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# Synchronic and Diachronic Typology: The Case of Ejective Voicing\*

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# 1. Introduction

Although ejectives are the fourth most common type of stop (Henton, Ladefoged, and Maddieson (1992)), and occur in approximately 20% of the world's languages (Catford 1992), there is relatively little known about their phonological behavior in both synchronic rules and diachronic sound changes. And yet ejectives have now become an important area of research in both phonological theory and in historical linguistics. In phonology, ejectives are important in evaluating the alleged privativity of laryngeal features (Lombardi 1991, 1995) and in testing the possible rule types such as spreading and delinking within autosegmental phonology (McCarthy 1988, Clements and Hume 1995). In historical linguistics, the behavior of ejectives has become central to Indo-European studies in light of the Glottalic Theory. In this paper I will focus on putative cases of ejective voicing by examining phonological data from both synchronic and diachronic sources1. The remainder of this section will discuss the background and issues at stake in phonological theory (1.1) and in historical linguistics (1.2). In section 2, I examine putative cases of ejective voicing and show that the direct laryngeal feature changing is not necessary. I then turn to look at several diachronic cases of ejective voicing in section 3. Loanwords with ejectives provide several cases of ejective voicing and these are discussed in section 4. Conclusions are drawn in section 5.

1.1 Phonological background

In the generative phonology of *The sound pattern of English* (Chomksy and Halle 1968), the evaluation metric of phonological rules could not formally distinguish between common rules of assimilation (1a) and unattested rules of random changes (1b), which both had the same formalism:

(1a).  $[+syllabic] \rightarrow [+nasal] / __ [+nasal]$ (1b).  $[+anterior] \rightarrow [+high] / __ [+round]$ 

In Clements (1985) the formalism of feature geometry organized phonological features into hierarchical class nodes, grouping, for example, laryngeal features under one node, and place features under another. This model allowed common sound changes such as assimilation to be expressed naturally, while uncommon sound changes were either impossible to express or more complicated (see McCarthy 1988). Thus in this model, assimilation is viewed as the spreading of one feature by creating an association line from one segment to another, for example. Dissimilation is viewed as delinking of a feature with subsequent default fill-in. In addition, in Clements and Hume (1995), feature-changing rules are admitted only reluctantly. They suggest that feature-changing rules involving such features as [sonorant], [vocoid], and [continuant] 'may be required to express processes of strengthening and weakening'. No suggestion is made that laryngeal features may be changed directly. This is a falsifiable hypothesis, and may be disproven empirically if there are indisputable cases of, say, laryngeal features which change from one feature to another directly. In this paper, I will look at

potential cases which illustrate alternations between ejective and voiced, but will conclude that other explanations are possible. Thus phonological theory does not need to express such laryngeal alternations through feature changing.

1.2. The Glottalic Theory and typology

The Glottalic Theory of Proto-Indo-European (PIE) posits that traditionally reconstructed PIE voiced stops should be reinterpreted as glottalic consonants (usually ejectives). It was formulated initially by Gamkrelidze and Ivanov (1972; see also 1973, 1984, 1995) and somewhat independently by Hopper (1973), and since then has generated a host of literature (see Salmons 1993 for an accessible overview). A comparison of the traditional reconstruction and the Ejective Model of the Glottalic Theory (Job 1989) is illustrated by the dental series in (2).

(2)	Series	<b>Traditional</b>	Glottalic (Ejective Model)
` ,	Ī	d	ť'
	II	dh	d/dh
	Ш	t	t/th

Advocates of the Glottalic Theory argue that historical reconstructions should be accountable to typological data. The following quote by Gamkrelidze and Ivanov is illustrative:

'Thus reconstructions can be considered real if they are consistent with two basic typological criteria: they must agree with synchronic typological universals and they must agree with diachronic typological universals (general schemas for change and transformation of languages).' (1995:xcv)

Despite this viewpoint, the vast majority of literature surrounding the Glottalic Theory has dealt only with synchronic typology. For example, arguments to support the theory are based on the patterning and gaps of inventories and on root structure constraints.

Regarding diachronic typology, Gamkrelidze and Ivanov note that 'a necessary condition for reality of reconstructions is that they must be consistent with diachronic typological data, with schemas for the change of particular linguistic structures over time, as established by the study of historical facts from individual languages' (1995:xciv-v). This approach implies that the proposed trajectories of sound change should be well documented from attested historical changes. In the Ejective Model, as Job (1989) points out, roughly 75% of the reflexes of the PIE ejectives are voiced stops (in at least seven IE branches, according to Garret 1991), so this model predicts that such a shift should be relatively common. Compare this to the traditional model, in which 75% of the reflexes do not change, while 25% devoice. In his review of Venneman (1989), which deals largely with the Glottalic Theory, Garrett reminds us that:

'while assessments of linguistic plausibility are undeniably necessary in reconstruction, a model of relationship includes not only a proto-language but the set of linguistic events which resulted in the attested daughter languages, and each of these events must also be plausible' (1991:796).

The question, then, is, how plausible is the change from ejective to voiced?

The problem with ejectives is simply that there is not yet a firm schema for change. Although Gamkrelidze and Ivanov discuss the importance of diachronic typology, they provide only one detailed, independent example of such a change (Chechen-Ingush, discussed in Gamkrelidze and Ivanov 1995:44-6, and below). They also briefly mention some cases of voicing of ejective affricates in Northeast Caucasian, as well as dissimilative voicing of ejectives from loanwords. Finally, they mention voicing of Proto-Semitic \*q (\*k'), in Arabic gāl dialects. This is not a firm empirical basis on which to base a proposed diachronic typological 'schema'.

To my knowledge, only Job 1984, 1989 has examined diachronic shifts involving ejectives, and most of his examples are from the languages of the Caucasus. This study, then, will expand our database of sound change by investigating putative cases of ejective voicing, drawing first upon attested synchronic alternations, then diachronic changes, and finally loanword phonology.

# 2. Synchronic alternations

In this section, I will review potential cases of synchronic ejective voicing. The question for phonological theory is whether these cases need to be described in one step involving laryngeal feature changing, or whether there are other explanations at hand. I will argue that all of these cases are explainable through feature delinking and default, or from assimilation, and thus do not require reassessment of the prohibition against direct laryngeal feature changing.

Donnelly (1992) reports that in Xhosa, a Nguni language which has full aspirated, ejective, and breathy-voiced series, in addition to its many clicks, '/k'/ is the only voiceless ejective which tends to be unejected and frequently voiced' (1992:2). In the first syllable of any root, ejection is maintained; however, in non-initial position, the velar ejective is never fully ejected and can always be voiced:

(3)	/-phek'-a/	[-phega]	'cook'
	/bek'-a/	[bega]	'put'
	/-thak'ath-a/	[thagatha]	'bewitch'
	/dak'ad-a/	[dagada]	'tear to pieces, mangle'
	/-kʰok'-a/	[khoga]	'draw out'

This phenomenon of ejective voicing appears to be postlexical and structure-creating, since plain voiced stops are not found underlyingly. (Doke (1967:92) notes a similar process for Zulu, another Nguni language). The question is whether the process takes place in two steps, or in one step. In the orthodox view, first the ejective feature [constricted glottis] is delinked from the laryngeal node of a velar and then there is fill-in of the feature [voice], perhaps by default. (Kiparsky's (1995:646) treatment of intervocalic voicing is incompatible with a privative view of laryngeal features.) On the other hand, if we allow laryngeal feature changing, we can accomplish this rule in one step, in this case [c.g.]  $\rightarrow$  [voice]. However, I believe that we can avoid laryngeal feature changing if we view ejective voicing as the result of the spread of [voice] from an adjacent vowel onto the velar ejective. Although [voice] on vowels is typically underspecified, this rule does appear to be post-lexical, at which point in the grammar many theories assume full specification of segments.

Another possible case of ejective voicing is found in Doke (1967:41), who describes the 'somewhat irregular' process of 'vocalization' in Venda, a Southeastern Bantu language<sup>2</sup>. In the formation of nouns of class 5, the 'unvoiced

explosives' change regularly such that /p' t' t' k'/ $\rightarrow$ /b d d g/. The voiced consonants remain unchanged, e.g. /gona/ 'knee', /magona/ 'knees' (159). (The situation with the fricatives is more complicated and need not concern us here). Examples are given in (4a), in which there is no alternation and the class prefix remains, and in (4b) in which there is alternation between the initial voiced consonants in the singular (without an overt prefix) and their cognate ejectives in the plural:

(4a)	sg.(cl. 5) lino lito lila	<u>pl. (cl. 6)</u> mano mato mala	gloss tooth eye intestine	
(4b)	bako dope daka gumbu	map'ako mat'ope mat'aka mak'umbu	cave mud bush big calabash	(Doke 1967: 157)

According to Doke, 'in each case the unaffected stem consonant is shown in the plural, the voiced consonant of the singular indicating the action of the suppressed prefix li-' (157). That is, the noun class 5 prefix disappears and there is concomitant mutation ('vocalization') of the initial root consonant. The plural prefix, /ma-/ in class 6 nouns, shows the initial stem without such voicing.

It is possible to interpret this as an instance of (morphologically restricted) ejective voicing due to feature changing, but this view is otherwise unmotivated. Another possibility would view this as the assimilatory spreading of [voice] from the prefix marker, which is subsequently deleted. At any rate, although there is clearly alternation between ejective and voiced consonants, it is not obvious that we must adopt a feature-changing approach, so I propose that this is another case of the assimilatory spreading of [voice].

Another possible case of ejective voicing is found in the Daghestanian language Lezgian, which has four underlying series of stops: ejective, voiced, voiceless aspirated, and voiceless unaspirated, and thus it is an ideal language on which to test theories of laryngeal feature-changing, especially since it has many unusual laryngeal alternations. I will ultimately argue that Lezgian alternations between ejective and voiced sounds are due to the role [voice] plays as a default laryngeal feature.

Following Lombardi's (1991) approach, I propose that Lezgian stops are represented as follows:

(5) a. voiceless unaspirated	b. voiceless aspirated	c. voiced	d. ejective
root	root	root	root
(Lar)	Lar	Lar	Lar
	[s.g.] (=[asp	]) [voice]	[c.g.] (=[gl])

All stop series except the voiceless unaspirated bear a single, privative laryngeal feature. The voiceless unaspirated stops do not bear any laryngeal feature and therefore the laryngeal node itself is not present. Normal cases of laryngeal neutralization involve the delinking of a laryngeal feature, typically in syllable- or word-final position. The neutralized consonant, then is a plain voiceless unaspirated consonant. In Lezgian, however, there is a constraint against word-final unaspirated stops (Haspelmath 1993). In current theories, this would have to be expressed as a positive licensing constraint that all word-final stops must have a laryngeal node, since we cannot ban nodes which are not present. This constraint thus accounts for the presence of word-final voiced, aspirated, and ejective stops, and the absence of voiceless unaspirated stops.

Lombardi notes that languages may have marked default consonants. Lombardi (1995:39) states that:

It would be possible to analyze neutralization to voiced (or other laryngeally marked) obstruents in this system, if an authentic case were found. It would require [a rule delinking the laryngeal node], and then a specific rule of fill-in of [voice] (or other feature) on unmarked sounds. This is obviously more complex than linking alone, which explains why it never occurs (or if such a case were found, it would account for its extreme rarity).

I propose that Lezgian could be a language in which the marked feature [voice] is such a default. I should note here that this is not always the result of default, and occurs only in certain morphological environments. Let us first examine the rule involving alternations between ejectives and voiced consonants, and then the evidence for [voice] as a default.

Lezgian shows alternations between word-final ejectives and voiced stops when there is a preceding ejective in a closed class of lexical items. Compare the following forms from Haspelmath (1993:61):

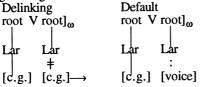
(6)	Ergative Singular	Absolutive Singular		
	q'ep'ini	q'eb	'cradle'	
	t'ap'uni	t <sup>3</sup> ab	'block'	

Another rule of [c.g.] Dissimilation (Haspelmath's Pre-ejective Ejective Aspiration) deglottalizes the preceding consonant when there is an intervening high vowel. In these cases, the first root ejective in the singular is deglottalized, and after a syncope rule due to stress shift in the absolutive singular, the stop is subsequently aspirated phonetically. The final consonant, which is an underlying ejective, undergoes Deglottalization in the absolutive singular, as it did in (6) above. The following are thus additional examples of the same alternations between ejectives and voiced stops.

(7)	<u>UR (pl.)</u>	SR (Plural)	Abs. Sg.	
	t'up'ar	thwp'ar	t'ub	'finger'
	t∫'ip'er	t∫ <sup>h</sup> p'er	t∫'ib	'span'
	ts'ip'er	ts <sup>hj</sup> p'er	ts'ib	'pot'
	t'ip'er	t <sup>hj</sup> p'er	t'ib	'owl'
	ts'ik'er	ts <sup>hj</sup> k'er	ts'ig	'middle'
	q'yt'er	q <sup>h</sup> чt'er	q'yd	'winter'

I formalize the rule as follows:

(8) Lezgian Deglottalization and Default voicing



(Morphologically restricted to some nouns in the absolutive singular)

This rule states that in the absolutive singular, the second of two ejectives dissimilates to become voiced, first by deglottalization and then by default fill-in of [voice]. As noted above, these alternations are restricted to a closed class of lexical items. There are many instances of ejectives in word-final position, even in the absolutive singular, e.g. /k'uk'/ 'peak' and /q'yt['/ 'armpit'.

Next we will examine some other aspects of Lezgian laryngeal phonology to motivate the view that [voice] is the default consonant. Haspelmath notes that there is a ban on word-final unaspirated stops. One rule which is relevant to determining the status of [voice] as a default feature is found in the rule Haspelmath calls Word-final Unaspirated Voicing. There is a regular alternation in all monosyllabic nouns between root-final voiceless unaspirated stop and the corresponding voiced stop word-finally. Compare the following:

(9)	<u>Plural</u>	Abs. sg.	<u>Gloss</u>
	jeper	jeb	string
	gatar	gad	summer
	pakwar	pag <sup>w</sup>	side, rib

The voiced equivalents of /tʃ, ts, q/ are /3, z, ʁ/, respectively. (Most dialects of Lezgian have lost the historical \*d3, \*dz, \*G). Because all consonants must have a laryngeal node word-finally, there appears to be a feature default of [voice], which accounts for the alternation between voiceless unaspirated and voiced in word-final position.

Additional evidence for this is found in certain reduplicated imperatives. The final consonant of the stem is reduplicated as a voiceless unaspirated plosive after the morphemic /-u-/, as shown in (10):

(10)	<u>Masdar</u>	<u>Imperative</u>	<u>Gloss</u>
• •	k-u-n	k-u-g	burn
	k <sup>h</sup> uts-u-n	khuts-u-z	pour
	q-u-n	d-n-R	fall (precipitation)

We have thus seen some evidence to suggest that the feature [voice] may be the default consonant in Lezgian. This may be due to the typologically unusual requirement that word-final consonants bear a laryngeal node. Because [voice] is the default consonant, laryngeal feature changing is not required. Instead, through delinking and default, we may preserve the more highly constrained system which prohibits direct feature changing (at least within laryngeal features).

Next, we will look at a case in which ejectives vary, apparently freely, between ejective and voiced. Coast Tsimshian (Dunn 1979), a Penutian language, has voiced, voiceless, and ejective plosives. The language apparently has free variation between ejectives and voiced stops. Regarding the ejective series, Dunn notes that 'glottalized segments often simplify by losing the glottalization and then becoming voiced' (1979:12). Dunn does not, however, provide evidence that this process is accomplished in two steps. He gives the following examples of the free variation:

(11)	k'wili q'asq'oos	gwylii Gasgoos	'three (general number)' 'crane, stork'
	q'asq'adzn	gasgadzn	'ants'
	ts'awes	dza?west	'salal'
	galts'ap	Galdzap	'town'

These examples are thus in free variation, which shows additional synchronic evidence for the alternation between ejectives and voiced stops.

Finally, an alleged case of ejective voicing is found in the Salishan language Tillamook, as reported by Edel 1939 and Reichard 1958-1960. These authors report that Tillamook has voiceless aspirated, "intermediate" (i.e., it alternates between voiceless unaspirated and voiced), and ejective plosives. In certain reduplicated forms such as the diminutive and verbal frequentative, the initial consonant of the reduplicated form shows a voiced member, while the root maintains its ejection. (Voiceless stops also show this alternation). For example,

(12)	Word	Gloss	<b>Diminutive</b>	Gloss
	t'ijĭighu	man	dut'ijíkhu	boy
	ts'.q		s-dzats'.q-æn	
	t'.tʃ	to shoot	da∫-ďi:t't∫-en	he shot it till he killed it

Thompson and Thompson (1966) reanalyzed the language on more contemporary phonemic terms and in light of other Salishan languages. They proposed only two phonemic series, voiceless unaspirated and ejectives. Aspirates are treated as clusters of consonant plus /h/. The case of reduplicative voicing described above would currently be handled as delinking the laryngeal node of the initial ejective reduplicative consonant under pressure from the Obligatory Contour Principle, which resolves the violation through dissimilation. Thompson and Thompson also posit what would currently be called a postlexical rule in which plain obstruents (and presumably laryngeal-less segments, in my re-analysis) are 'regularly partially or fully voiced in position directly before vowels'. Thus phonologically there is feature delinking, not feature changing. And for those ejectives that do get (partially) voiced, this is accomplished in two steps, delinking plus the postlexical rule which spreads [voice] regressively from a following vowel.

# 3. Diachronic ejective voicing

As mentioned above, in Gamkrelidze and Ivanov (1984, 1995) the only detailed evidence given for a diachronic change from ejective to voiced stop is found in the Nakh languages Chechen and Ingush. Gamkrelidze and Ivanov posit that Chechen and Ingush non-initial ejectives changed to voiced stops, while Bats (Tsova-Tush) maintains the Proto-Nakh ejectives in this position. I should note that this interpretation has not gone unchallenged by some Soviet scholars, and

most recently by Job (1989). However, the foremost Western scholar on the Nakh languages, Johanna Nichols (1993; see also her note in Gamkrelidze and Ivanov 1995:47), provides additional convincing evidence regarding loanwords and

cognate Daghestanian languages.

In initial position, all three stop series (ejective, aspirated, and voiced) correspond. In non-initial position, the Nakh voiceless stops all correspond. The voiced stops in Bats correspond to zero or a glide in Chechen-Ingush. The ejectives in Bats correspond to voiced stops in Chechen and Ingush, with the exception of uvular ejectives, which remain unchanged. Here follow some examples of this correspondence between voiced consonants in Chechen and Ingush, and ejectives in Bats:

(13)	<u>Chechen</u>	<u>Ingush</u>	<b>Bats</b>	Gloss
	nab	nab	nʕap'	sleep
	ſad	[o <u>d</u>	ſa <u>t'</u>	knot
	phagal	phagal	phak'al	hare
	k'ezi	k'a <u>z</u> a	k'a <u>ts'</u>	puppy
	hazar	hazar	ħa <u>t['</u> ar	to look
	juq <sup>-</sup> '	ju <u>q'</u>	ju <u>q'</u>	middle

It is highly likely that the intervocalic deletion of the voiced stops (not shown here) and the voicing of ejectives could be conceived of as part of the same lenition process. It is possible, as David Odden (p.c.) has suggested, that the ejectives were deglottalized and that the resulting voiceless unaspirated stops were reinterpreted as voiced stops. Perhaps this is a more common phonetic path. Or perhaps there was simply direct spread of voicing from an adjacent vowel. But what is important for the Glottalic Theory is to establish that the change from ejective to voiced is both possible and plausible.

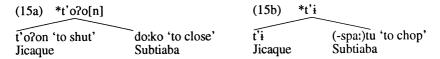
The implications of a change from ejective to voiced for the Ejective Model have also been noted by Colarusso (1981), who notes that in the Northwest Caucasian language Abaza, the Anatolian dialect has developed voiced variants of two morphemes in final position. (See also Lomtatidze and Klychev 1989:110).

(14) Standard Abaza	Anatolian Abaza	Gloss
a. /s-t[' <sup>jw</sup> a-p'/	/s-tʃ <sup>'jw</sup> a-b/	'I sit, I am sitting'
b. /s-Św-i-t'/	/s-Św-j-d/	'I write, I am writing'

Apparently, however, this process occurred only in these two morphemes and was

not a regular process.

So far, the examples we have seen do not provide evidence for the exact type of change needed by the Ejective Model; namely, a wholesale change of all ejectives, especially in initial position. There is one possible example of initial ejective voicing from the under-documented Hokan languages Jicaque-Subtiaba (Oltrogge 1977). Oltrogge notes that Proto-Jicaque-Subtiaba \*t' remains ejective in Jicaque while it voices initially in Subtiaba, but deglottalizes elsewhere. The only example provided by Oltrogge is given in (15):



Thus, although this example looks promising for the Ejective Model, there must be more comparative work done before the sound change can be securely accepted. There are other sparsely documented changes from ejective to voiced in other languages discussed in Fallon (forthcoming). Other putative changes from ejective to voiced have also been reported, but these include cases such as Proto-Semitic (and Proto-Indo-European), mentioned above, in which the reconstructed forms are hotly contested. It is therefore important to try to seek independent cases to assess the plausibility of ejective voicing. Next we shall examine how ejectives became voiced in the course of loanword phonology.

# 4. Loanwords

Loanword adaptation can also shed light on phonological processes involving ejectives. Kartvelian languages provide interesting examples of several types of loanword adaptation. All Kartvelian languages have voiceless (aspirated), voiced, and ejective series of stops. Georgian loanwords (some themselves adapted from Greek) which contained two ejectives within a root were often changed by dissimilation to voiced consonants in the borrowing language. In the following examples, the initial ejective became voiced in Svan.

Svan (Schmidt 1991)

(16)	Georgian	<u>Svan</u>	Gloss
	k'ak'-ali	gak'	'walnut'
	p'ap'a (Ming.)	bap'	'priest'
	p'et're	bet're	'Peter'
	kat'o	gat'	'bran'
	Rut 0	gai	oran

The process is presumably the result of an OCP-driven constraint against two ejectives within a root. In some cases, however, perhaps from a different period of loans, the second consonant voiced, as in the following example:

(17)	<u>Georgian</u>	<u>Svan</u> <u>Gloss</u>	
	t∫'ak'i	t∫'äg 'mare'	(Schmidt)

In still other examples, Svan ejectives apparently became voiced after preceding sibilants, as the following examples illustrate.

(18)	Georg.	<u>Svan</u>	Gloss	
	la∫k'ari	la∫gär	army	
	skeli	sgeli	thick	
	∫keri	Jger	Black Sea rhododendron (F	Rogava 1982)

Georgian loanwords into the Indo-Iranian language Ossetic, spoken in the Caucasus, often dissimilated the first of two ejectives in a root (Rogava 1982), as we saw in Svan above.

(19)	Georgian	Ossetic	Gloss
	p'it'na	bit'na	mint
	t'ik'i	dik'i/ditʃ'i	wineskin
	p'ark'i	bark'i/ bartʃ'i	small bag, little sack
	k'ot'ofi	got'oʃi	banočka (for bloodletting)
	kotfora	gotsora	crested

(19) Georgian Ossetic Gloss
p'et're bet're Peter
p'at'ara liaxvi bat'ara liaxvi Malaja Liaxvi (river)

In sum, loanword phonology provides rich examples of ejective voicing. Many of these are the result of dissimilation. It is unusual in these cases that the default consonant appears to be voiced.

### 5. Conclusion

In this paper, I have examined putative cases of ejective voicing, which is an important testing ground on two fronts. Phonologically, direct ejective voicing could have forced a re-examination of the assumption that laryngeal features cannot change automatically. This assumption falls out of restrictions imposed by phonological theory to try to constrain the different possible rule types. We have seen that all putative cases of ejective voicing may be explained by other means: by the spread of [voice] from vowels (Nguni languages) and from a particular morpheme (Venda), or by the treatment of voice as a default (Lezgian). This does not, however, deny the plausibility of the Ejective Model of the Glottalic Theory, since there were several examples of diachronic ejective voicing. The example from the Nakh language is good testimony, though perhaps it is a moot point whether it was the result of deglottalization and then voicing or simply the spread of voice from adjacent vowels. We saw additional evidence from Anatolian Abaza, though this was limited to two morphemes. Additional possibilities were found in Proto-Jicaque-Subtiaba, which is unfortunately not as robust an example as one would like. Finally, we have seen evidence from loanword phonology, often involving dissimilatory voicing of ejectives.

In sum, through an informed interplay between synchronic and diachronic phonology, scholars interested in the behavior of sounds can provide complementary views of the same phenomenon. In this case, examination of ejective voicing provides confirmation of current phonological theories which constrain types of phonological processes, and illuminates the diachronic typology of sound changes for the historical linguist.

## Notes

- \*. I am grateful to David Odden for valuable discussion and detailed comments, though I have not always followed his suggestions. Funding for travel to the BLS conference was provided by the Ohio State University Department of Linguistics Language Files funds.
- 1. A fuller treatment of ejective voicing is found in Fallon (forthcoming), upon which this study draws. The phonetic evidence discussed at the conference presentation are not given here due to space limitations but may be found in Fallon (forthcoming).
- 2. David Odden (p.c.) notes that in most Southern Bantu languages (except Shona), there is no contrast between voiceless unaspirated stops and ejectives. He claims that the fact that nonaspirate voiceless stops are pronounced as ejectives in these languages is a phonetic fact and that there is no phonological evidence that these are true ejectives. Although I respect Odden's expertise on Bantu matters, I prefer to posit underlying ejectives without convincing evidence to the contrary.

# References

- Catford, J.C. 1992. Caucasian phonetics and general phonetics. Caucasologie et mythologie comparée, Actes du Colloque international due CNRS IVe Colloque de Caucasologie (Sèvres, 27-29 juin 1988), ed. by Catherine Paris, 193-216. Paris: Peeters.
- Chomsky, Noam and Morris Halle. 1968. The sound pattern of English. New York: Harper and Row. Reprinted 1991, Cambridge, MA: MIT Press.
- Clements, G.N. and Elizabeth V. Hume. 1995. The internal organization of speech sounds. Handbook of Phonology, ed. by John Goldsmith, 245-306. Cambridge, MA: Blackwell.
- Colarusso, John. 1981. Typological parallels between Proto-Indo-European and the Northwest Caucasian languages. Bono homini donum: Essays in historical linguistics in memory of J. Alexander Kerns, (Amsterdam Studies in the Theory and History of Linguistic Science, Series IV—Current Issues in Linguistic Theory, 16), ed. by Yoël L. Arbeitman and Allan R. Bomhard, Pt. 1, 475-557. Amsterdam: John Benjamins.
- Doke, C.M. 1967. The Southern Bantu languages. (Handbook of African Languages). London: Dawsons of Pall Mall.
- Donnelly, Simon. 1992. On the representation of aspiration harmony in Xhosa. Urbana-Champaign, IL: University of Illinois Ms.
- Dunn, John Asher. 1979. A reference grammar for the Coast Tsimshian Language. (National Museum of Man Mercury Series; Canadian Ethnology Service Paper no. 55). Ottawa: National Museums of Canada.
- Edel, May M. 1939. The Tillamook language. International Journal of American Linguistics 10.1-57.
- Fallon, Paul D. Forthcoming. The synchronic and diachronic phonology of ejectives. Columbus, OH: Ohio State University dissertation.
- Gamkrelidze, Thomas V. and Vjačeslav V. Ivanov. 1972. Lingvističeskaja tipologija i rekonstrukcija sistemy indoevopejskix smyčnyx. Konferencija po sravitel'no-istoričeskoj grammatke indoevropjskix jazykov, pradvaritel'nye materaly. Moscow: Izdatel'stvo Nauka.
- Gamkrelidze, T. and V. Ivanov. 1973. Sprachtypologie und die gemeinindogermanischen Verschlüsse. Phonetica 27.150-6.
- Gamkrelidze, Thomas V. and Vjačeslav V. Ivanov. 1984. Indoevropejskij jazyk i indoevropejcy: Rekonstrukcija i istoriko-tipologičeskij analiz prajazyka i proto kul'tury. Tbilisi: Izdatel'stvo Tbilisskogo Universiteta.
- Gamkrelidze, Thomas V. and Vjačeslav V. Ivanov. 1995. Indo-European and the Indo-Europeans: A reconstruction and historical analysis of a protolanguage and a proto-culture. 2 vols. (Trends in Linguistics, Studies and Monographs, 80). Trans. by Johanna Nichols. Ed. by Werner Winter. Berlin: Mouton de Gruyter.
- Garrett, Andrew. 1991. Indo-European reconstruction and historical methodologies. Review of The new sound of Indo-European: Essays in phonological reconstruction, ed. by Theo Venneman. Language 67:4.790-804.
- Haspelmath, Martin. 1993. A grammar of Lezgian. (Mouton Grammar Library, 9). Berlin: Mouton de Gruyter.
- Hayward, K.M. 1989. The Indo-European language and the history of its speakers: The theories of Gamkrelidze and Ivanov. (Review of Gamkrelidze and Ivanov [1984]). Lingua 78.37-86.Heine, Bernd Von.

1975. Ik - eine ostafrikanische Restsprache: Historische Entwicklung und Vokabular. Afrika und Übersee 59.31-56.

Henton, Caroline, Peter Ladefoged, and Ian Maddieson. 1992. Stops in the world's languages. Phonetica 49.65-101.

Hopper, Paul J. 1973. Glottalized and murmured occlusives in Indo-European. Glossa 7.141-66.

Job, Michael. 1984. Das "Glottale Modell" des Proto-Indogermanischen und die kaukasischen Sprachen. Georgica 7.34-37.

Job, Michael. 1989. Sound change typology and the 'Ejective Model'. In Venneman 1989, 123-36.

Kiparksy, Paul. 1995. The phonological basis of sound change. The handbook of phonological theory, ed. by John Goldsmith, 640-70. Cambridge, MA: Blackewell.

Lombardi, Linda. 1991. Laryngeal features and laryngeal neutralization. Amherst, MA: University of Massachusetts, Amherst dissertation.

Lombardi, Linda. 1995. Laryngeal features and laryngeal neutralization. The Linguistic Review 12.35-59.

Lomtatidze, Ketevan and Rauf Klychev. 1989. Abaza. The indigenous languages of the Caucasus, vol. 2: The North West Caucasian languages. (Anatolian and Caucasian Studies), ed. by B. George Hewitt, 89-154. Delmar, NY: Caravan Books.

McCarthy, John J. 1988. Feature geometry and dependency: A review. Phonetica 43.84-108.

Nichols, Johanna. 1993. The Nakh-Daghestanian consonant correspondences. Paper presented at the Eighth Biennial NSL conference, Chicago.

Oltrogge, David. 1977. Proto Jicaque-Subtiaba-Tequislateco: A comparative reconstruction. Two studies in Middle American comparative linguistics. (Summer Institute of Linguistics Publications in Linguistics, 55), (ed.) by david Oltrogge and Calvin Rensch, 1-52. Dallas: Summer Institute of Linguistics and Arlington: University of Texas.

Reichard, Gladys A. 1958-1960. A comparison of five Salish languages: I. International Journal of American Linguistics 24.293-300. II: IJAL 25.8-15; III: IJAL 25.90-6; IV: IJAL 25.154-67; V: IJAL 25.239-53; VI: IJAL 26.50-61.

Rogava, G.V. 1982. K voprosy o zakonomernosti dissimiljativnogo ozvončenija gluxix smyčnyx. Ežegodnik Iberijsko-Kavkazskogo Jazykoznanija 9.22-8.

Salmons, Joseph C. 1993. The Glottalic Theory: Survey and synthesis. (Journal of Indo-European Studies Monograph Series, 10). McLean, VA: Institute for the Study of Man.

Schmidt, Karl Horst. 1991. Svan. The indigenous languages of the Caucasus, vol. 1: The Kartvelian languages. (Anatolian and Caucasian Studies), ed. by Alice C. Harris, 473-556. Delmar, NY: Caravan Books.

Sommerfelt, Alf. 1938. Études comparatives sur le caucasique du nord-est. Norsk Tidsskrift for Sprogvidenskap 9.115-43.

Thompson, Laurence C. and M. Terry Thompson. 1966. A fresh look at Tillamook phonology. International Journal of American Linguistics 32.313-9.

Venneman, Theo (ed.) 1989. The new sound of Indo-European: Essays in phonological reconstruction. (Trends in Linguistics: Studies and Monographs, 41). Berlin: Mouton de Gruyter.