XX. LINGUISTICS*

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A. EXTRAPULMONIC CONSONANTS (EJECTIVES, IMPLOSIVES, CLICKS)

In the studies devoted by G. Akhvlediani to the manifold questions of general and Georgian phonetics, important conclusions have been drawn from observing the ejective (alias "glottalized") consonants of the Kartvelian languages.[1] The investigator elicited the ternary structure of the Georgian stops; each ejective (or "abruptive," in Akhvlediani's personal terminology) enters into a triad of correlative phonemes; the other two subsets of this triadic set, on the one hand, are aspirates, and on the other, "voiced" stops, as they are labeled conventionally. The careful research accomplished by Georgian phoneticians definitely proved that voicing does not act as a constant distinctive property of these phonemes; in certain positions, e.g., in the anlaut or in the neighborhood of aspirates, they become voiceless but still differ from the aspirates by "the weak, lax pronunciation which appears to be their integral property in any position."[2] Thus, the Georgian phonemic system displays a coexistence of two autonomous consonantal oppositions: 1) _tense~lax_ (with voicing of lax consonants as their contextual,

*This work was supported by the National Institutes of Health (Grant MH-13390-02) and the Joint Services Electronics Programs (U.S. Army, U.S. Navy, and U.S. Air Force) under Contract DA 28-043-AMC-02536(E).

incidental concomitant), and 2) *checked~unchecked*.[3] The tenseness is implemented by aspirate fortes, and the checked character by ejectives. A particularly sharp distinction of these two binary features is observable, e.g., in the Andian language in which in certain consonantal classes both checked (ejective) and unchecked (purely pulmonic) phonemes participate in the opposition *tense~lax*. Thus, for instance, this language distinguishes four voiceless hushing affricates, transcribed by T. Gudava as $\underline{\check{c}}$ (lax unchecked), $\underline{\check{c}}^{\text{ə}}$ (tense unchecked), $\underline{\check{c}̣}$ (lax checked), $\underline{\check{c}̣}^{\text{ə}}$ (tense checked); and, moreover, one corresponding voiced affricate, ǯ.[4] Such a state of affairs must be distinguished from the phonemic status of those languages which display merely a differentiation of aspirates and ejectives. This undissociable dyad actually implements the binary feature *tense~lax* with an underscored contrast between the two opposites, of which the latter exhibits a lowered air pressure in the cavity. In such cases the ejective mechanism is but a concomitant, redundant accessory of lax consonants. Also in those languages in which the two voiceless series of aspirates and ejectives are supplemented by a third phonemic series of constantly voiced consonants, the two sole features involved are *tense~lax* and *voiced~voiceless*, as in languages with such phonemic triplets at /*th*/~/*t*/~/*d*/.

In languages that display two autonomous distinctive features, *tense~lax* and *checked~unchecked*, the checked phonemes may be implemented either as ejectives or as implosives. The common property of these two phonetic varieties is the action of an extrapulmonic airstream. As it was formulated repeatedly, e.g., recently by Ladefoged, the glottalic variety of the mentioned mechanism "is involved in the production of two kinds of sounds: ejectives, in which the closed glottis moves rapidly upwards and compresses the air behind an articulatory closure; and implosives, in which there is a downward movement of the closed glottis, which tends to cause a lowering of the pressure behind the oral closure."[5]

To our knowledge, no language makes use of a distinction between ejective and implosive phonemes, all other features of these phonemes being equal, but there are languages in which some of the phonemes produced with a merely pulmonic airstream are opposed to ejectives and some others of them to implosives. For example, voiceless stops are subdivided into pulmonic and ejective phonemes, and voiced stops into pulmonic and implosive phonemes. We also observe cases in which ejectives and implosives are in free, stylistic variation. Obviously such contextual and/or optional variants implement one and the same category of checked plosives as opposed to their pulmonic, i.e., unchecked counterparts.[6]

Clicks whose production indispensably involves a velaric air stream mechanism pertain to the same class of primarily extrapulmonic speech sounds as the two types of glottalic consonants – the ejectives and the implosives. Clicks actually border upon the implosives, as emphasized by D. M. Beach, one of the best inquirers into this peculiarity of South African languages: "The essential feature of a click is the influx of air into the mouth from without, in other words, the implosion."[7] Both the clicks proper and the implosives proper are "inward-drawn phones," all produced by a rarefaction of air. The specific trait of any click is the release of a double obstruction, a pre-velar impediment and a velar closure.[8] The latter is released with an efflux, and the various forms of this release diversify the final phase of the sound.

It appears opportune to extend the phonemic examination to the clicks as the third variety of consonants produced uniquely or chiefly by means of an extrapulmonic rarefied airflow. The difference between clicks and nonclicks, or, in current African terminology, 'plain consonants,' proves in turn to be one of the phonetic implementations of the phonemic opposition *checked~unchecked*. The above-made observation on the nonexistence of any phonemic distinction between ejectives and implosives may be applied to clicks, too. No phonemic distinction takes place between clicks and ejectives or implosives, as long as these glottalic consonants function in the given sound pattern as autonomous constituents of the opposition *checked~unchecked* and not as a mere implementation of lax phonemes opposed to the tense ones.

The lack of discrimination between the independent phonemic opposition *glottalic~nonglottalic* (=*checked~unchecked*) and the cases of its merger with the opposition *lax~tense* has prevented some observers of South African languages from drawing the pertinent conclusion that, in fact, ejectives, implosives, and clicks are *phonemically* incompatible. This deduction means that these three varieties do not show properties that could be, *ceteris paribus*, phonemically opposed to each other within one and the same phonological system or could autonomously function within a bundle of distinctive features. Thus, e.g., the Zulu system[9] of six acute diffuse stops is based on three distinctive features: *voiced~voiceless*, *tense~lax*, and *checked~unchecked*. Of the two tense stops, the unchecked one is implemented by an aspirate alveolar *th* and the checked one by the dental click *ch*; of the two lax stops, the unchecked one is implemented by an ejective alveolar $t^?$ and the checked by the dental click *c*. The two voiced stops are implemented by the alveolar *d* and the dental click *gc*. The inventory of compact stops, namely plain velars (*kh*, $k^?$, *g*) and corresponding palato-alveolar clicks (*qh*, *q*, *gq*), is based on the same three binary features, with the sole difference that the *tense~lax* opposition is expanded upon the unchecked voiced stops: a lax one represented by *g* and a tense one rendered by *k* in Doke's orthography, but with his expressive reminder that the latter sound "has slight voicing" and "is sometimes mistaken by Europeans for *g*."[10] The Zulu language has three unchecked grave diffuse (labial) stops – *ph*, $p^?$, *b* – similar to their acute diffuse (alveolar) counterparts – *th*, $t^?$, *d* – whereas the only checked labial phoneme of this language is implemented by an implosive which, according to Doke, "is, in reality, a species of click sound" but differs "from the true clicks, in that the tongue does not form a rarefaction between the forward and velar points of articulation *** but a rarefaction is formed by the enlargement of the air-passage above the larynx, by moving the larynx down; so that on releasing the lips to pronounce a voiced bilabial, the air momentarily rushes in to fill the rarefied space, a kind of inverted b being the result, followed immediately by the outbreathed vowel."[11] Thus, the checked consonants are implemented in Zulu either as clicks or as implosives; the latter contextual variant occurs only in the bundle with the gravity feature, while the other variety of glottalic sounds, the ejectives, present nothing there but an implementation of lax consonantal phonemes.

One illusory exception from the proposed rule of incompatibility between clicks and ejectives in one and the same phonemic system emerges in linguistic literature. It is in Korana, a regional variety of the Hottentot language. Beach, who devoted the third part of his book to the phonetics of this dialect, states that a century ago the Korana-speaking people lived between the Orange and the Vaal rivers, while now they have almost disappeared, and at the time of the author's field work solely "a few scattered individuals, very old men and women," were still familiar with the Korana dialect.[12] Only a few of those speakers display a "velar glottalic affricative type kx? different from the rest of their click phonemes," while some dialectal varieties of Korana, and in particular the speech of the Griqua, do not use that species of clicks.[13]

Before discussing this peculiar class represented by four separate phonemes and, according to Beach, opposed to the other twenty click phonemes of the same dialect by combining the usual suction with a glottalization, let us first draft a brief survey of the latter twenty phonemes which exhaust the click inventory of the widespread and best studied Nama dialect. Already the earliest serious attempts for a delineation and transcription of Nama undertaken by Tindall[14] and Krönlein[15] revealed the fundamental distinctions underlying the rich inventory of the Hottentot clicks. Beach's phonemically oriented description and his "proposed spelling," a revised version of Krönlein's Hottentot orthography,[16] have actually outlined the bulk of those binary oppositions into which clicks and plain consonants of Nama may be decomposed. N. S. Trubetzkoy's phonemic analysis of the Nama clicks[17] reinterpreted some of the criteria used by Beach and has brought to light their strictly dichotomous character. With a few redefinitions this classification becomes transposed spontaneously into our system of distinctive features:[18]

1. Compact~diffuse, cf. Trubetzkoy's "Hinterlinguale"~"Vorderlinguale"; in Krönlein's and Beach's spelling, graphs with integral prefixes (≠ and /) vs graphs with fractured prefixes (! and //).

2. Continuant~discontinuous, cf. Trubetzkoy's "Reibelaute"~"Verschlusslaute," or in C. M. Doke's terms borrowed by Beach, "drown out"~"instantaneous"[19]; in Krönlein's and Beach's spelling, bare-slant prefixes (/ and //) vs composite prefixes (≠ and !).

3. Nasalized~non-nasalized; the former symbolized in the various spelling patterns

by the postfix n. Further oppositions are confined to the non-nasalized clicks.

4. Tense~lax; cf. Trubetzkoy's "aspiriert"~"unaspiriert" (with an important discussion[20] of Beach's phonetic data); Tindall's spelling with the postfix kh vs k (or k vs g to avoid a digraphic postfix) and with h vs zero is the most adequate.

5. Flat~nonflat; in Trubetzkoy's expressly tentative definition (provided with a cautious vielleicht), "schwer"~"leicht",[21] and in Beach's phonetic description, "glottal" vs "velar" type of final efflux. The specific movements of the glottis involved in the production of the clicks with a "glottal" efflux, as described by Beach, strikingly resemble the motor pattern of the Arabic "ayned," pharyngealized buccals. The essence of their pharyngealization consists in a downward shift and/or weakening of some upper frequency components caused by a contraction of the upper pharynx accompanied by coordinated movements of the hyoid bone and glottis. This subclass of Nama clicks, jointly with the Arabic "mufaxxama," may be viewed as a pharyngealized variety of the "flat" phonemes (cf. Jakobson[22]).

In addition to the twenty click phonemes built of five distinctive features enumerated above, one variety of the Korana dialect exhibits four supplementary clicks. According to Beach's observations,[23] after the suction influx and the release of the prevelar closure, "an efflux, due to the pressure from the larynx, is made by lowering the back of the tongue from the velum, resulting in a velar scrape." Precisely this velar scrape, and not the subsequent "release at the glottis," offers the relevant particularity of the clicks which belong to Beach's "velar glottalic" type. Correspondingly, the larger inventory of plain consonants attested in the same dialectal variety of Korana includes two additional phonemes in comparison with Nama, namely the "glottalic affricates kx? and ts?", as defined by Beach.[24] The most characteristic property of kx? is "the explosion at the velum resulting in a sound which has been likened to a scrape" and just in contradistinction to this strident scrape, the kh phoneme of the dialect under discussion is "pronounced usually as a clear plosive instead of an affricate,"[25] whereas the corresponding, "strongly aspirate" phoneme in Nama is provided with a concomitant, redundant affrication.[26] The other of the two correlative consonants observed in Korana by Beach and transcribed as ts?, sounds, according to his report, "sharper, more sibilant, and less breathy" than the tense th in Nama, despite a concomitant affrication of the latter sound. As to the tense phoneme th of Korana, it is, at least in its main allophone, a clear-cut stop, pronounced with strong aspiration and without any affricative admixture (Beach[27]) in contrast to its opposite – the less breathy and more sibilant "ts?".

Stridency turns out to be the true distinctive feature of the two Korana affricates and of the four clicks described as "glottalic" by Beach. In the Hottentot spelling pattern, the strident feature of the peculiar Korana clicks could be rendered by a postfixed q, since the letter q is frequently used in phonetic literature for discerning the strident velar from the mellow k.

Thus the four additional clicks occurring in a dialectal variety of Korana may be analyzed and spelled as 1. checked strident compact discontinuous (!q), 2. checked strident compact continuant (//q), 3. checked strident diffuse discontinuous (≠q), and 4. checked strident diffuse continuant (/q).

Except for the tonality features, all of the distinctive features are shared by the Nama clicks with the other nonvocalic phonemes: compact~diffuse (k:t=kh:th=x:s); continuant~discontinuous (s:t=x:k); nasal~nonnasal (n:t=m:p); tense~lax (th:t=kh:k=h:zero implemented as ʔ). The classes of unchecked and checked consonants exhibit each a different tonality feature – grave~acute in the former (p:t=m:n) and flat~nonflat (≠:≠k=≠h:≠x=!:!k=!h:!x, etc.) in the latter class.

The strident~mellow opposition displayed in Korana appears both among unchecked consonants (q:k=c:t, where c, as in Latin Slavic spelling and phonetic transcription, is utilized for rendering the dental affricate) and among clicks (!q:!k=//q://k=≠q:≠k=/q:/k). The unchecked consonants of Korana seem, moreover, to include the feature voiced~voiceless (see Beach[28]) absent in clicks.

To sum up, ejectives, implosives, and clicks are to be treated as different implementations of one and the same distinctive feature: checked~unchecked. While on the motor level its essence is quite clear, our tentative acoustical definition – "higher rate of discharge of energy within a reduced interval of time vs lower rate of discharge within a longer interval" or, in other terms, "lower vs higher damping" (see Jakobson[29]) – must be submitted to a further, deeper physical inquiry into all three kinds of checked consonants.

When mapping the geographical distribution of clicks, implosives, and ejectives (as far as the latter are discriminable from the lax set of the tense~lax opposition), one will have to interpret these three subspecies as diverse phonetic varieties of one and the same phonemic category[30] and to pay due attention to the spread of the checked~unchecked opposition in all three of its implementations.

R. Jakobson

Footnotes and References

1. G. Akhvlediani, "Dve sistemy garmoničeskix smyčnyx v gruzinskom jazyke," Sbornik statej pamjati ak. L. V. Ščerby (Leningrad, 1951); "O nekotoryx osnovnyx voprosax fonetiki gruzinskogo jazyka," Fonetičeskij sbornik, edited by V. Artemov and S. Zhgenti (Tbilisi, 1959), and several studies in Georgian.

2. T. Abzianidze, "The Degree of Voice in Georgian Voiced Occlusives," and L. Gamsakhurdia, "Noise Occlusive Phonemes in Georgian," Fonetičeskij sbornik (Tbilisi, 1959).

3. Cf. R. Jakobson, Selected Writings, I (The Hague, 1962), pp. 550-555, 485f.

4. See T. Gudava, Konsonantizm andijskix jazykov (Tbilisi, 1964), pp. 6, 18, 75.

5. P. Ladefoged, _A Phonetic Study of West African Languages_ (Cambridge, 1964), p. 5; cf. K. L. Pike, _Phonetics_ (Ann Arbor, 1934), p. 8.

6. R. Jakobson, _Selected Writings_, I, _op. cit._, p. 654f.

7. D. M. Beach, _The Phonetics of the Hottentot Language_ (Cambridge, 1938), pp. 74-76.

8. "Stützverschluss," as termed by N. S. Trubetzkoy, _Grundzüge der Phonologie_ (Göttingen, 3rd edition, 1962), p. 129.

9. Cf. C. M. Doke, _The Phonetics of the Zulu Language_ (Johannesburg, 1926), and _Text-Book of Zulu Grammar_ (Cape Town, 5th edition, 1954). In the transcription of the Zulu plain consonants I use the symbols of the International Phonetic Association as adapted for Doke's _Phonetics_, p. 41, but in the spelling of the Zulu clicks I follow the simpler letters and digraphs of his _Text-Book_, p. 20.

10. C. M. Doke, _Text-Book_, p. 14; _idem_, _The Southern Bantu Languages_ (Oxford University Press, 1954), p. 31: "In Zulu the _k_*** has a slight degree of voicing."

11. C. M. Doke, _The Phonetics of the Zulu Language_, _op. cit._, p. 60.

12. D. M. Beach, _op. cit._, p. 7.

13. _Ibid_, pp. 232-234.

14. H. Tindall, _A Grammar and Vocabulary of the Namaqua-Hottentot_ (Cape Town, 1857).

15. J. S. Krönlein, _Wortschatz der Khoi-Khoin_ (Berlin, 1889).

16. _Ibid._, p. 288ff.

17. N. S. Trubetzkoy, _Grundzüge der Phonologie_, _op. cit._, pp. 129f; 151-155.

18. Cf. R. Jakobson and M. Halle, "Phonology and Phonetics," in _Manual of Phonetics_, edited by B. Malmberg (Amsterdam, 1968).

19. C. M. Doke, "The Phonetics of C̱hũ: Bushman," _Bantu Studies_, II (1925), p. 77.

20. N. S. Trubetzkoy, _op. cit._, p. 153f.

21. _Ibid._, p. 154f.

22. R. Jakobson, _Selected Writings_, I, _op. cit._, pp. 510-522.

23. D. M. Beach, _op. cit._, p. 232.

24. _Ibid._, p. 222f.

25. _Ibid._, p. 220f.

26. _Ibid._, p. 66; cf. Trubetzkoy, _op. cit._, p. 153.

27. D. M. Beach, _op. cit._, p. 218f.

28. _Ibid._, p. 213f.

29. R. Jakobson, _Selected Writings_, I, _op. cit._, p. 486.

30. Cf. N. V. Jušmanov, "Fonetičeskie paralleli afrikanskix i jafetičeskix jazykov," _Africana_, I (Leningrad, 1937), p. 39f.

B. THE VOWEL SYSTEM OF FAROESE AND THE FAROESE VERSCHÄRFUNG

Faroese[1] has a quite embarrassingly rich variety of surface phonetic vowels, relatable by an equally rich system of alternations. Although most of these alternations are more or less adequately described in the standard grammars (Hammershaimb,[2] Krenn,[3] Lockwood[4]) as rules for the pronunciation of the standard Faroese orthography, most recent treatments, which have been more strictly theoretical, have taken the position that the Faroese orthography is too consciously archaic to be taken seriously, and that rules based on it are largely ad hoc. Such treatments as Bjerrum's,[5] a glossematic approach, and Roe's,[6] an American structuralist analysis, have started with the phonetic facts and extracted some minimal regularities from them without attempting to account for the full range of systematic phonemic alternations. O'Neil[7] has adopted a slightly more abstract approach, admitting a more abstract and non-biunique relationship between phonemic and phonetic representation. His treatment, too, has started from the surface facts, and especially in the case of the phonetic diphthongs which are represented as accented simple vowels in the orthography has missed some interesting generalizations thereby.

Let us consider first the vowels represented as unaccented simple vowels in the orthography. There is a consistent alternation in their phonetic values, depending on whether they appear in a long or a short syllable:

1. <u>a</u> : lamin [lɛamIn] 'lame, nom. masc.' lamnir [lamnIr] 'nom. masc. pl.'
   <u>e</u> : gera [ǰe:ra] 'to do (inf.)' gert [ǰɛrt] 'do (2sg pres.)'
   <u>ø</u> : kjøti [čø:ti] 'meat (dat. sg)' kjøts [čøts] 'meat (gen. sg.)'
   <u>o</u> : tora [to:ra] 'to dare (inf.)' tordi [tɔrdi] 'dared (past sg.)'
   <u>i/y</u> : ymissur [i:mIssUr] 'different (nom. masc. sg.)' ymsir [Imsir] 'nom. masc. pl.'
   <u>u</u> : rugur [ru:wUr] 'rye' rugbreyð [rUbbrɛj] 'ryebread'

Long syllables are those ending in one consonant, no consonant, or the clusters <u>kl</u>, <u>kr</u>, <u>pl</u>, <u>pr</u>, or <u>tr</u>. Syllables ending in two consonants are short unless the two form one of the clusters above.

If we assume that the feature values corresponding to these vowels are

I.

vowel	back	high	low	round
a	+	–	+	–
e	–	–	–	–
ø	–	–	–	+
o	+	–	–	+
i/y	–	+	–	–
u	+	+	–	+

We can then account for the alternation in 1 with a rule which makes vowels in short syllables lax, under the assumption that all vowels are tense in underlying forms. The phonetic reflex of tenseness will then be length, in the case of non-low vowels; another rule will be needed to diphthongize tense a to [ɛa]. In at least some dialects, tense e and o are further raised to i and u before a, presumably by a further rule. Another dialectal phenomenon is the change of lax a to [ɛ] before the velar nasal.

Turning now to the vowels represented with accents in the orthography, we see that they are all diphthongs, with the following values in long position:

2. í/ý : ui̯
   ú : üu̯
   ó : ɛu̯ or öu̯ or ɔu̯
   á : ɔa

We noticed above that the diphthongization of tense a inserted a new vowel ɛ before the a; let us hypothesize that a similar process applies to these vowels, which we can mark with some diacritic feature such as [+long] in the lexicon. The diphthongization rule can then be written as

Rule 1 (diphthongization of long vowels)

$$\phi \dashrightarrow \begin{bmatrix} \text{V} \\ -\text{low} \\ \alpha\text{high} \\ -\beta\text{back} \\ -\beta\text{round} \end{bmatrix} \Big/ \underline{\qquad} \begin{bmatrix} \text{V} \\ +\text{long} \\ \alpha\text{high} \\ \beta\text{round} \end{bmatrix}$$

This will produce the diphthongs /ui, iu, ɛo, oa/. Now assume a rule that rounds a high vowel before a high round vowel, which is generalized in some dialects to apply to non-low vowels. The diphthongs are now /ui, üu, ɛo or öo, oa/ the second elements of which will be turned into glides by virtue of a rule, which is needed in the grammar anyway to express the fact that Faroese diphthongs, including [ai, ei, oi] as well as these, are all falling. The glide corresponding to o is of course u̯. While this may appear simply gimicky, it does express the fact that the strange Faroese diphthongs are not arbitrary, but are systematically related to a long vowel system:

II.

vowel	high	round
í/ý	+	−
ú	+	+
ó	−	+
á	−	−

Two of the diphthongs produced at this point, [ɔa]<á and [ɛa]<a lose their second elements with compensatory lengthening before the vowel a:

Rule 2 (diphthong simplification)

$$
\begin{array}{lccc}
 & V & a & a \\
 & 1 & 2 & 3 \\
\dashrightarrow & \begin{bmatrix} 1 \\ +\text{long} \end{bmatrix} & \emptyset & 3
\end{array}
$$

In addition to these vowels, generated from underlying simple vowels, there are 3 diphthongs which appear to form a system themselves; there seems to be no reason to derive them from anything but themselves:

III. ei̯ (orthographic ey)
oi̯ (orthographic oy)
ai̯ (orthographic ei)

We have thus the following vowel system:

IV. short:

i		u
e ø		o
	a	

long:

í	ú
á	ó

diphthongs:

ei̯		oi̯
	ai̯	

Let us consider one other rule affecting the vowel system before we look at the consequences of this analysis for the morphology. There is a rule in Faroese which inserts a glide between two adjacent vowels in words like:

3. siður	[si:jUr]	'custom'
kvæði	[kvɛaji]	'ballad'
deyður	[deijUr]	'dead'
soðin	[so:jIn]	'boiled (p. p.)'
maður	[mɛavUr]	'man'
leður	[le:vUr]	'leather'
suður	[su:wUr]	'south'
húðir	[hüu̯wIr]	'skins'

The glide which is inserted is either [j] or [w], with [w] disappearing after phonetic [ɔ] or becoming [v] by an independently needed rule after any segment but a [+high] vowel. The vowel which is inserted in each case is given in Table V:

V.

Second vowel / First vowel	a	i	u
i	j	j	j
u	w	w	w
e	–	j	w
ø	–	j	w
o	–	j	w
a	–	j	w

We see that the insertion rule can be written in two parts, one of which inserts a 'similar' glide after a high vowel, and the second of which inserts such a glide before a high vowel in case the first did not apply:

Rule 3a

$$\phi \dashrightarrow \begin{bmatrix} +\text{son} \\ -\text{cons} \\ +\text{high} \\ \alpha\text{back} \end{bmatrix} / \begin{bmatrix} \text{V} \\ +\text{high} \\ \alpha\text{back} \end{bmatrix} \_\_\_\_ \text{V}$$

Rule 3b

$$\phi \dashrightarrow \begin{bmatrix} +\text{son} \\ -\text{cons} \\ +\text{high} \\ \alpha\text{back} \end{bmatrix} / \text{V} \_\_\_\_ \begin{bmatrix} \text{V} \\ +\text{high} \\ \alpha\text{back} \end{bmatrix}$$

These two rules are obviously related and should be collapsed to express the generalization inherent in them. Simply collapsing the left side of the rule (the SC) by bracketing the two right sides will not be adequate, partly because the generalization is left largely unexpressed by this, and partly because these two rules must be disjunctively ordered if they are to yield the correct results. There is, however, evidence (Chomsky[8]) to show that rules that are formally related by the bracket notation are conjunctively ordered.

The two environments here are the reverse of one another, much like the cases of neighborhood rules suggested by Bach.[9] This, in fact, appears to be a more general case of the same phenomenon, since the cases adduced by Bach in support of his proposed notation contained relevant environments on only one side of the segment in question at a time. Bach did suggest, however, that neighborhood rules are disjunctively ordered, as is required here. Let us then define an extension of Bach's notation, such that

4. $\quad X \dashrightarrow Y / \Sigma\ W \_\_\_\_ Z$

abbreviates the sequence of disjunctively ordered rules

5. $X \dashrightarrow Y \,/\, W \underline{\quad\quad} Z$
$X \dashrightarrow Y \,/\, \overline{Z} \underline{\quad\quad} \overline{W}$

where $\overline{W}$, $\overline{Z}$ represent the symbol sequences W, Z taken in reverse order. If either W or Z is null, this reduces to Bach's notation. Note that this notation makes the claim that there is no favored order of expansion of such a schema, since the opposite order could be obtained by writing the rule as

6. $X \dashrightarrow Y \,/\, \Sigma\ \overline{Z} \underline{\quad\quad} \overline{W}$

As far as is known, there is no evidence to support any proposal concerning a preferred order of expansion, and, as far as can be seen, there could be none, since the two sides of the environment are not in general formally distinguishable. Once two rules have been combined by this notation, however, the resultant schema is uniquely expandable by the definition above. The claim is simply that the formal relation of collapsibility is order-independent, like the braces notation, rather than order-dependent, like the parentheses notation.

Making use of the notation defined above, we can now collapse rules 3a and 3b into the single schema

Rule 3 (glide insertion)

$$\emptyset \dashrightarrow \begin{bmatrix} +\text{son} \\ -\text{cons} \\ +\text{high} \\ \alpha\text{back} \end{bmatrix} \Big/ \ \Sigma \begin{bmatrix} \text{V} \\ +\text{high} \\ \alpha\text{back} \end{bmatrix} \underline{\quad\quad} \text{V}$$

Having outlined some aspects of the vowel system above, let us consider the morphological alternation known as verschärfung. This name was originally given to a sound change in Germanic postulated to account for certain cognates between WGmc glides on the one hand, and NGmc and EGmc clusters of ddj (ggj) and ggw on the other. As Roe has pointed out in his recent useful study,[6] this alternation has generally been regarded as an exclusively and peculiarly Gmc phenomenon, with the result that parallels with changes in other language families have been ignored. Thus, Ital. maggiore 'greater', from Lat. māior, shows the same correspondence, as does the initial gw of Romance borrowings from Gmc forms with initial w. Thus, Prov. Cat. Span. Port. guardar, from Gmc. wardon, 'protect, ward off', Mod. Span. guadanar 'to mow', from Gmc. waidanjan, from waida, 'meadow' (examples from Elcock[10]). Indeed, while the conditions under which the (presumably) lengthened glides that give ggj and gw arise remain problematical, the Gmc change itself is of an extremely common sort.

Such a change is the basis of a productive rule of verschärfung in Modern Faroese. Thus, most verbs that have the clusters ggj or gv (=[ǰ, gv] before vocalic endings such as the infinitive marker -a show simply a (diphthongized) long vowel before consonantal endings, such as -r of the 3sg pres.:

7. búgva [bIgva] 'to live, dwell' 3sg býr [buir][11]
grógva [gregva] 'to grow' 3sg grør [grø:r]
doyggja [dɔǰa] 'to die' 3sg. doyr [dojr]
spýggia [spUǰa] 'to vomit' 3sg. spýr [spuir]

Note that beside the alternation of [ǰ, gv] with ∅, there is also an alternation between simple and complex vowels. Further, in nouns like

8. skógvur [skegvur] 'shoe', gen. skós [skɛus, skøus, or skɔus]

the different dialectal pronunciations of the diphthong written ó are not paralleled by differences in the vowel of the nominative form. Similarly, the vowel in búgva is not the first element of the diphthong ú, but rather its unrounded variant. These considerations make it impossible to deal with the phenomenon simply as an alternation between consonant and ∅ with loss of the second element of a diphthong before the consonant cluster.

Let us see what happens if we simply represent the forms in 7 and 8 in the underlying vowel system outlined above:

9. a. /bú + a/ /bú + r/
b. /gró + a/ /gró + r/
c. /doi + a/ /doi + r/
d. /spí + a/ /spí + r/
e. /skó + ur/ /skó + s/

After the umlaut[11] has applied, forms 9a and 9b become:

10. a. /bú + a/ /bí + r/
b. /gró + a/ /grø + r/

Now Rule 1 (diphthongization of long vowels) applies, yielding:

11. a. /biu+a/ /bui+r/
b. /greo+a/ /grø+r/
c. /doi+a/ /doi+r/
d. /spui+a/ /spui+r/
e. /skeo+ur/ /skeo+s/

At this point, the first vowel of each diphthong will receive stress, and unstressed mid vowels will be raised to high. This affects only the second elements of 11b and 11e, giving;

12. b. /greu+a/ /grø+r/
c. /skeu+ur/ /skeu+s/

Now the rule of glide insertion applies to the left forms (Rule 3), inserting glides before the vocalic endings and yielding:

13.	a.	/biu+wa/	/bui+r/
	b.	/greu+wa/	/grø+r/
	c.	/doi+ja/	/doi+r/
	d.	/spui+ja/	/spui+r/
	e.	/skeu+wur/	/skeu+s/

I assume the glides to be inserted to the right of the morpheme boundary, though it makes no difference whether they appear before or after it. Now the rule which makes the second elements of diphthongs into glides (i.e., specifies them as falling) applies to give:

14.	a.	/biw-wa/	/buj+r/
	b.	/grew+wa/	/grø+r/
	c.	/doj+ja/	/doj+r/
	d.	/spuj+ja/	/spuj+r/
	e.	/skew+wur/	/skew+s/

The geminate glides which now appear before the vocalic endings are now subject to another very general rule of Faroese, namely the dissimilation of sonorant clusters after a long vowel. This rule applies to the clusters nn, nr, rr, rl, ll, etc. to a greater or lesser extent in all West Scandinavian dialects. In Faroese it applies to <u>ll</u> in any position, and to some other clusters after [+tense] vowels (arising from underlying diphthongs and long vowels, in this analysis). Thus we have the forms:

15. seinur [sajnUr] 'late, m. sg. nom.' seinni [sajdni] 'later'
morgun [mɔrgUn] 'morning, nom.' morni [mɔdni] 'morning, dat. sg.'

While it is not entirely clear under what circumstances this rule applies, its structural change can be stated as follows

<u>Rule 4</u> (dissimilation)

$$[+\text{sonorant}] \dashrightarrow \begin{bmatrix}-\text{sonorant}\\-\text{continuant}\end{bmatrix} \;/\; \underline{\qquad} \; [+\text{sonorant}] \;/\; E$$

The rule does not apply if the second sonorant is <u>r</u>, or if the two disagree in the feature [consonantal]. It is unclear whether other conditions on the application of the rule should be built into it, or whether they should be entered as exceptional features of individual forms in the lexicon.

In any event, it will apply to any sequence of glides, dissimilating a <u>j</u> to a segment with the features 16a, and a <u>w</u> to a segment with the features 16b after the marking conventions have applied:

16. a. $\begin{bmatrix} \text{-syllabic} \\ \text{-sonorant} \\ \text{-continuant} \\ \text{+consonantal} \\ \text{+high} \\ \text{-back} \\ \text{+voiced} \end{bmatrix}$ b. $\begin{bmatrix} \text{-syllabic} \\ \text{-sonorant} \\ \text{-continuant} \\ \text{+consonantal} \\ \text{+high} \\ \text{+back} \\ \text{+voiced} \end{bmatrix}$

But these are just the segments /g_1/ and /g/. When this rule applies to the forms in 14, the output will be:

17. a. /big+wa/ /buj+r/
b. /greg+wa/ /grø+r/
c. /dog_1+ja/ /doj+r/
d. /spug_1+ja/ /spuj+r/
e. /skeg+wur/ /skew+s/

Another rule which palatalizes velars before front vowels and glides is necessary in any event, to account for forms like:

18. stingur [stIngUr] 'stab of pain, nom. sg.' stingi [stinǰi] (dat. sg.)
liggja [lIǰa] 'to lie' (from underlying /ligg+j+a/) liggur [ligg+Ur] 3sg. pres.

This rule will palatalize the c and d forms in 17 to

19. c. /doǰ+ja/ /doj+r/
d. /spuǰ+ja/ /spuj+r/

Now notice that if the rule to round the first element of the diphthongs *ó* and *ú* is ordered after this point, the correct values will be obtained for those vowels whose second elements have been dissimilated, since they are no longer in position to be rounded. The rule which turns *w* into *v* except after high vowels will apply to the left forms in 17a, b, and e, which, after the vowel interpretation rules (for lax vowels), will give the correct forms:

20. a. [bIgva] [bujr]
b. [grɛgva] [grør]
c. [dɔǰa] [dojr]
d. [spUǰa] [spujr]
e. [skɛgvUr] [skɛws, skøws, or skɔws]

Thus, all of the rules necessary to account for the Faroese *verschärfung* are more or less independently motivated in those forms with vocalic endings. In forms like *hoyggj* 'hay' where *verschärfung* takes place finally, the second element of the geminate glide is from the rule which turns *g* to *j* after a front vowel in a final position, which is also needed independently. That there is a *g* in final position in the form is shown in the genitive singular, where before the ending +s the g is devoiced to k and retained, the phonetic form being [hojks].

There remain a few forms with final verschärfung which are unexplained, such as brúgv 'bridge, nom.'. To account for the final glide here, we must first note another set of unexplained glides. These are the cases where a v appears after a nonhigh vowel and before a nonhigh vowel, as in:

21. æða [ɛava] 'eider duck' (oblique singular cases æðu [ɛavu])
    røða [rø:va] 'speech' (oblique singular røðu [røvu])

In these cases, what has happened is that the oblique form has been reanalyzed, and the epenthetic glide taken as part of the stem. These stems are thus relexicalized as

22. /aw/
    /røw/

If the same process applied to reanalyze, say, the plural of brúgv, which is brúgvar, this stem will be entered in the lexicon in the form /brúw/, which will provide the final verschärfung. This leaves virtually no forms unaccounted for, the principal exceptions being some forms for which a consciously archaic doublet without verschärfung is preserved.

But there are also some large classes of forms in which we would expect to find verschärfung if the phonetic shapes were basic, for they contain the appropriate conditions for the creation of the geminate glides whose dissimilation, as we have just seen, leads to the verschärfung.

23.	a.	víga	'to dedicate'	[vujja]
	b.	júgur	'udder'	[jüwwUr]
	c.	síga	'to lower'	[sujja]
	d.	blíður	'friendly'	[blujjUr]
	e.	heiðin	'heathen'	[hajjIn]
	f.	týða	'to translate'	[tujja]

Unless some reason can be found for the glides in these forms to remain undissimilated, it will be necessary to mark the forms in the lexicon as exceptional with respect to this rule. This arbitrary subcategorization is of course to be avoided if possible. A principled basis for preventing dissimilation here could take one of two forms: either it might be shown that the geminate glides do not exist at the time the rule applies, or that they are not adjacent at this point. This might be due to some segment which intervenes at the point where dissimilation occurs, and which is later deleted.

For the forms 23a, b, and c, an immediate explanation is available. They represent forms with an underlying intervocalic g. This deletion of intervocalic g is a very general phenomenon in Faroese:

24. a. øga [ø:a] 'to increase'
    b. siga [si:ja] 'to say'
    c. fagur [fɛavUr] 'beautiful'

The existence of the g in underlying forms is demonstrated by its appearance in other positions than intervocalic (or final):

25. a. vígdi [vujgdi] 'dedicated (sg.)'
    b. júgs [jüwks] 'udder (gen. sg.)'
    c. sígdi [sujgdi] 'lowered (sg.)'
    d. øgdi [øgdi] 'increased (sg)'
    e. sagdi [sagdi] 'said (sg)'
    f. fagran [fagran] 'beautiful (m. acc. sg.)'

Thus, we need a rule of velar deletion to delete these g's in intervocalic and final position. If we restrict this rule so that it applies after the rule of dissimilation, that will account for the fact that the forms 23a-c do not show verschärfung.

The other forms which do not show verschärfung are those with an ð in the orthography between those two vowels whose juxtaposition would give rise to the glides that should be dissimilated. The presence of this character in the orthography is no evidence for anything, of course, though these are the forms which had a phonetic [ð] in Old Norse. Since the disappearance of these segments from the phonetic representation is not demonstrably more ancient than the verschärfung, it is not improbable that their presence could affect the operation of this latter process, perhaps leaving traces in the modern language which would lead us to reconstruct them in the abstract representations of a synchronic grammar.

There are, in fact, several positions in which a reflex of the posited segments appears. In weak verbs, for example, the same forms which fail to show verschärfung, among others, show an intrusive d before the d of the preterite.

26. stríða [strujja] 'to struggle'; pret. sg. stríddi [strujddi]
    týða [tujja] 'to translate'; pret. týddi [tujddi]

Similarly, the adjectives which fail to show verscharfung before the -ur ending of the nom. sg. masc. show an intrusive t before the -t ending of the nom. sg. neut.:

27. blíður [blujjUr] 'friendly'; neut. blítt [blujtt]
    fróður [frɛwwUr] 'wise'; neut. frótt [frɛwtt]
    frúður [prüwwUr] 'handsome'; neut. prútt [prɛwtt]

The doubling of the final t is phonetically distinguishable, since geminate voiceless stops in Faroese are preaspirated, while single stops are not.

Other adjectives show the posited underlying segment as a d before n when syncope applied in some cases:

28. heiðin [hajjIn] 'heathen (nom. masc. sg.)'; acc. masc. sg. heidnan [hajdnan]
sodin [so:jIn] 'cooked (n. m. sg.)'; acc. m. sg. sodnan [sɔdnan]

These phenomena, if accounted for by positing an underlying segment which is later deleted in the position of the ð in the orthography, would seem to indicate that the features of this segment should be those of a dental of some sort. In other forms, however, the segment appears before r as a g:

29. tráður [trɔavUr] 'thread' dat. sg. traðri [trɛagri]
veður [ve:vUr] 'weather' dat. sg. veðri [vegri]
suður [su:wUr] 'south' compar. syðri [sIgri] 'more southerly'

These forms would seem to indicate that the segment in question is a velar, or else that there are two such segments. Let us note, however, that all of the positions in which it appears as a dental are before a dental; in these positions there are rules which assimilate a velar to a dental in any event. Thus, beside the forms in 28 above, we have the contracted inflected forms of the participles of verbs ending in g:

30: draga 'to drag' acc. m. sg. p. p.: drignan [drIdnan]
níga 'to sink down' [nujja] acc. sg. m. p. p. nignan [nIdnan]

The g's are not assimilated in the environment of 27 (/______ t), however, and by no means all g's are assimilated to a following d as in 26. Hence it would be a mistake to identify it with g. The facts of 29, however, argue that it must at least share some features with g. Let us assume that it is a spirant corresponding to g(γ), and that there is a rule of the grammar that deletes this segment in most cases:

Rule 5 (γ-deletion)

$$\gamma \longrightarrow \emptyset$$

We might deal with the deletion of g in intervocalic and final position by assuming that in these positions it becomes a spirant (a very natural situation) and that the rule of γ-deletion then applies to it. This is not necessary however, and I have no particular evidence to support the division of g-deletion into two stages.

The forms that do not undergo verschärfung, then, have either a g or a γ in their underlying representations, and the rules which delete velars (whether separate ones for g and γ or the same rule 5) cannot apply before the dissimilation rule. The dissimilation rule, however, must be ordered after the rule of glide insertion in order to have available to it the glides that it is to dissimilate. We note, however, that in those forms in which the presence of a velar consonant prevents the dissimilation, the glide insertion rule does apply after the velar disappears. Under current theories of phonological rule ordering, this is an impossible situation, since the rules are assumed to be ordered linearly, the order relationship between rules being total and transitive.

In a recent paper[12] I have argued that, in fact, the ordering relationship holding among phonological rules is not total, and that the rules are ordered relative to one another in pairs, a relationship which is not necessarily transitive. In such a theory, the Faroese situation can be handled by restricting the rules as above (dissimilation cannot apply before glide insertion, velar deletion cannot apply before dissimilation). These restrictions do not specify an order of velar deletion and glide insertion relative to one another, however, and glide insertion is still free to apply after velar deletion. Such a situation, in which there are three rules A, B, and C, such that in forms where A and B apply A precedes B, and in forms where B and C apply B precedes C, but in forms where only A and C apply C may precede A are critical cases for determining whether the order of phonological rules is total, as has been maintained in previous theory, or only partial (as maintained in Anderson[12]). If the analysis presented here is correct, it furnishes strong empirical evidence for the latter hypothesis. No such evidence has ever been provided for the hypothesis of total ordering; it has been assumed on the grounds that no counterevidence had hitherto been presented, and it was the stronger hypothesis available. Such cases as the Faroese rules discussed here provide such counterevidence, however, and support a weaker hypothesis of partial ordering.

The facts adduced above also provide interesting evidence bearing on the importance of a naturalness convention as suggested by Kiparsky[13] in historical change. Consider the Faroese verb síggja 'to see'. This verb shows verschärfung and is to be derived from an underlying form /sí+a/. It is an interesting fact that this verb is from a form sēa in PGmc times; it was subject to a rule shifting stress in e-diphthongs in early Norse times. This rule is still operative in Modern Icelandic (cf. Anderson[12] for details) and results in the form sjá ([sjá:] in Old Norse; [sjaw] in Mod. Icel.). As Faroese is derived from a dialect of Old Norse, it is reasonable to assume that this was originally the form in Faroese as well. The existence of the underlying long vowel rather than just a glide is motivated in this form, however, by the appearance of it or its ablaut conditioned variants in the remainder of the paradigm, in positions in which the stress shift rule would not apply. Thus, although the form sjá is no doubt to be assumed for Old Faroese before the rules of verschärfung applied, it was still synchronically derived from /sē+a/, a fact that is confirmed by its later development into síggja (the ē being raised to ī before a, a process already alluded to above). In other forms such as hjálpa, however, where the já is also originally from ēa, but in which there is no need to retain this derivation to explain the synchronic paradigm, there is no such re-emergence of the original form when it would be subject to the verschärfung. It has been reanalyzed, with the less abstract but invariant surface form taken as basic. Similarly, in dialects in which the old rule of stress shift in e-diphthongs is lost, such as Old Norwegian, the original form of *sjá* re-emerges as *sīa*, though the forms such as *hjálpa* remain *hjálpa*. These facts argue that the forms were reanalyzed as soon as their derivations from more abstract forms were no longer motivated.

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Footnotes and References

1. The phonological theory assumed in this report is essentially that of N. Chomsky and M. Halle in *The Sound Pattern of English* (New York: Harper and Row, 1968) with certain modifications of the feature system as suggested recently by Halle. By far the most extensive treatment of *verschärfung* in Faroese to date is that of H. A. Roe, to which I am obviously indebted on many points.
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7. W. A. O'Neil, "Faroese Vowel Morphophonemics," Lg. 40: 366-71, 1964.
8. N. Chomsky, "Some General Properties of Phonological Rules," Lg. 43: 102-28, 1967.
9. E. Bach, "Two Proposals Concerning the Simplicity Metric in Phonology," a paper read at the meeting of LSA, New York, December 1966.
10. W. D. Elcock, *The Romance Languages* (London: Faber and Faber, Ltd., 1960).
11. The vowels *ý* and *ø* in these 3sg forms are the result of "umlaut" from *ú* and *ó*. This process is perfectly regular in the present tense singular forms of verbs.
12. S. R. Anderson, "An Outline of the Phonology of Modern Icelandic Vowels" (unpublished).
13. P. Kiparsky, Lectures in Course 23.785, M.I.T., Autumn Term, 1967.