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Kristján Árnason

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The Segmental and Suprasegmental Status of Preaspiration in Modern Icelandic*

Kristján Árnason

The paper discusses the historical origin, present day distribution and prosodic status of preaspiration in Icelandic. Having developed as a movement of the openness of the glottis, originally a feature of "hard" stops, towards the nucleus of the stressed syllable, its distribution must be accounted for by a "segmental" rule operating on historical (underlying) hard stops. Its status with respect to length and stress is, however, shown to be that of a prosody of the nucleus of the Modern Icelandic syllable, since it carries length when the syllable is stressed. The development of preaspiration is seen as a part of a more general rule also responsible for voiceless sonorants and fricatives in the nucleus.

Kristján Árnason, Háskóli Íslands, Málvísindastofnun. Árnagarði við Suðurgötu 101 Reykjavik, Iceland.

1. ON RULE TYPES

Following the development of the theories of metrical and autosegmental phonology, the question of the differences and division of labour between the three types of "formalism", segmental, metrical or autosegmental had to come up (cf. e.g. Leben 1982, Anderson 1982). Although this discussion has been going on for some time, there is still room for considerable disagreement or unclarity as to who is to do what. Suggestions are still being made—e.g. that things previously accounted for segmentally should be treated metrically or autosegmentally instead.

In his attempt to clarify the difference between different types of "segmental" and "suprasegmental" rules, Anderson (1982), borrowing terminology originally introduced by Howard (1972), distinguishes between the *focus* and the *determinant* of phonological rules. Roughly, the focus is the element that undergoes the "change" and the determinant is the environment that triggers it. This helps Anderson to isolate the nature of the difference between suprasegmental and segmental rules by referring to the types of environments that the rules operate in and the types of

units they may affect. Thus e.g. rules affecting only syllabic rhymes, such as stress rules, can be defined so as to operate only within certain domains. The difference lies, then, not so much in the concept of phonological rule, but rather in the difference between the types of foci and determinants. Segmental rules can only refer to segments, whereas other types of rules refer to other sorts of units.

Thus, phonological rules look in fact very much the same as before the advent of these new formalisms. The metaphor is still basically:

A changes into B under conditions C.

What has changed is the alphabet on which the focus, the determinant, and the operation, or mapping between the input and the output, can be defined. Suprasegmental rules use new symbols, assumed to refer to things other than segments; metrical rules can refer to S nodes and W nodes; and autosegmental rules can refer to "autosegments" (basically phonological features which can have domains that are larger (or smaller) than segments).

For example, Clements & Keyser (1983: 25) state that the aim of their CV-phonology is to "provide an alphabet out of which syllable units are constructed together with a characterization of the permissible arrays of alphabetic units". In addition to this they make claims about "parameters along which individual languages vary in their choice of syllable types", and thirdly their theory is intended to "characterize the class of language particular rules which modify or extend the underlying syllable representations". The rules seem to be of the regular type, only the alphabet is new. Thus it seems that the question of rule types, as discussed by Leben and Anderson, is really the question of what sort of alphabet is best suited to describe this or that phenomenon.

But there is another area where the question of the nature of phonological rules or rule types is relevant. This is the old problem area of the borderline between different levels of phonological description, or between morphology and phonology and/or morphophonemics. Among the most recent contributions to the discussion of this old problem is Kiparsky's "Lexical Phonology" (cf. e.g. Kiparsky 1982, 1984). Kiparsky suggests that there is basically only one type of phonological rule, but the application

of particular rules may be restricted in ways determined by the organization of the "phonology" on "lexical levels" (the number of which still has not been decided). The rules whose application is restricted in this way are called lexical, others postlexical.

The analysis of Modern Icelandic preaspiration touches on questions relevant in both these areas. Preaspiration has been submitted to both segmental and suprasegmental analyses. Haugen (1958: 72) sees preaspiration as a feature of the stop that necessarily follows it, whereas others have seen it as a separate segment (Pétursson 1978: 180–91) or as some sort of autosegment (Thráinsson 1978). In Árnason (1984), preaspiration is seen as an element of voicelessness in the nucleus of the Icelandic syllable.

In work within generative phonology, preaspiration has been seen as introduced by a rule (Árnason 1977, Thráinsson 1978), the main motivation for this rule being sought in morphophonemic alternations. But in forms where there is no alternation and preaspiration shows up in all occurrences of morphemes, this motivation is lacking.

There are thus several questions that arise in connection with the analysis of preaspiration in the light of recent developments in phonological theory: Is preaspiration segmental or supra-segmental (autosegmental)? Are the rules that account for its distribution "lexical" or "postlexical"?

2. THE GOALS OF THIS STUDY

It is not the purpose of this paper to answer all these questions, but it is hoped that the discussion that follows will help to clarify at least some relevant points. It will be shown that answers to the questions above depend on which aspects of preaspiration we study. Facts about its distribution are best accounted for by a "segmental" rule, whereas facts concerning the phonetic behaviour of preaspiration with respect to stress and length call for some sort of suprasegmental formalism. It will be maintained that an understanding of these facts can best be achieved by looking at these phenomena in a historical perspective. The different facts about preaspiration are seen as stemming from different historical layers in the language. It will be maintained that only by recognising this can we hope to be able to give any empirical content to the formalisms used in capturing these facts. The distribution

of preaspiration can only be understood by looking at the change that gave rise to it, and other rules and formalisms that seem to be necessary must be studied in this light and basically seen as historical innovations that leave their marks on the present language in different ways.

Among the things that a linguist wanting to write a synchronic phonology for a language might want to do are the following:

(1) a. He might want to be able to account for the *historical origin* of phonological phenomena.
   b. He might want to be able to enumerate all and only the possible phonological forms of the language under investigation. In other words describe the *distribution* of the forms of the language, which forms occur and where.
   c. He might want to be able to describe the stress pattern and *rhythmic structure* of the language and the processes that occur in actual speech (fast speech phenomena and allegro rules).
   d. He might want to be able to explain how children can learn the language and how people can speak it.

In spite of claims to the contrary, it seems that, in the present state of the development of phonological theory, we can hope to be able to give sensible answers in only three of these areas, namely a, b, and c. The answers that are nowadays given to questions about psychology and learnability by generative linguists are not very convincing. The metaphor most commonly used is that of a "language faculty" and "linguistic competence" or "internalised grammar". Because computer programs are well understood things and they are sometimes made to do things that look similar to what humans seem to do when they learn and speak languages, the metaphor is that the human "language faculty" is supposed to be like a computer language, stored away in some place in the mind, and called on to compute speech, whenever needed. But this evidently does not have to be so. It is conceivable, and in fact quite likely, that the human mind works in a way fundamentally different from a computer.[1]

I will therefore avoid allusion to any sort of claims about psychological reality or language learning, but rather limit the discussion of preaspiration in Modern Icelandic to the aspects

named in points a and b, which are connected, and to the pheno-
mena mentioned in c.

3. DISTRIBUTIONAL FACTS

The distribution of preaspiration can be described with the help
of a rule like (2) (cf. Rögnvaldsson 1984: 55, but see also Árnason
1977 and Thráinsson 1978), where h stands for preaspiration. (No
assumption is here made as to the "nature" of preaspiration, that
is whether it is a feature of a segment, a separate segment or a
prosody of some sort):

$$(2) \quad \phi \rightarrow h / \underline{\quad\quad} \quad \begin{matrix} C \\ \begin{bmatrix} +\text{spr. gl.} \\ -\text{cont.} \end{bmatrix} \end{matrix} \quad \begin{matrix} C \\ [-\text{cont.}] \end{matrix}$$

In other words, it occurs before "hard stops" followed by "non-
continuants". Forms exemplifying this are: *hattur* [hahtYr] 'hat',
tappi [tʰahpI] 'tap', *bekkur* [pɛhkYr] 'bench', *vakna* [vahkna]
'wake up' *opna* [ɔhpna] 'open up' *vatn* [vahtn̩] 'water', *Hekla*
[hɛhkla] 'Hekla', *epli* [ɛhplI] 'apple' *vætla* [vaihtla] 'to flow' etc.
(The feature [−cont] is here used to represent the class /l,m,n/,
cf. Svavarsdóttir 1984.)

Given the usual set of assumptions made by generative
phonology, the evidence for the existence of rule (2) is "over-
whelming". We have preaspiration showing up in morpho-
phonemic alternations like *jökull* [jö:kYtl] 'glacier(nom.)' vs.
jökli [jöhklI] 'glacier (dat.)', and whenever the environment is
created, preaspiration occurs.

Obviously, there is a close connection between a and b in (1)
above. Each new form has the distribution determined by its
historical origin. Therefore rule (2) can be used with about equal
ease to describe the historical origin and the distribution of pre-
aspiration. It might be objected that the symbols mean something
different when used in a historical rule than when used in a
synchronic rule. The issue is perhaps not very clear, but it seems
to be rather difficult to prove any real difference. In a historical
rule, the things must stand for the phonological features present
when the innovation occurred. That is, when a consonant having
the feature "spread glottis" was followed by a noncontinuant,

then the h developed. In a synchronic rule, these things look very much the same, only now the once historical forms are assumed to be underlying. Thus the once existing hard /tt/ as in *hatt* or *sett* is "underlying" in the synchronic description, because it is used in the effort to account for the distribution of preaspiration. But the distribution of preaspiration is really explained by its historical origin, or to put it another way, preaspiration occurs where it occurs because it was introduced there by a phonological innovation. Rule (2) as a synchronic rule is thus only in the mind of the *linguist*, who has put it there as a metaphor based on the historical origin of the preaspiration. What he does is first to reconstruct the historical stage that prevailed before preaspiration developed, and from that predict where preaspiration occurs and where it does not.

What the ordinary *speaker* does is an altogether different matter. We don't really know what is going on unconsciously in his mind. To the extent that his tasks resemble those of the linguist, he may of course use the same methods, but we don't know that. And indeed, he does not worry about a logically coherent model, his goal being first and foremost to master the language in order to be able to communicate. The linguist's worries are of a different nature.

If morphophonemic alternation is a motivation for the analysis of preaspiration as derived by rule, we must ask what to do about forms where there is no morphological derivation or where the preaspiration occurs in all variants of the morphemes in question. This is the case in e.g. *hattur* or *opna*, where the preaspiration stays throughout the paradigm. In order to derive these forms correctly, preaspiration would probably be assumed to be post-lexical, but the serious question is what reason we have for assuming underlying forms for *hattur* and *opna* which never manage to appear unchanged on the surface. The seriousness of this problem varies according to the general point of view taken as described above. The usual assumption is that underlying forms like /hattYr/ will get a free ride, given the necessity of rule (2) to derive e.g. [sɛhtI] as the phonetic form of the past *setti* for the verb *setja*, the past form being formed by adding a t-formative to the stem *set-*, to give the underlying form /settI/. For a theory which takes itself seriously as making claims about psychological reality, this seems to be a problem. The question is how the

speaker gets to know that the [ht] part of [hahtYr] is really not what it seems to be, but something else. But for a historical perspective like the one proposed here, this is no problem. If we define our goal as accounting for the distribution of preaspiration, and we say that wherever it occurs, this is due to rule (2), we simply project from motivated cases like *setti* and *jökli* to unmotivated cases like *hattur* and *opna*. The only empirical consequence of our analysis is that preaspiration has the historical origin described by rule (2), in *hattur* and *opna* as well as in *setti* and *jökli*, and this is most probably true. No claim is here made about the psychological reality of this rule or whether speakers use it to produce both *setti* and *hattur* or *jökli* and *opna,* and the analysis can not be proven right or wrong on psychological grounds.

Thráinsson (1978) suggests that the forms of loanwords like *blokk* [plɔhk] 'block', *trukkur* [tʰrYhkYr] 'truck', *stoppa* [stɔhpa] 'to stop' with preaspiration, and the pronunciation by native speakers of Icelandic of foreign forms like *Mutter* (German) and *fat* (English) as [muhtɛr] and [faht] respectively show that preaspiration is an active rule in the minds of speakers of Icelandic.

This might seem to be a good argument for the psychological reality of the preaspiration rule, but the situation is slightly more complicated. Taking the English form *fat* as an example, we can describe what the speaker does when he adapts this word to his phonological system in the following way:
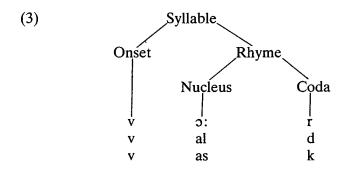
Icelandic has the following well formed phonological strings that roughly correspond to the English form [fæt], namely [fa:tʰ] (Northern dialects), [fa:t], (Southern dialects), [fat:] and [faht]. (Presumably forms with a different consonantal element preceding the final stop, say [s] or [l̥] [fast], [falt] are out, since they would be taken to correspond to different English forms, such as *fast* and *falt*.)

When it comes to picking the most suitable form, there is a choice in two places: first there is a choice between a long or a short vowel. A choice of a long vowel here limits the options in the choice of the following consonantism, since there is no opposition between aspirated and unaspirated stops following long vowels; the difference is dialectal, so if a speaker of a Northern dialect picks a long vowel, his form would have to be [fa:tʰ] (aspirated), but for a speaker of a Southern dialect the form will have to be [fa:t]. If the short vowel is chosen, on the

other hand, there is a choice between a form with a long unaspirated consonant ([fat:]) or a form with preaspiration ([faht]). The case seems to be that [faht] is the most common Icelandic distortion of English *fat*. This means that the regular choice is a short vowel followed by preaspiration and a [t]. This in itself is an interesting fact, but it is not clear that it tells us anything about how speakers analyse forms with preaspiration, that is whether they see them as deriving from underlying hard geminates or something else. The adaptation of the foreign form [fæt] to the Icelandic phonological system is basically a choice of the most suitable Icelandic correspondent. This may have to involve substituting a sequence of segments for a single segment in the lending language, as is the case e.g. with the /sj/ sequence which corresponds to the English /ʃ/ in the Icelandic *sjoppa* [sjɔhpa] 'shop'. From the premise that speakers analyse preaspirated stops as underlying hard geminates, and the fact that they pronounce English *fat* as [faht], it follows that *fat* has the underlying form /fatt/. But this does not go the other way around. From the fact that speakers pronounce *fat* as [faht] it does not follow that [ht] is underlying /tt/. A different analysis of preaspiration would equally well account for this fact. If, for example, we say that [ht] is underlying /ht/, and the [t:] in [fat:] is /tt/, the substitution of the Icelandic form [faht] for the English [fæt] involves substituting the phoneme sequence /faht/ for the corresponding English /fæt/ instead of, say, /fatt/, which would give [fat:]. A speaker who analyses [ht] as /tt/ and [t:] as something else has to make a similar choice. The question why [faht] is selected over [fat:] or [fa:t]/[fa:tʰ] is of course an interesting one, but it is not clear that either analysis makes any predictions about this. Indeed the strategy seems to be to first decide the length of the vowel, and then the spelling is most probably responsible for the choice of the form with preaspiration *(fatt)* over the one without it *(fadd)*.

4. THE STRUCTURE OF THE ICELANDIC SYLLABLE AND THE PHONOLOGY OF LENGTH

Haugen 1958 divided the Modern Icelandic syllable into three constituents, onset, nucleus and coda, and similarly Árnason 1984 pictured the structure of the Icelandic syllable as this:

(3)

```
                    Syllable
                   /        \
            Onset           Rhyme
              |            /      \
              |      Nucleus      Coda
              |         |          |
              v         ɔ:         r
              v         al         d
              v         as         k
```

According to Haugen the nucleus carries the accent, or length, of the syllable when it is stressed. Thus when a syllable like *vor* is stressed, the vowel lengthens, but when for example *vask* carries stress, it is the [s] that is lengthened. Thus what counts when it comes to distributing length among segments is whether the nucleus is *consonantal* or *vocalic,* as Haugen puts it. A vocalic nucleus consists of a bare vowel, but a consonantal nucleus has a consonantal element that may be lengthened under stress.

A few remarks are in order concerning the relation of this analysis to the more common analysis of length in Icelandic (cf. e.g. Vennemann 1972, Árnason 1980 and Gussmann 1985). It is customary to write the Icelandic length rule as a phonological rule of the traditional type, making vowels short or long under certain conditions. The basic fact is that vowels are long before no more than one consonant in the same "syllable", but short when two or more follow:

(4) *dal* [taːl] 'valley (acc.)'
    dals [tals] 'valley (gen.)'

There is a complication in that when a cluster of /p, t, k or s/ + /v, j or r/ follows, the vowel is long instead of short:

(5) *lepja* [lɛːpja] 'lick'
    vitja [vɪːtja] 'to see, look in on'
    skrökva [skröːkva] 'to lie'
    Esja [ɛːsja] 'name of a mountain' etc.

Among the formulations of this rule is one which assumes that a syllable boundary of some sort is inserted between the members of the lengthening clusters: *lep.ja* etc. which would give them the same status as *dal* etc. In that way it becomes possible to state the

length rule simply as a lengthening in syllables with no more than one consonant following the vowel:

(6) $V \rightarrow [+long]/ - C^1$.

or conversely as a shortening of vowels before two or more consonants within the same syllable:

(7) $V \rightarrow [-long]/ - C_2$.

There are several things concerning this that have been a matter of debate and that do not concern us here. In particular, there has been some disagreement about the nature and status of the syllable boundary (cf. e.g. Vennemann 1972, Árnason 1980, Gussmann 1985, Murrey and Vennemann 1983). But most writers seem to have agreed that the length rule should be formulated as a rule rewriting vowels as long or short according to the environment. And indeed this seems to be the proper way of doing it. What we are dealing with is the distribution of "long" and "short" vowels. But the length rule needs a slight reinterpretation:

The ontological status of the feature [long] has not always been very clear in the discussion of these phenomena. Some linguists have wondered whether Icelandic vowels should be analysed as long or short on the underlying level before the application of the length rule. Pétursson (1978: 46–9) seems to assume that stressed vowels are underlyingly long, and so do Rögnvaldsson (1984) and Orešnik (Ms), and accordingly they assume that the length rule is a vowel shortening rule. But there is no reason to assume that vowels are either long or short in underlying forms "prior" to the application of the length rule. The length rule is simply a statement of the distribution of vowels that become long or short when stressed. In the so-called long environment it is the vowel that takes the durational accent, and in the short environment it is the consonantal part of the nucleus. Understood in this way, either version of the length rule is a legitimate distributional rule, and it is a matter of economy to decide which version to use, if the question should be decidable. In fact Eiríkur Rögnvaldsson makes a good case for using the version in (7), since it is quicker to enumerate the short environments than the long environments and then the short environments can be expressed in an elsewhere statement. But the main point is that [+long] simply means *stretchable* and [−long] means *unstretchable*, and the distribution

is determined by the historical change that gave rise to the situation (cf. Árnason 1980, Ch. 4). The stretchable vowels carry the accent by themselves and form vocalic nuclei, whereas the unstretchable ones need consonantal elements of some sort to go with them in the nucleus. They are the ones that occur in consonantal nuclei.

The facts about length in Modern Icelandic become most clear when words are put under contrastive stress. In an utterance like:

(8) *Ég HATA fisk!* 'I HATE fish!'

with contrastive stress on the verb *hata*, the verb has a very long [aː]. But when the verb *elska* 'love' is put in the same context, as in:

(9) *Ég ELSKA fisk!* 'I LOVE fish!'

it is most natural to stretch the /l/. The pronunciation is something like [ɛlː.ska] with an [l], the length of which varies with the strength of the stress.

Similarly, in the case of monosyllables like *ost* 'cheese' or *vald* 'power', it is usually the consonant following the vowel that carries the length or accent in sentences like:

(10) *Ég bað um OST* [ɔsːt] 'I asked for CHEESE'

(11) *Hann hefur mikið VALD* [valːt] 'He has great POWER'.

From the point of view of length and stress, Haugen's division of the rhyme into nucleus and coda in the way shown in (3) is then useful. It is the nucleus that carries the length. In traditional phonetic descriptions of Icelandic (see e.g. Ófeigsson 1921, Einarsson 1927), it is often noted that consonants in the position following short vowels (as the [s] in *ost* and the [l] in *vald* and *elska*) are half-long. In Haugen's analysis this is due to the fact that the consonants carry the accent, and under normal stress-conditions this is realised as the traditionally observed half-length.

It is now interesting to see what happens to preaspiration in this situation. We will be interested to see whether it should be analyzed as belonging to the coda or the nucleus. The answer is very clear. When forms like *hattur, tappi, vakna, vatn, Hekla, epli* etc. are stressed contrastively, it is most natural for the preaspiration to be stretched, as shown in (12):

(12) *Mig vantar HATT* [*hah:t*] 'I need a HAT'
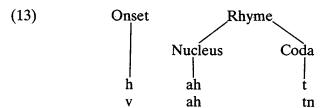   *Þetta er TAPPI* [*tah:pI*] 'This is a TAP'
   Þú átt að VAKNA [*vah:kna*] 'You are to WAKE UP'
   Mig vantar VATN [*vah:tn*] 'I need WATER'
   HEKLA [*hɛh:kla*] *er mesta eldfjallið* 'HEKLA is the great-
   est volcano'
   EPLI [*ɛh:plI*] *eru holl* 'APPLES are healthy'

This suggests that the preaspiration should be bracketed as a part
of the nucleus:

(13)

```
        Onset          Rhyme
                      /      \
                 Nucleus      Coda
                    |           |
         h         ah           t
         v         ah           tn
```

When a syllable follows, as in *vakna* and *epli*, the consonantism
of the coda may become an onset to the following syllable:
[vah:.kna], [ɛh:.plI] etc.

It is obvious that this does not fit too well into a description
which analyses preaspiration as a feature of the following segment.
For example, Haugen (1958) takes the preaspiration to be a
feature of the following stop, but if this were the case, it seems
that in forms like *epli* and *opna* we would expect the length to be
carried by the whole segment instead of just the preaspiration, as
is the case. True, it might be said that the preaspiration part of
the (complex) segment [hp] is more stretchable, and therefore the
natural way to stretch it would be to let the [h]-part carry the
length. But this would make /hp/ and other preaspirated segments
different from other segments in the same environment, since we
would be dealing with a "diphthong" with only the first component
stressed. This would be markedly different from e.g. [vɛlta],
where the whole segment [l] is stretched: [vɛl:ta] and not, say
[vɛh:lta].

In Thráinsson's analysis (1978) this problem does not come up,
since according to him preaspiration is always derived by turning
a /p, t, k/ into a separate segment[h]. But in the cases where the
preaspiration precedes a liquid or nasal, as in *epli* and *opna*, this
has to be done by assuming a rule lengthening all stops before

/l, m, n/ (Thráinsson 1978: 30). Thus the derivation of *opna* would have to be something like this:

(14) Underlying form /opna/
   Lengthening /oppna/
   Preaspiration [ɔhpna]

But the evidence for the existence of a lengthening rule applying before preaspiration and feeding it in the way described above is not very clear.

It is true that the length of the stop has been measured to be similar in the pair *glöggva* 'make clear (to oneself)' (cf. *glöggur* 'clear') and *mygla* 'mold' (cf. Thráinsson 1978: 31). But the length of the consonant in both cases is most likely the traditionally observed half-length of a consonant following a short vowel. The fact that the "double" g of *glöggva* can have the same length as the "single" g in *mygla* only shows that the difference between long and short consonants is neutralized in this environment, and it cannot be taken as any sort of evidence that the /g/ in *mygla*, and by some sort of analogy the /p/ in *opna*, is long or double at some underlying level.

The best candidate for accounting for the distribution of pre-aspiration still seems to be a rule like (2). To account for the shortness of the stops in *hattur* ([hahtYr]), *tappi* ([tʰahpI]) etc. it would be possible to assume with Rögnvaldsson (1984) that this is due to an independently needed rule that shortens a long (or geminate) consonant following another consonant. This would give the following derivation (borrowed from Rögnvaldsson Ms.: 5):

(15) Underlying form /hattur/ /opna/
   Preaspiration /hahttur/ /ohpna/
   Shortening   /hahtur/ —
   Surface form [hahtYr] [ɔhpna]

But with the help of the terminology used here we can give a somewhat more interesting account of this. Rögnvaldsson observes that in forms like the genitive of *háls*, the addition of the genitival -s adds nothing to the length of the final /s/ already present in the stem (the genitive has the same phonetic form as the nominative: [hauls]). This he takes as evidence that a rule (also needed in other cases) shortens long consonants following

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other consonants. If we assume that the only source of consonantal length is the stress carried by the nucleus, the "shortening" becomes automatic. Once the preaspiration has forced itself into the nucleus in *hattur*, we could say that the "double" t has to move into the coda, where there is no room for length or gemination, so it has to be short.

But the rule accounting for the distribution of preaspiration in terms of an [h] inserted before p, t, k does not by itself account for the fact that preaspiration carries length. Something more is needed. We have have to account for the fact that this [h] becomes a part of the nucleus, and we also have to account for the fact noted by Thráinsson (see also Árnason 1984) that there seems to be a close relation between preaspiration and the voicelessness of sonorants and fricatives in the same position in forms like *verk* [vɛɾk] 'work', *velta* [vɛl̥ta] 'to roll', *heimta* [hɛim̥ta] 'demand' *vanta* [van̥ta] 'need'. And also we would like to be able to account for the fact that postaspiration is excluded from stops that follow preaspiration or a voiceless continuant. Thus rule (2) does not account for everything concerning preaspiration.
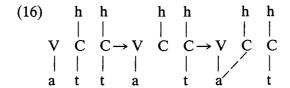
There are several "theories" on the market that might be worth considering, to see what they can do for us. One such theory is Clements and Keyser's (henceforth C&K) theory of CV-phonology (Clements & Keyser 1983). About their framework, C&K state as follows:

> "the CV-tier . . . serves in phonological representation to distinguish functional positions [peak versus nonpeak] within the syllable" (p. 10).

But the CV-elements are also timing units of some sort, corresponding to the traditional concept mora (cf. p. 80):

> "A mora is any element of the CV-tier dominated by the node "Nucleus" in the Nucleus display".

And in this context Icelandic preaspiration gets brought into the discussion. C&K adopt Thráinsson's analysis of preaspiration as a deletion of the supralaryngeal features of /p, t, k/, and see the association of the vowel with the voiceless interval before the remaining stop as an instance of compensatory lengthening (Clements & Keyser 1983: 79):

(16)
```
     h   h        h   h        h   h
     |   |        |   |        |   |
 V   C   C→ V     C   C→ V     C   C
 |   |   |   |        |   |  /      |
 a   t   t   a        t   a´        t
```

The broken association line in the last stage of the derivation represents the association of the segment [a] with the place left open by the deletion of the /t/. The topmost h's represent the feature [+spread glottis] on a special tier "allotted to laryngeal features in Icelandic".

But we have seen that Thráinsson's account of the distribution of preaspiration in terms of a deletion of the first of two identical consonants has problems with cases like *opna* etc. where the stop is followed by a nasal or lateral, since here an otherwise unmotivated lengthening rule is needed that feeds the preaspiration rule.

C&K treat heavy nuclei as bimoric. They can be either VV or VC. It is not altogether clear on what grounds it is to be decided whether to analyse nuclei as VC or VV. Presumably this has to do with the functional positions the elements define; thus a heavy VV-nucleus would have two equally strong morae (two peaks), whereas a VC-nucleus would have a strong mora (a peak) followed by a weak one (nonpeak). C&K assume English to have heavy nuclei of the type VC, and judging from the way preaspiration is represented in the example above, it might seem natural to adapt their framework to the facts described above by assuming that Modern Icelandic heavy nuclei can be of the form VC. Thus a tree describing the Icelandic nucleus would be like this:

(17)
```
        N
       / \
      V   C
```

We could then say that stress/length is mapped onto the "nucleus projection", and segmental duration then determined by the composition of the nucleus. But we have seen that the stress is always carried by the second mora, and it seems that we are forced to part with Clements and Keyser, since it is not clear that it can be said that this second mora (a C-element) is weaker than the first one in any reasonable sense. We could say instead that the

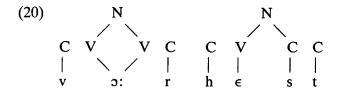nucleus can be of the two types suggested by Haugen, that is consonantal:

(18)

```
        N
       / \
      V   C
```

or vocalic:

(19)

```
        N
       / \
      V   V
```

In a consonantal nucleus the consonantal element is stretched, but in a vocalic nucleus it is the vowel. The second mora of the nucleus is thus in a sense "carrier" of stress/length.

We can thus give the following representations for *vor* 'spring' and *hest* 'horse':

(20)

```
        N                      N
       / \                    / \
  C   V   V  C       C   V   C   C
  |    \ /   |       |   |   |   |
  v    ɔ:    r       h   ɛ   s   t
```

5. PREASPIRATION AS A PROSODY

I mentioned that several linguists have suggested that the voicelessness of preaspiration is a prosody or "autosegment". A prosody can have smaller or larger units than segments as its domain or "anchor", and can stretch over a period longer or shorter than a segment.

What reason is there for assuming that preaspiration is anything other than a segment—a segmental feature in other words?

There are two considerations that will have a bearing on this:

(21) a. Does the voicelessness or the openness of the glottis stretch over a longer period than what could be associated with the preaspiration?

b. Does the openness of the glottis co-occur with more supralaryngeal configurations than those particular to preaspiration?

To start with the first question it is sometimes assumed that the feature [+spread glottis] stretches into the stop following preaspiration. Although this needs closer phonetic investigation, it seems that the glottis does not have to stay open into the following stop. For example, measurements of the laryngeal activity in the production of Icelandic obstruents made by Löfqvist & Yoshioka (1981: 5–6) suggest that the opening of the glottis associated with preaspiration does not stretch into the [p] in e.g. *seppi* [sɛhpI] 'dog'. Furthermore, in my own speech the stop following preaspiration can be glottalized, which means that the glottis can be closed right after the end of the preaspiration.

It is clear, however, that there is an overlap with the preceding vowel, as shown e.g. in (16). But this is in fact only to be expected if preaspiration is an [h], since [h] simply stands for a gesture of voicelessness which can co-occur with different supralaryngeal configurations. For example the initial voiceless consonants [l̥, r̥, n̥ and ç] are often analysed as phonemic /hl, hr, hn and hj/ in forms like *hlaupa*, 'run', *hross* 'horse' etc.

Also, it has long been noted (cf. e.g. Thráinsson 1978, Ewen 1982, Árnason 1980: 25, 1984) that forms with preaspiration are by no means the only ones to have a voiceless interval between the nuclear vowel and a following voiceless obstruent. As shown in Árnason 1984: 143, fricatives and sonorants are in most Icelandic dialects always voiceless in the same environment (i.e. before "hard" stops): *hefta* [hɛfta] 'hamper', *maðkur* [maþkYr] 'worm', *viska* [vIska] 'wisdom', *lagt* [laxt] 'laid', *velta* [vɛl̥ta] 'to roll', *hempa* [hɛmpa] 'a cape', *henta* [hɛnta] 'to suit' and *verka* [vɛr̥ka] 'to clean'.

On the analogy of [hahtYr] for *hattur* we could transcribe *hefta* as [hɛVhta], *maðkur* as [maÐhkYr], *velta* as [vɛLhta] etc., using capital letters to represent (archi-)segments neutral with respect to voicing, and assuming that the voicelessness-gesture represented by [h] is automatically associated with the preceding segment, in other words that [Vh] stands for [f], [Ðh] for [þ], [Lh] for [l̥] etc. The analysis of [l̥] in *velta* would then be analogous to that of the [l̥] in *hlaupa*, except that in the latter case the h is usually written before the l.

In Árnason 1984, forms with preaspiration and forms with voiceless fricatives and sonorants are subsumed under the heading "nuclei with checked voicing". It is obvious that the voicelessness

here should be abstracted away from the particular segments and analysed as a separate component or prosody. The commonness of voicelessness at this particular place in the articulation must be seen as a basic characteristic of Icelandic phonology. In Árnason 1984 the choice between held or checked nuclei is accordingly seen as a basic one in the Icelandic phonological system.

There is thus good reason to analyse Open glottis as a prosody, and the facts described above suggest that its domain is the nucleus. If the nucleus is the carrier of length, and length occurs on the substrings where the Open glottis prosody is in effect, it follows that the prosody belongs there. For a nucleus to have that prosody means that it is voiceless in the second mora. We can express this as shown in (22) for *vor*, *hest*, *hatt* and *valt*, where the square brackets represent the boundaries of the nucleus:

(22)

```
                      h               h
                      |               |
  C  V  V  C     C  V  C  C     C  V  V  C
  |  \ / |       |  |  |  |      |  \ / |
  v  [ɔ:]ₙ r     h  [ɛ  s]ₙ t    h  [ a:  ]ₙ t

        h
        |
  C  V  V  C
  |  |  |  |
  v  [a  l]ₙ t
```

This would then account for the distribution of stress and the phonetic realizations in modern speech.

But the distribution of preaspiration is still a derivative of its historical origin, and we may now reformulate Rule (2) to account also for the devoicing of obstruents and sonorants in the following way, as a sort of diphthongization of the hard stop that followed a vowel which did not become long in the quantity shift:

$$
(23) \quad \begin{bmatrix} -\text{son} \\ -\text{cont} \\ +\text{spr.gl} \end{bmatrix} \rightarrow [+\text{spr.gl.}] \begin{bmatrix} -\text{son} \\ -\text{cont} \end{bmatrix} / \begin{matrix} V \\ [-\text{long}] \end{matrix} \quad (X) -
$$

And this can also be used to account for the distributon in Modern Icelandic.

The representations in (22) and (23) together satisfy the goals

set out in (1) a.–c., (23) describes the distribution of preaspiration in terms of the historical rule that led to its emergence, whereas (22) accounts for its participation in the rhythmic structure of the spoken language today.

Turning back to the historical background for a moment, we see that it is possible to bring preaspiration and devoicing together under one heading, using the features common to both. If we assume that preaspiration and devoicing of fricatives and sonorants originally developed from hard stops (i.e. stops with [+spread glottis]), we can say that in both cases we are dealing with *a movement of the openness of the glottis connected with the stop towards the nucleus*. It is thus an anticipatory opening of the glottis. This happened when a vowel preceded that did not become long in the quantity shift. This also shows us the relation between vowel lengthening and preaspiration in a new light, since we can say that a split occurred between forms with hard consonants following the vowel. When p, t, k were followed by vowels or the consonants v, j, r, the vowel lengthened, and preaspiration did not occur, as in *taka* 'take' [tʰaːka] and *vitja* 'to look in on' [vɪːtja], but otherwise, that is, if the vowel was not lengthened, the anticipatory opening of the glottis occurred. When a consonant intervened between the vowel and the hard stop, this opening of the glottis, (the h) coincided with this intervening consonant.

The fact that the devoicing before hard stops, as expressed in (23), has not spread to all dialects in its final form (there are Northern dialects which still retain voiced sonorants before p, t, k, following very complicated rules, cf. e.g. Guðfinnsson 1964, Thráinsson 1980 and Jónsson 1982) can be seen as an instance of a change that still has not reached its final conclusion.

The relative chronology of the two changes involved, namely the quantity shift and preaspiration/devoicing, has not been figured out. Vowel lengthening as a part of the quantity shift has been dated to start in the 16th century, but very few attempts have been made at dating the emergence of preaspiration/devoicing. But this analysis suggests that it is younger than the quantity shift. This is the chronology suggested by Allen (1973: 70) for vowel lengthening and preaspiration. If devoicing and preaspiration are one and the same process, the fact that devoicing has not reached all dialects fits well with the idea that it is relatively recent. (For a review of theories of the origin of preaspiration

and an attempt at an explanation in terms of word accents, see Liberman 1982, in particular pp. 260–72.)

Historically the bracketing described in (22) must be a recent phenomenon. At least it must be younger than the quantity shift, and the structure it represents is the one prevalent in Modern Icelandic. Indeed, it can be said that the quantity shift has led to the emergence of this bracketing. The lengthening of vowels in the long environment and the lack of it in the short environment calls for this organization of duration as an exponent of stress. Increased stress can lengthen the long (stretchable) vowels, but not the short (unstretchable) ones, in which case length is carried by the consonant that follows. In the case of preaspiration, the voiceless interval that developed in front of the hard stop came to be included in the new nucleus and thus carries length. Thus Allen's idea (loc. cit.) that preaspiration is a voiceless lengthening of the preceding vowel is true in the sense that the anticipatory opening of the glottis is associated with the preceding vowel—but in the case of devoicing, it came to be associated with the consonant already present.

It is not clear whether the chronological relationship between the quantity shift, preaspiration/devoicing and the emergence of the bracketing represented by (22) can be determined further. But whatever the result of that would be, it would determine the relative order of the "synchronic" rules in question, and indeed vice-versa. The plausible "logical" synchronic ordering of the rules could be projected back to the history, since we are dealing with historical innovations that leave a mark on the present language. If the following turns out to be a plausible order for the rules in question, this would constitute a reconstruction of the relative chronology:

(24) 1. Length rule
2. Bracketing
3. Preaspiration/devoicing.

But the problem is that it is not clear that this order is logically clearer than, say:

(25) 1. Length rule
2. Preaspiration/devoicing
3. Bracketing.

It is possible either to think of bracketing as a "preexistent" condition on the output of preaspiration/devoicing (cf. 24), or as a "rule" operating on its output (25). Thus this internal reconstruction does not seem to get us very far, and indeed the gritty details are always messier than the abstractions on the linguist's desk.

6. CONCLUSION

It has been the purpose of this paper to point out that the two main facts about Icelandic preaspiration, its distribution and its behaviour with respect to length as a surface marker of stress, can best be understood and analysed by looking at them separately and putting them in the proper diachronic perspective. By doing this the empirical content of the formalisms used to describe the phenomena becomes much clearer, and confusion is avoided. The main point is that we need old-fashioned rules like (23) and (7) to account respectively for the distribution of preaspiration and stretchable and unstretchable vowels, but to account for the realization of forms in actual speech we need the bracketing described in (22). The difference between (23) and (22) is that they look at the phenomena from different angles. Preaspiration must have originated as a feature of the hard stops, but its role in actual speech now makes it a prosody of the nucleus. I suppose, then, that I agree with Stephen Anderson (1982), when he argues that "garden variety rules", as he calls them, cannot be replaced by nonlinear formalisms. We need them for what they are good for. In this case they can account for distributional and historical facts which the nonlinear formalism cannot and need not deal with.

NOTES

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1 We may in fact very well be in the situation that the old Norse vikings were in when it came to explaining the movement of the Sun. The best theory they had was that the Sun was pulled across the sky by an invisible team of horses. The metaphor of the "language faculty" as a computer program may seem to many as the "best" theory, but others may prefer different metaphors.

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