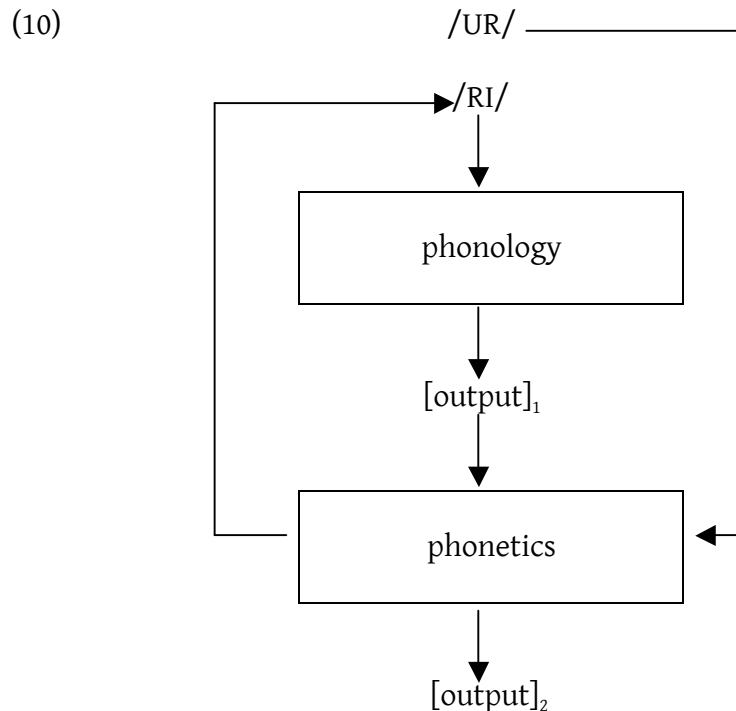
- The necessity of aligning a [PHARYNGEAL] feature or gesture to overlap a vowel can be thought of as a necessary condition for the realization of pharyngeal contrasts in WG, i.e. pharyngealization is only a viable contrast if it is perceptible on a preceding vowel as well as on the consonantal articulation.

3.2 The Realized Input

- I make the following proposal:

There is a representation other than the input and output, the Realized Input, in which underlying pharyngealization has spread to the first preceding vowel. The RI is the input to the phonological grammar.

- The RI is the result of putting the UR through a language specific phonetic grammar (cf. Flemming 2006). It is also possible to conceive of the RI as the fully faithful candidate (McCarthy 2006), the output candidate that violates no faithfulness constraints.
- The idea is that phonetic realization (aligning the gestural or featural components of a representation) can happen twice during the course of a phonological derivation: to the UR and to the output of the phonology.



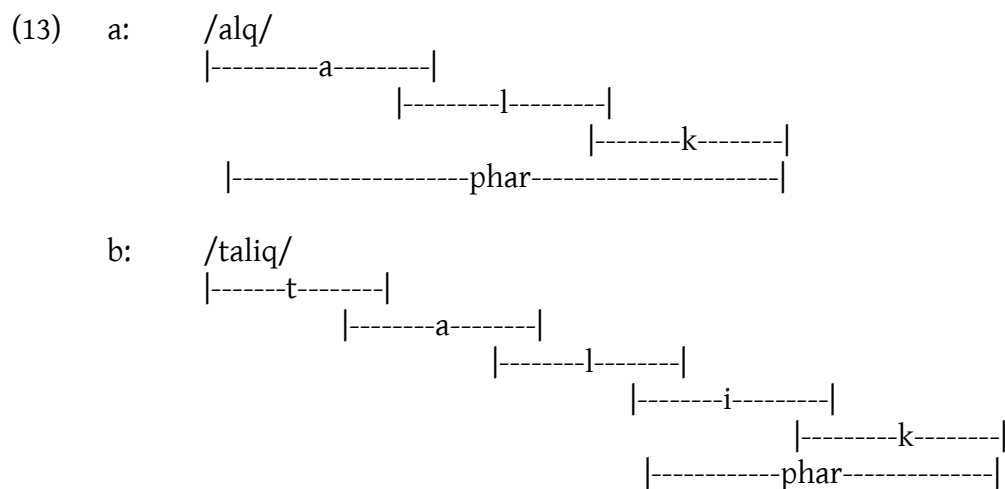
- In WG, the Realized Input results in the following forms.

(11) /alq/ → /aḷq/
 /taliq/ → /taḷiq/

- Informally, assume that the inputs consist of the following gestures (or features which translate into these gestures).

$$(12) \quad /alq/ = \begin{array}{|c|} \hline \text{---a---} \\ \hline \text{---l---} \\ \hline \text{---k---} \\ \hline \text{---PHAR---} \\ \hline \end{array} \quad /taliq/ = \begin{array}{|c|} \hline \text{---t---} \\ \hline \text{---a---} \\ \hline \text{---l---} \\ \hline \text{---i---} \\ \hline \text{---k---} \\ \hline \text{---PHAR---} \\ \hline \end{array}$$

- The phonetic grammar aligns these gestures something like in (13), overlapping [PHARYNGEAL] with a vocalic articulation. This alignment achieves the RIs given in (11).



3.3 Further evidence for the Realized Input

- The concept of a RI is independently motivated by explanations of phonological phenomena that rely on phonetic detail (Steriade 2001, Jun 2002).
- As illustration, deletion of a consonant before another consonant ($C_1C_2 \rightarrow C_2$) occurs in languages where C_1 is unreleased.
- If release is an aspect of the phonetics of a the language, and not specified in the underlying representation (as is standardly assumed), then motivation for C_1 deletion is dependent on phonetic information.
- Jun (2002) gives the following examples from Diola Fogy (Sapir 1965) and Zoque (Wonderly 1953).
 - In Diola Fogy, preconsontal stops are deleted.

$$(14) \quad /let+ku+jaw/ \rightarrow [lekujaw] \quad \text{'they won't let go'}$$

- In Zoque, preconsontal stops are allowed, but are released.

(15) /petkuy/ → [pet^lkuy] ‘broom’

- Jun (2002) proposes the universal ranking $MAX_{REL}-C \gg Max-C$ to account for the resistance of released stops to deletion. If a markedness constraint against clusters, *CC, is ranked between these two faithfulness constraints, preconsontal released stops will be preserved and unreleased stops will delete.
- The RI of underlying clusters in Diola Fogy and Zoque will specify their release properties, allowing the grammar to refer to these properties in order to determine whether or not C_1 will surface.

(16) RIs of cluster inputs in Diola Fogy and Zoque

	input	RI
DF:	/let+ku+jaw/	/let ^ˈ kujaw/
Z:	/petkuy/	/pet ^l kuy/

- (17) and (18) show how the ranking $MAX_{REL}-C \gg *CC \gg Max-C$ accounts for the patterns in (14) and (15).

(17)

	$MAX_{REL}-C$	*CC	Max-C
→ lekujaw			*
le ^l kujaw		*!	

(18)

	$MAX_{REL}-C$	*CC	Max-C
→ petkuy		*	
pekuy	*!		*

4. Deriving the plurals [a_l:it] and [ta_l:it]

- The trouble in trying to derive [a_l:it] and [ta_l:it] from the unfettered inputs /alq/ and /taliq/ is that pharyngealization has the same source in each: underlying /q/.
- Opposite rankings of the same faithfulness and markedness constraints are needed to generate the two plurals. This is impossible in a single grammar.

(19)

	MAXPHAR	*PHAR
→ a _l :it		*
a _l :it	*!	

(20)

	*PHAR	MAXPHAR
ta _l :it	*!	
→ ta _l :it		*

- The RI introduces other instances of pharyngealization to which correspondence constraints may refer.

- A constraint IDENTPHAR-V demands identity in the feature [PHARYNGEAL] between corresponding vowels in the Realized Input and output.

(21) IDENTPHAR-V Given a vowel in the Realized Input V_{RI} and a corresponding output vowel V_o , if V_{RI} is [PHARYNGEAL] then V_o is [PHARYNGEAL].

- If this constraint outranks a general markedness constraint against [PHARYNGEAL], [aL:it] is the optimal plural form. (Here I assume a markedness constraint penalizing each segment specified as [PHARYNGEAL]).

(22)

/aḷiq+it/	IDENTPHAR-V	*PHAR
→ aL:it		**
aL:it	*!	

- /aḷiq+it/ → [aL:it] differs from /talīq+it/ → [taL:it] in input pharyngealization of /a/. Not only does deleting pharyngealization in (23) not violate IDENTPHAR-V, preservation does violate it³.

(23)

/talīq+it/	IDENTPHAR-V	*PHAR
→ taL:it		
taL:it	*!	**

- The sub-optimality of candidate [taL:it] shows that *Pharyngeal must also dominate a general faithfulness constraint, MAXPHAR, which favors preservation of any underlying pharyngealization.

(24)

/talīq+it/	IDENTPHAR-V	*PHAR	MAXPHAR
→ taL:it			*
taL:it		*!	
taL:it	*!	**	

- The ranking needed to derive the plural forms [aL:it] and [taL:it] is given in (25).

(25) IDENTPHAR-V >> *PHAR >> MAXPHAR

³ It is also worth noting that pharyngealization is unprotected by IDENTPHAR-V in [taL:it] because the pharyngealized vowel in the RI does not have an output correspondent. The derivation looks as in (i), where the pharyngealized vowel in the RI is syncope:

(i) /tal₁i₂q₃i₄t/ → tal₁q₃i₄t → taL:_{1,3}i₄t

Even in an example like *nunaq* ~ *nun:at* where the pharyngealized vowel in the RI (/nunaq/) has not syncope, pharyngealization may not be preserved in this position (see (28) and the following discussion).

5. Deriving the singulars [alıq] and [talıq]

- The current ranking selects the wrong output for both inputs /alıq/ and /talıq/.

(26)

/talıq/	IDENTPHAR-V	*PHAR	MAXPHAR
→ talıq		** !	
talıq	* !	*	*
● talık		*	*
talik	* !		**

(27)

/alıq/	IDENTPHAR-V	*PHAR	MAXPHAR
→ alıq	* !	**	**
● alık		***	*
alıq		**** !	

- An explanation for the optimality of the attested singular forms [alıq] and [talıq] lies in understanding the distribution of pharyngeal contrasts in the language as a whole.
- Pharyngealized vowels only surface preceding uvulars and pharyngealized geminates; consonants that are specified as [PHARYNGEAL].
- The distribution of [PHARYNGEAL] on consonants is sensitive to two factors: primary place of articulation and length. Pharyngealization is allowed on [DORSAL] segments (uvulars) and long segments (pharyngealized geminates).
- The following constraints can be used to derive this distribution. For justification and further discussion of these constraints, see the appendix.

(28) IDENTPHAR[DORSAL] Given a segment in the Realized Input ς_{RI} that is [DORSAL] and a corresponding output segment ς_o that is [DORSAL], if ς_{RI} is [PHARYNGEAL] then ς_o is [PHARYNGEAL].

*VC A consonant preceded by a [PHARYNGEAL] vowel is [PHARYNGEAL].

*PHAR{singleton} Singletons are not [PHARYNGEAL].

- IDENTPHAR[DORSAL] >> *PHAR{singleton} allows uvular singletons.

(29)

/q/	IDENTPHAR[DORSAL]	*PHAR{singleton}
→ q		*
k	* !	

- *PHAR{singleton} >> MAXPHAR eliminates pharyngealized non-uvular singletons.

(30)

/!/	*PHAR{sing}	MAXPHAR
→ l		*
l̤	*!	

- *VC, *PHAR{singleton} >> IDENTPHAR-V eliminates pharyngeal vowels before non-pharyngealized consonants.

(31)

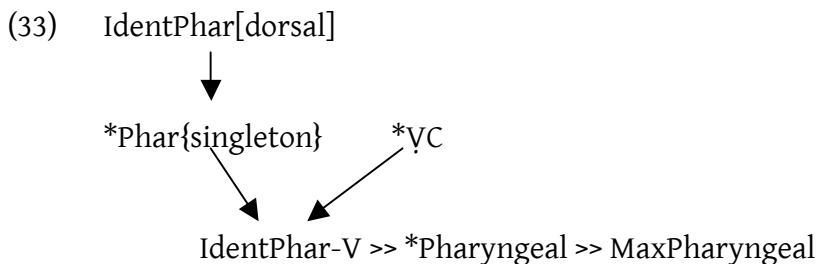
/i!/	*VC	*Phar{singleton}	IdentPhar-V
→ il			*
i!l	*!		
i!l̤		*!	

- *VC >> IDENTPHAR-V >> *PHARYNGEAL allows pharyngeal contrasts on geminates.

(32)

/i!L:/	*VC	IDENTPHAR-V	*PHARYNGEAL
→ i!L:			**
i!L:	*!		*
i!L̤:		*!	

- The total ranking needed to account for pharyngealization contrasts in underived forms is in (33).



- The grammar now generates the correct singular forms for the RIs /a!q/ and /ta!iq/.

(34)

/a!q/	IDENTPHAR[DORS]	*PHAR{SING}	*VC	IDENTPHAR-V	*PHAR	MAXPHAR
→ aliq				*	*	**
aliq				*	**!	**
a!iq		*!				
a!iq			*!			*
a!iq̤			*!		***	*

- [aliq] is selected by the phonological grammar as the optimal output. When [aliq] is passed through the phonetic grammar, pharyngealization spreads from /q/ to the first preceding vowel, producing the attested surface form [a!iq].

(35)

/taliq/	IDENTPHAR[DORS]	*PHAR{SING}	*VC	IDENTPHAR-V	*PHAR	MAXPHAR
→ taliq		*			**	
taliq		*		*!	*	*
talịk	*!		*		*	*
talik	*!			*		**

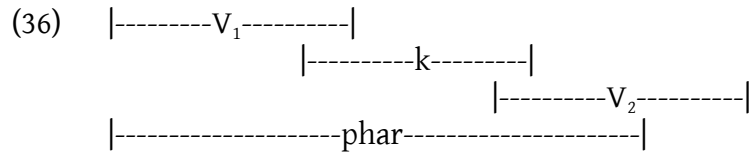
- [taliq] is the optimal candidate in (35), with a pharyngealized vowel preceding [q]. This vowel is pharyngealized in the output because it is pharyngealized in the input, preserving pharyngealization in the phonology satisfies IDENTPHAR-V.

6. Conclusion

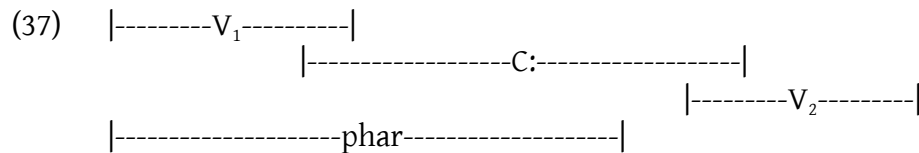
- This talk has aimed to provide an account of pharyngeal preservation in West Greenlandic.
- Initially, the presence or absence of pharyngealization in the plural forms [ạL:it] and [taL:it] appears arbitrary. I showed that this arbitrary distinction has an explanation in the shape of the underlying form of the root: /alq/ v. /taliq/.
- The analysis of pharyngeal preservation relies on the introduction of the Realized Input, the phonetic realization of the UR to which correspondence constraints may refer. Pharyngealization is present in derived forms if it is present on the relevant vowel in the RI.

Appendix: Justification for the constraints in (28).

- IDENTPHAR[DORSAL] is necessary to express the special status of a contrast between velars and uvulars ([DORSAL] and [DORSAL, PHARYNGEAL] segments) as opposed to other pharyngealized and un-pharyngealized consonants ([CORONAL] and [CORONAL, PHARYNGEAL] segments).
- *VC and *PHAR{singleton} together eliminate contrastive pharyngealization on singletons and vowels.
- Given Richness of the Base (Prince and Smolensky 1993) an input sequence /ạl/ is possible. *VC will block this sequence from surfacing faithfully. The logical repairs that satisfy this constraint are: [ạl], [al] and [ạL:]. *PHAR{singleton} eliminates [ạl], leaving the two attested outputs [al] and [ạL:].
- The only [PHARYNGEAL] singletons in WG are uvulars. Pharyngealization on a uvular affects both the preceding and following vowel. Rischel reports vowels following uvulars to be pharyngealized, but to a lesser extent than preceding vowels. This description suggests an alignment like that in (36).



- When [PHARYNGEAL] is associated to a geminate, only the preceding vowel is affected. This suggests that [PHARYNGEAL] is aligned to precede the consontal constriction, but ends before the CV transition.



- Suppose that pharyngealization has a minimum duration that must be achieved for [PHARYNGEAL] to be realized (otherwise it will be deleted).
- Now suppose that this duration, as suggested by (38), is such that any association to a singleton consonant will necessarily result in [PHARYNGEAL] overlapping both preceding and following vowels.
- It is possible that *PHAR{singleton} is motivated as a means of avoiding a secondary articulation overlapping the CV transition of a stop. This could be thought of as a way of maximizing the perceptibility or strength of the cues to primary place. If [PHARYNGEAL] is present at the CV transition, the cues to primary place of articulation will be weakened.

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