# Release and reduction: two origins of schwa



- The label "schwa" has been applied to a phonological value that is especially variable in its phonetic properties. (for example, Browman and Goldstein 1992 for English schwa)
- Flanking consonants and vowels may have a significant coarticulatory influence on schwa's phonetic starting and ending postures.
- Origins of schwa:
  - (1) Consonantal release (e.g. Hall 2006)
  - (2) Vowel reduction (e.g Browman and Goldstein 1992)
  - (3) Epenthesis (e.g. Van Oostendorp 1995)

Also:

(4) Schwa-zero alternations (e.g. Kenstowicz 1994).

# 1. Release into schwa

- In  $\ldots$  C<sub>1</sub>(+)C<sub>2</sub> $\ldots$  contexts, the identity of C<sub>1</sub> may, on occasion, fail to be successfully communicated to a listener (e.g. Lombardi 1991, Steriade 1997 for laryngeal contrasts).
- Alternatively,  $C_1$  may released into a "little vowel" before the  $C_2$  constriction is fully achieved.  $C_1$  will be more resistant to neutralization or merger.
- This release may become exaggerated over time:  $C_1 \neg C_2$ .
- $C_1C_2$  heterorganicity increases the likelihood of  $C_1$  release, since the articulators necessarily change their posture as  $C_1$  is followed by  $C_2$  (e.g. Chitoran, Goldstein, and Byrd 2002).
- Trans-sonorant harmony is sometimes found as well (Hall 2006), perhaps due to formant "bleeding"
- Such "intrusive" vowels—be they schwa or vowel copies—are often ignored by prosodic phonology, in that they are "skipped over" for stress (Hall 2006)

# (1) Hall (2006):

(a) Release into schwa:

Bulgarian	gar <u>ə</u> bav	hunchbacked
Dutch	kalam	quiet
English (dialects)	ar <u>ə</u> m	arm
German (S. Hamburg)	beraten	to fry
Irish Gaelic	'ag <u>ə</u> lə	fear
	'gor <u>ə</u> m	blue
Saami	skuol: <u>ə</u> fi:	owl
Sanskrit	dar <u>ə</u> ∫ata	?

(b) Release into a vowel copy

Arbore	lefi+ <u>e</u> +t+atto	that ewe
Chamicuro	tu? <u>u</u> lu	chest
Finnish	kal <u>a</u> vo	transparency
Hausa	k <sup>w</sup> ur <u>u</u> k <sup>w</sup> urtu	small drum
Hocank (Winnebago)	s <u>i</u> ni	cold
	ho≀t∫õ <u>gə</u> +rə	the Hocank
Hua	okuruma?	sky
Kekchi	pa? <u>a</u> t	twins
Lakhota	<u>ga</u> la	no gloss
Late Latin	sk <u>i</u> riptum	a writing
Mamainde	mih+ <u>i</u> +tak?u	it is cloudy
Mono	gàf <u>ū</u> rū	mortar
Negev Bedouin Arabic	ga'h <u>a</u> wa	coffee
Oscan	múl <u>ú</u> ki:s	name
	pat <u>e</u> rei	father
Popoluca	it <u>a</u> ?a	your father
Scots Gaelic	∫al <sup>v</sup> <u>a</u> k	hunting
Spanish (Chilean)	k <u>o</u> ronika	chronicle
Tiberian Hebrew	∫alaħ+ <u>a</u> +t	you (fs) sent

(2) Theoretically plausible diachronic routes of  $C_1(+)C_2$ 



• Proposal: If neutralization of  $C_1$  does not induce excessive homophony, a language might be more able to tolerate this neutralization due to  $C_1$  "unrelease". However, if a language

Dan Silverman MFM17 28 - 30 May 2009

were to suffer excessive homophony as a consequence of  $C_1$  neutralization, then it might more likely possess  $C_1$  "release" (Martinet 1953, Silverman 2006)

# Indonesian

- Monomorphemic Indonesian words: right-to-left syllabic trochees, end-rule right, with initial dactyls in words with an odd number of syllables, excluding three- and (by necessity) one-syllable words.
- Schwas are completely invisible to stress (Cohn 1989).

(3)		All full vowels:	Schwas and full vowels:	Examples:	
	a.	'σσ	ə'σ	bə'ri	give
				k <u>ə</u> r'ja	work
	b.	ס'סס	<del>3</del> 9'σ	s <u>ətə</u> 'lah	after
	c.		രാ'ര	'gam <u>ə</u> lan	Indo. orchestra
	d.	'סס,סס	ძიად	a'part <u>e</u> men	apartment
	e.		ອ'ວອບ	t <u>∫ə</u> 'rit <u>ə</u> ra	story
	f.		<del>ээ</del> 'σσ	p <u>ə</u> rəm'puan	woman
	g.		രാ'രര	kopə'rasi	cooperation
	h.	,ଦଦ,ଦଦ'ଦଦ	'იაიბები	dif <u>ə</u> rensi'asi	differentiation
				divərsifi'kasi	diversification

• Cohn (1989): the distribution of schwa is largely predictable, and may thus be viewed as a consequence of epenthesis.

# 2 Reduction to schwa

• Due to its short duration and its tendency to coarticulate, schwa is a likely outcome of vowel reduction in stressless domains.

# **Reduction to schwa in English**

- Three categories just as in Dutch (e.g. Van Oostendorp 1995): Non-alternating (lexical), e.g. 'soofa sofa, about
  Epenthetic, e.g. 'biandad branded, 'themtad tempted 'dandaaz judges, 'binfaz brushes) Third, Reduced, (ialaks relax - rilakseifn relaxation; '?æran atom - ?a'thamik atomic).
- Chomsky and Halle (1968:110) "lax vowels reduce to a central, high, or mid unrounded 'neutral' vowel in English when they are sufficiently weakly stressed: [-stress, -tense, V]→[ə]; "The exact phonetic realization of [ə] does not concern [Chomsky and Halle]" (p.110)
- Browman and Goldstein (1992) report on the articulatory characteristics of schwa in the context pV<sub>1</sub>pə'pV<sub>2</sub>pə for a single American English speaker, where V<sub>1</sub> and V<sub>2</sub> were all possible combinations of I, ε, a, Λ, u.
- If schwa is actually a "targetless" vowel, then tongue activity during schwa should be fully predictable from the articulatory posture of these preceding and following contexts, provided these flanking postures are exhaustively quantified.

- The range of variation in the production of schwa is greater than the range of any other vowel, though indicates "a warping of the trajectory toward an overall average or neutral tongue position" (pp.41, 42).
- Flemming (2007): F2 varies more than F1, probably due to the fact that flanking consonants necessarily involve a mouth closing/jaw-raising gesture, thus lowering F1.
- Stresslessness feeds shortening, shortening feeds contrast loss, and contrast loss feeds coarticulation. Schwa results.
- Flemming and Johnson (2007) word-final schwa in word-final position (as in 'tʃhamə china or 'khamə comma) displays a relatively consistent mid-central quality, though a certain amount of between-speaker height variation is observed.
- Flemming (2007): American English possesses two schwas, word-medial schwa that is more variable, and word-final schwa that is more stable.
- Another possibility: one schwa in English, the variability of which is largely a consequence of its lexical context.
- Within-word motor routines are more frequently produced than are between-word motor routines. As such, they may be more susceptible to fixed coarticulatory effects than are between-word motor routines (Bybee 2001).
- Since the context that follows word-final schwa varies in unconstrained ways (depending only on the phonological shape of the following word), its coarticulatory tendencies may be less entrenched, less routinized, than its word-medial counterpart.
- The result is that word-final schwa may display more stability than its word-medial counterpart.

# **3** Schwa-zero alternations

• As a consequence of schwa's auditory indistinctness, its *presence* in a given phonetic context may be susceptible to confusion with its *absence* in an otherwise identical phonetic context, perhaps leading to a **a**~Ø alternation

# Schwa-zero alternation in Hindi

• Schwa alternates with zero in would-be VC<sub>2</sub>CV contexts, provided that it is not the first vowel of the morpheme

(4)a.	p <b>it∫ka</b>	squeezed	pit <u>∫ə</u> k	squeeze
	pighla	melted	pɪgʰ <u>ə</u> l	melt
	dewrani	brother-in-law's wife	dew <u>ə</u> r	brother-in-law
	nəmkin	salty	nəm <u>ə</u> k	salt
	sıski	a sob	sıs <u>ə</u> k	sob
	hırni	doe	hırən	deer
	tərpa	cause to be restless	tə <u>rə</u> p	restlessness
	wapsi	on return	wapes	return
	upri	pertaining to the top	upər	top
	ubtən	an unguent	ub <u>ə</u> tna	to anoint
	gərdzila	thunderous	gər <u>ə</u> d3na	to thunder

b.	a+səməj	asəməj	inopportune
	ə+∫ərir	ə∫ərir	without body
	ə+kələŋk	əkələŋk	spotless
	kʊ+∫əkʊn	kʊ∫əkʊn	bad omen

- Hindi schwa derives from Sanskrit \*\*ə and short \*\*a. In Old Hindi, this vowel, and also, some instances of other short vowels (\*I and \*u), alternated with zero in \*VCVCVI contexts (Misra 1967).
- As a consequence of their attendant jaw lowering, it takes longer to implement low vowels than non-low vowels, and so *contrastively short* low vowels are thus especially susceptible to rising.
- Provided that phonetic confusion between VCØCV and pre-existing VCCV sequences does not induce undue semantic confusion (by inducing a significant amount of homophony), it is quite possible that the sound pattern may ultimately change from VC<sub>9</sub>CV to VCCV.
- Why not schwa deletion in VCC<sub>2</sub>CV and VC<sub>2</sub>CCV contexts?
- The resulting sequence might be confused with VCCV.
- At this point, the chances of inducing homophony—hence confusion on the part of listeners—increase considerably.
- Since speech signals that confuse listeners (as opposed to those that do not confuse listeners) are less likely to be reproduced as these listeners become speakers, the presence of confusing signals as part of the conventionalized speech repertoire may be passively curtailed (Labov 1994, Silverman 2006). This may have influenced the present-day Hindi pattern: VCC<sub>2</sub>CV and VC<sub>2</sub>CCV do not alternate with VCCV.
- Exceptions:

(5)	kadəmbri ~ kadəmb <u>ə</u> ri	a novel, name for a girl
	ustra ~ ust <u>ə</u> ra	razor
	pundrik ~ pund <u>ə</u> rik	white lotus
	məndzri ~ mənd <u>zə</u> ri	tiny cluster of flowers, name for a girl

- Schwa deletion here results in tri-consonantal sequences that are also found elsewhere, and are usually of the form *nasal homorganic stop sonorant*.
- The phonetic properties of these particular tri-consonantal sequences are readily recoverable from the speech signal, since the medial consonant here does not possess place features that are distinct from the preceding nasal, and thus it does not contribute place cues of its own.

# Schwa-zero alternation in Chukchee

• Kenstowicz (1994) discusses schwa insertion.

(6)	a.	CCə+C	
		tumγ <u>ə</u> +ret	group of comrades
		meml <u>ə</u> +jocy+ən	pail
		qej <u>ŋə</u> +yiniw	lots of brown bears
		meml <u>ə</u> +jocy+ən qej <u>ŋə</u> +yiniw	pail lots of brown bea

b. C+əCC watap+<u>ə</u>nlaŋ place without moss r?ew+<u>a</u>t?ulwhale meatnam+<u>a</u>tku+ngroup of villages

- When a morpheme boundary is present in a string of three adjacent consonants (C+CC or CC+C), schwa is found at the morpheme boundary itself (CəCC or CCəC), and thus "morpheme integrity" is preserved.
- Schwa is serving a demarcative function here, in that it provides information about morphological structure: the presence of schwa cues morpheme boundaries.
- Schwa in Chukchee may thus be characterized as a "prosody" in the sense of Firth (1948).
- Instead, when a morpheme boundary is coextensive with a word boundary, schwa is found *away* from that boundary.

(7)	a.	#CəC p <u>ə</u> ne+k t <u>ə</u> m+ək t <u>ə</u> nut+ək	to grind to kill to swell	ye+mne+lin ye+nmə+len ye+nnut+lin	past tense
	b.	CəC# qep <u>ə</u> l mim <u>ə</u> l	ball water	qepl+e meml+aratyayən	erg. waterfall

- The *absence* of schwas at word edges may also be viewed in terms of Firthian prosodies: word boundaries might be cued in part by low-probability consonantal sequences that—due in great part to the prevalence of word-medial schwas—are less often encountered word-medially.
- That is, preserving consonants at word edges, as opposed to inserting schwa here, might render word boundaries more prominent due to the potentially low probability of such boundary-straddling (hence boundary-*cueing*) sound sequences.

# 4. Concluding remarks, and ideas for future research

- Schwa is short in duration, is subject to significant coarticulatory variation, and seems to have a mid- centralizing-tendency.
- Phonologically, it has been classified as a "featureless" vowel.
- Its featureless status makes it a likely candidate for epenthesis.
- Some schwas may have their origins in the audible release of a consonant when this consonant is immediately followed by another consonant: cues to the phonetic content of consonants are more reliably communicated upon audible release, ideally into a vowel.
- These schwas may or may not be visible to the prosodic structure of the language.
- Schwa may also be the result of vowel reduction. Its short duration and its consequent tendency to coarticulate make schwa a likely candidate for the vocalism of stressless domains.
- Perhaps as a consequence of its tendency to camouflage itself, schwa is especially susceptible to deletion, and thus may alternate with zero under varying conditions.
- Proposals that might be investigated in future studies:

- (1) Release into schwa is more likely to be present in a language when the absence of release might lead to a significant increase in the amount of homophony.
- (2) Trans-sonorant harmony deriving from schwa-insertion is more likely to be present in a language if it does not produce a significant amount of homophony.
- (3) Reduction of full vowels to schwa is more likely to be present in a language when it does not induce a significant amount of homophony.
- (4) Word-medial schwa is likely to possess a greater amount of fixed coarticulation than is word-peripheral schwa; word-peripheral schwa is likely to possess more a stable realization (confirmed by Flemming for English).
- (5) Schwa deletion is more likely to be present in a language when cues to neighboring consonants are not jeopardized to the point of their deleting as well.
- (6) Schwa deletion is more likely to be present in a language if the resulting strings of consonants are already present in the language (confirmed by Ohala for Hindi).
- (7) Schwa deletion is more likely to be present in a language when it does not induce a significant amount of homophony.
- (8) Schwa insertion may display a word-medial versus word-edge asymmetry in terms of its insertion site such that its presence or absence plays a demarcative role (confirmed by Kenstowicz for Chukchee).

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