

Release and reduction: two origins of schwa



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- 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 ... C₁(+)C₂... contexts, the identity of C₁ may, on occasion, fail to be successfully communicated to a listener (e.g. Lombardi 1991, Steriade 1997 for laryngeal contrasts).
- Alternatively, C₁ may be released into a “little vowel” before the C₂ constriction is fully achieved. C₁ will be more resistant to neutralization or merger.
- This release may become exaggerated over time: C₁əC₂.
- C₁C₂ heterogeneity increases the likelihood of C₁ release, since the articulators necessarily change their posture as C₁ is followed by C₂ (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):

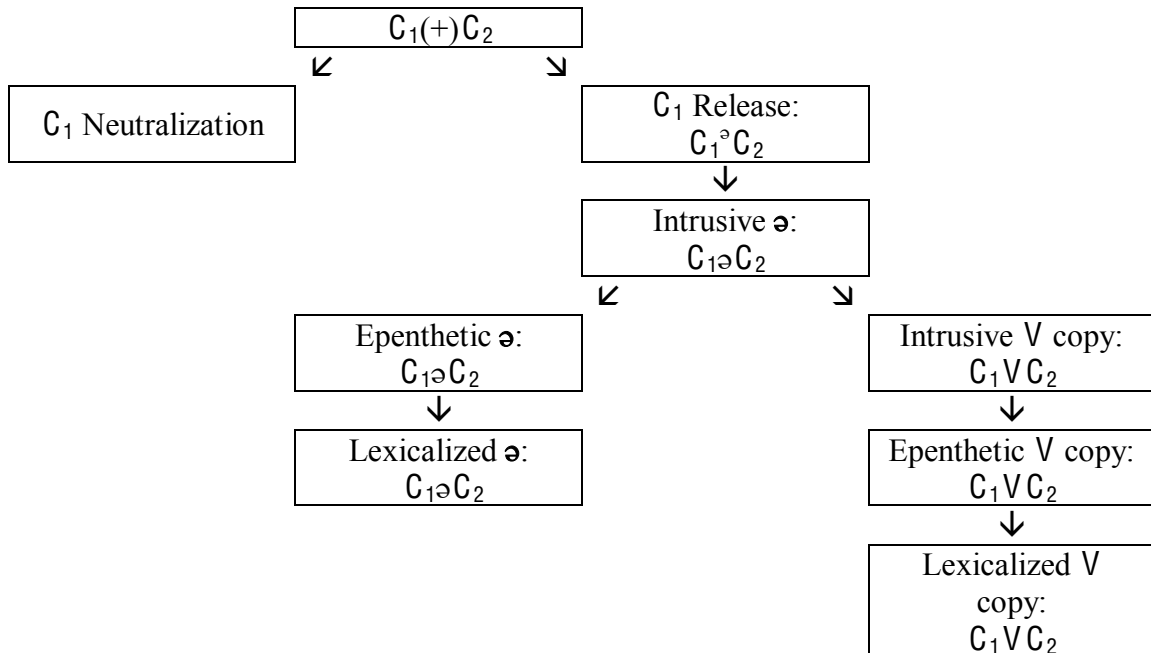
(a) Release into schwa:

Bulgarian	garəbav	hunchbacked
Dutch	kaləm	quiet
English (dialects)	arəm	arm
German (S. Hamburg)	bəʁatən	to fry
Irish Gaelic	'agələ	fear
	'gorəm	blue
Saami	skuol:əfi:	owl
Sanskrit	darəʃata	?

(b) Release into a vowel copy

Arbore	lefi+e+t+atto	that ewe
Chamicuro	tuʔulu	chest
Finnish	kalavo	transparency
Hausa	k^wuruk^wurtu	small drum
Hocank (Winnebago)	sini	cold
	ho:ʃəge+rə	the Hocank
Hua	okurumaʔ	sky
Kekchi	paʔat	twins
Lakhota	gala	no gloss
Late Latin	skriptum	a writing
Mamainde	mih+i+takʔu	it is cloudy
Mono	gàfūrū	mortar
Negev Bedouin Arabic	ga'hawa	coffee
Oscan	múlúki:s	name
	paterei	father
Popoluca	itaʔa	your father
Scots Gaelic	jal^vak	hunting
Spanish (Chilean)	koronika	chronicle
Tiberian Hebrew	jalah+a+t	you (fs) sent

(2) Theoretically plausible diachronic routes of C₁(+)C₂



- Proposal: If neutralization of C₁ does not induce excessive homophony, a language might be more able to tolerate this neutralization due to C₁ “unrelease”. However, if a language

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
			kə 'rja	work
b.	σ'σσ	əσ'	sətə' lah	after
c.		σə'	' gamə lan	Indo. orchestra
d.	,σσ'σσ	σ'σəσ	a' partə men	apartment
e.		ə'σəσ	tʃə' ritə ra	story
f.		əσ'σ	pə'rə m 'puan	woman
g.		σə'σ	kopə' rasi	cooperation
h.	,σσ,σσ'σσ	,σəσσ'σ	, difə rens'i'asi	differentiation
			, divə rsifi'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. 'soufə *sofa*, ə'bæut *about*
Epenthetic, e.g. 'brændəd *branded*, 'tɛmtəd *tempted* 'dʒʌdʒəz *judges*, 'brʌʃəz *brushes*) Third,
Reduced, (rəlæks *relax* – rɪlæksɪ'n *relaxation*; 'æɪəm *atom* – 'ætə'mɪk *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 pV₁pəpV₂pə for a single American English speaker, where V₁ and V₂ were all possible combinations of **i, e, a, ʌ, 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 *ˈtʃʰamə china* or *ˈkʰamə 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 $\text{ə} \sim \emptyset$ alternation

Schwa-zero alternation in Hindi

- Schwa alternates with zero in would-be VCəCV contexts, provided that it is not the first vowel of the morpheme

(4)a.	pitʃka	squeezed	pitʃək	squeeze
	piɠʰla	melted	piɠʰəl	melt
	dewrani	brother-in-law’s wife	dewər	brother-in-law
	nəmkin	salty	nəmək	salt
	sɪski	a sob	sɪsək	sob
	hɪrni	doe	hɪrən	deer
	tət̪pa	cause to be restless	tət̪əp	restlessness
	wapsi	on return	wapəs	return
	upri	pertaining to the top	upər	top
	ub̪tən	an unguent	ub̪ət̪na	to anoint
	gərdʒila	thunderous	gərd̪ʒna	to thunder

b.	a+səməj	asəməj	inopportune
	ə+fərir	əfərir	without body
	ə+kələŋk	əkələŋk	spotless
	ku+fəkun	kufəkun	bad omen

- Hindi schwa derives from Sanskrit ****ə** and short ****a**. In Old Hindi, this vowel, and also, some instances of other short vowels (***ɪ** and ***ʊ**), alternated with zero in ***VCVCV_i** 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 **VCəCV** to **VCCV**.
- Why not schwa deletion in **VCCəCV** and **VCəCCV** 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: **VCCəCV** and **VCəCCV** do not alternate with **VCCV**.
- Exceptions:

(5)	kadəmbri ~ kadəmbəri	a novel, name for a girl
	ustra ~ ustəra	razor
	puṇḍrik ~ puṇḍerik	white lotus
	məṇḍzri ~ məṇḍzəri	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	
		tumyə+ret	group of comrades
		məmlə+jocy+ən	pail
		qejŋə+yiniw	lots of brown bears
	b.	C+əCC	
		watap+ənlan	place without moss

rʔew+ətʔul	whale meat
nəm+ətku+n	group 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			
		pəne+k	to grind	ye+mne+lin	past tense
		təm+ək	to kill	ye+nmə+len	
		tənut+ək	to swell	ye+nnut+lin	
	b.	CəC#			
		qepəl	ball	qepI+e	erg.
		miməl	water	memI+aratyayən	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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