A. OUTLINE OF THE ACCENTUATION IN INFLECTIONAL PARADIGMS
OF LITERARY LITHUANIAN WITH AN APPENDIX ON THE
ACCENTUATION OF NOMINAL DERIVATIVES

Differences in the location and nature of the word accent constitute a major feature
of Lithuanian morphology.\footnote{This work was supported by the National Institute of Mental Health (Grant 5 PO1 MH-13390-05) and the National Institutes of Health (Grant 5 TO1 HD-00111-06).} Descriptions of the accent vary, but most descriptions of the Lithuanian accent agree on the following:

Each word must have an accent, i.e., a stress/pitch complex assigned to one of its syllables. If the accented syllable is short it "takes" a grave (\(\grave{\text{}}\)), which is characterized as short stress with a nondistinctive pitch.

(1)   galv\(\'\) \([galv'a]\) 'head'

visas \([v''isas]\) 'all, whole'

If the accented syllable is long, i.e., either contains a long vowel, a diphthong, or a sequence of a short vowel and a tautosyllabic sonorant, the syllable bears stress and its pitch distinctions acquire phonological significance. Such stressed long syllables can be either falling (have the acute accent \(\acute{\text{}}\)) or rising (have the circumflex accent \(\sim\)):
All accents can be characterized in terms of the rise in pitch. In the case of the short accent and the acute, the rise is abrupt, near the onset of the vowel, and may be followed by a fall or stay level, i.e., the eventual fall does not seem to be a defining feature. In the case of the circumflex, the rise is more gradual and does not reach its peak until the second part of the long vowel or diphthong.  

Accentual differences can have various functions. One is to distinguish between lexical items that would otherwise be homophonous:

(3) 
\[ \text{'aùšti ['áùš't'i] 'to dawn'} \]
\[ \text{'aùšti ['aùš't'i] 'to weave'} \]

Of far greater significance is the role of the accents in alternations between forms of one and the same stem:

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ns</td>
<td>dovanà 'gift'</td>
<td>Gs</td>
<td>dovanòs</td>
</tr>
<tr>
<td>Ds</td>
<td>dovanòs</td>
<td>As</td>
<td>dovanà</td>
</tr>
<tr>
<td>Is</td>
<td>dovàna</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not only do accents alternate (the grave, the circumflex, and the acute all appear in the above paradigm), they also move from syllable to syllable.

The degree of complexity of Lithuanian accentual alternations can be illustrated by the well-known foursome lièpa 'linden', rankà 'hand, arm', galvà 'head', and ziemà 'winter', which have the following accentual paradigms:

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Lièpa</td>
<td>rankà</td>
<td>galvà</td>
<td>ziemà</td>
</tr>
<tr>
<td>Lièpos</td>
<td>rankòs</td>
<td>galvòs</td>
<td>ziemòs</td>
</tr>
<tr>
<td>Lièpai</td>
<td>rankai</td>
<td>gálvai</td>
<td>zìemai</td>
</tr>
<tr>
<td>Liètà</td>
<td>rankà</td>
<td>gálva</td>
<td>ziemà</td>
</tr>
<tr>
<td>Lièpoje</td>
<td>rankòje</td>
<td>galvojè</td>
<td>ziemojè</td>
</tr>
<tr>
<td>Lièpos</td>
<td>rankòs</td>
<td>galvòs</td>
<td>zìemos</td>
</tr>
<tr>
<td>Lièpy</td>
<td>ranky</td>
<td>galvy</td>
<td>zìemòs</td>
</tr>
<tr>
<td>Lièpoms</td>
<td>rankòms</td>
<td>galvòms</td>
<td>zìemòms</td>
</tr>
<tr>
<td>Lièpas</td>
<td>rankàs</td>
<td>galvàs</td>
<td>ziemàs</td>
</tr>
<tr>
<td>Lièpomis</td>
<td>rankòmis</td>
<td>galvòmis</td>
<td>ziemomis</td>
</tr>
<tr>
<td>Lièpose</td>
<td>rankose</td>
<td>galvosè</td>
<td>ziemosè</td>
</tr>
</tbody>
</table>
It has long been noticed, e.g., that Classes 1 and 2 share certain traits as against 3 and 4; e.g., stress on the stem as against the ending in the Gen. sg.:

(6) Gs  liépos, rākos : galvūs, Žiemūs

and that paradigms (1) and (3) share certain traits as against (2) and (4), e.g., stress on the stem as against the ending in the Instr. sg.:

(7) Is  liépa, gālva : rankā, Žiemā

While there is no lack of investigations of the above phenomena, none can be considered entirely satisfactory for a variety of reasons. Some studies are limited to historical considerations; others restrict themselves to the examination of disyllabic stems only; still others treat the accentual entities (grave, acute, circumflex) as not further subanalyzable, or a combination of the above.

We will make an initial assumption, namely that assigned to each word and underlying all accentual phenomena is a two-level abstract pitch contour, with an initial low (nonhigh, [-H]) level followed by a high ([+H]) level:

(8) +H  

lie tuvis  

+H  

'Lituanian'

mar tī  

+H  

'bride'

Upē  

+H  

'river'

We will further use the same two-level structure to diagram accentual differences in long syllables, whereas in the acute the [+H]-level will start the syllable as follows:

(9) +H  

mer gāte  

+H  

'girl'

jau niems  

+H  

'young, Dpm'

 liépa  

+H  

'linden'

dūlkes  

+H  

'dust'

[sic; in intonable sequences starting with a short "i" or "u" the orthographic grave represents the acute accent; cf. definition of "intonable segment" below.]
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The same pitch contour will be used to formalize the circumflex as well, only here the break between levels will be said to occur in mid-syllable.

(10) \[ \begin{array}{c}
\text{aukštas} \quad \tilde{\text{tis}} \\
\hline
\text{su} \quad \tilde{\text{o}} \\
\hline
\text{velnia} \quad \tilde{\text{i}}
\end{array} \]

'a speaker of High Lithuanian'

'dog'

'devils'

If accented long monophthongs are treated as sequences of (short) vowels, their pitch contours can be represented exactly like those of diphthongs:

(11) \[ \begin{array}{c}
viršūnė \\
\hline
\text{viršūnė} \\
\hline
\text{begūnas} \\
\hline
\end{array} \]

'tip, summit'

'word'

If we examine the proposed representations, we see that the orthographic accents are predictable from the pitch contour of the word - they always fall on the syllable containing the first high-pitch segment in the word. Once the first high-pitch segment in the word is marked, the position and nature of the accent is unambiguously determined, as shown in (13):

(13) \[ \begin{array}{c}
\text{kooja} \\
\hline
\text{zoodis} \\
\hline
\text{upe}
\end{array} \]

'foot, leg'

'word'

For graphic simplicity, we will mark the earliest high-pitch vowel in the work with the Lithuanian orthographic grave, as no possible confusion can arise from its use:

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Formally, we shall assume that in the input to the phonological rules, a word has one sonorant specified as being [+high pitch] or [+H] for short. An early rule in the phonology (the H-DISTRIBUTION rule) then distributes high pitch to all segments that follow the segment originally specified as [+H].

In working with our materials, we found it necessary to abandon the school examples of líepa, rankà, galvà, and ziema, since they are monosyllabic stems and the final (if short) or the penultimate (if long) intonable segment (henceforth "mora") is also the first mora of the word.\(^5\) This latter circumstance has in the past been the cause for false or limited generalizations. Accordingly, our examples below are (where possible) of trisyllabic words, so that the entire range of accentual phenomena can be exhibited.

<table>
<thead>
<tr>
<th>Class 1</th>
<th>Class 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na smulkmena</td>
<td>skutena</td>
</tr>
<tr>
<td>Gs smulkmenoos</td>
<td>skutenos</td>
</tr>
<tr>
<td>Ds smulkmenai</td>
<td>skutenai</td>
</tr>
<tr>
<td>As smulkmena</td>
<td>skuten</td>
</tr>
<tr>
<td>Is smulkmena</td>
<td>skuten</td>
</tr>
<tr>
<td>Ls smulkmanooje</td>
<td>skutenooje</td>
</tr>
<tr>
<td>Vs smulkmena</td>
<td>skutena</td>
</tr>
<tr>
<td>Np smulkmenoos</td>
<td>skutenos</td>
</tr>
<tr>
<td>Gp smulkmenai</td>
<td>skutenai</td>
</tr>
<tr>
<td>Ap smulkmenas</td>
<td>skutenas</td>
</tr>
<tr>
<td>Ip smulkmanoons</td>
<td>skutenois</td>
</tr>
<tr>
<td>Lp smulkmanoojé</td>
<td>skutenoojé</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class 3</th>
<th>Class 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na doovanà</td>
<td>avika</td>
</tr>
<tr>
<td>Gs doovanôs</td>
<td>avikos</td>
</tr>
<tr>
<td>Ds doovanai</td>
<td>avika</td>
</tr>
<tr>
<td>As doovanà</td>
<td>avikas</td>
</tr>
<tr>
<td>Is doukanà</td>
<td>avika</td>
</tr>
<tr>
<td>Ls doovanoojé</td>
<td>avikooye</td>
</tr>
<tr>
<td>Np doovanoos</td>
<td>avikoos</td>
</tr>
<tr>
<td>Gp doovanyû</td>
<td>avikû</td>
</tr>
<tr>
<td>Ap doovanas</td>
<td>avikas</td>
</tr>
<tr>
<td>Ip doovanoomís</td>
<td>avikoomís</td>
</tr>
<tr>
<td>Lp doovanoojë</td>
<td>avikoosë</td>
</tr>
</tbody>
</table>

\(^{(14)}\) kòoja = kójà

\(^{(15)}\) kozodis = kôdis

\(^{(15)}\) ûpé = ûpé

\(^{(15)}\) Ns smulkmena elsenà skutenà siuvèija mokykla meryna

\(^{(15)}\) Gs smulkmenoos elsenos skutenos siuvèjoos mokykyklos merignos

\(^{(15)}\) Ds smulkmenai elsenai skutenai siuvèjai mokyklaï merignai

\(^{(15)}\) As smulkmena elsenà skutenà siuvèjà mokykyka meryna

\(^{(15)}\) Is smulkmena elsenà skutenà siuvèjà mokykyka meryna

\(^{(15)}\) Ls smulkmanooje elsenooje skutenooje siuvèjooje mokykykjeo mergnooje

\(^{(15)}\) Vs smulkmena elsenà skutenà siuvèjà mokykyka meryna

\(^{(15)}\) Np smulkmenoos elsenos skutenos siuvèjoos mokykykoos merignos

\(^{(15)}\) Gp smulkmenai elsenai skutenai siuvèjai mokykyklaï merignai

\(^{(15)}\) Ap smulkmenas elsenas skutenas siuvèjas mokykyklaï merignai

\(^{(15)}\) Ip smulkmanoons elsenois skutenois siuvèjoois mokykykoois merignois

\(^{(15)}\) Lp smulkmanoojé elsenooye skutenooye siuvèjooye mokykykoye merignooye

\(^{(15)}\) Ns doovanà zukenà avika veluonà peyya Ašvià

\(^{(15)}\) Gs doovanôs zukenos avikos veluonos peyysos Ašvioûs

\(^{(15)}\) Ds doovanai zukenai avika veluonai peyysai Ašvioûs

\(^{(15)}\) As doovanà zukenà avikas veluonà peyysas Ašvioûs

\(^{(15)}\) Is doukanà zukenà veluona peyysa Ašvià

\(^{(15)}\) Ls doovanooye zukenoojé avikooye veluonooye peyysoooye Ašviooojë

\(^{(15)}\) Np doovanoos zukenos avikos [gålvoos] [žëmoos] [žiemoos]

\(^{(15)}\) Gp doovanûy [gålyû] [žënyû] [žiënyû]

\(^{(15)}\) Ap doovanas zukenas avikas [gålvas] [žëmas] [žiëmas]

\(^{(15)}\) Ip doovanoomís zukenoomís avikoomís [gålvoomís] [žëmoomís] [žiëmoomís]

\(^{(15)}\) Lp doovanoojë zukenoomè avikoosè [gålvoosè] [žëmoosë] [žiëmoosë]

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Inspecting the accusative singular form of each word, namely:

(16) smulkmen AA elesen AA skuten AA siuveej AA mokyykl AA mergin AA

we note that for smulkmen high pitch \( ^\prime \) starts on the ante-penultimate mora of the stem, for elesen, skuten and siuveej – on the penultimate mora of the stem, and for mokyykl and mergin – on the last mora of the stem. Note, furthermore, that the last two were precisely the stems which in (15) were called "Class 2" and subject to a type of accent shift; i.e., Classes 1 and 2 are phonetically definable with respect to each other. That is to say, a word will undergo accent shift only if its earliest high-pitch mora is also the last mora of the stem. Thus, what has been called accentual paradigm 1 and accentual paradigm 2, in fact, make up a single paradigm (henceforth Class 1-2, to keep new terminology at a minimum). In this we agree with Darden\(^3\) who remarked that "there are not two classes 1 and 2, but one class plus a rule."

We will call this rule the METATONY rule; it is the synchronic counterpart of Saussure's Law. It is in principle a phonetic rule, which has, however, some morphological restrictions, and will be ordered after the H-DISTRIBUTION rule. In terms of the formalism outlined above, the rule removes the high pitch from the stem-final mora, thereby extending the domain of the low-pitched portion \([-H]\) by one mora and diminishing the domain of the high-pitched portion by one:

(17) Before metatony  \[ ^\prime \text{mooky} \text{ykla} \] or \[ ^\prime \text{mooky} \text{yklâ} \]

After metatony  \[ \text{mookyyk} \text{la} \] or \[ \text{mookyyk} \text{lâ} \]

As the above example illustrates, the shift in the place of the stress is an automatic consequence of removing high pitch from the last vowel of the stem, since the onset of the high-pitch level of the word has in effect "moved."

As a comparison of Class 1 and Class 2 paradigms in (15) will show, the METATONY rule applies only if the desinence contains a single mora; in that case the high-pitch onset is "moved" to the desinence. The METATONY rule is morphologically restricted. It does not apply in the Vocative, or in Nominative singular forms that end in an -\text{a} (pirkstas 'finger', versis 'ox', turgus 'market' [cf. Acc. pl. turgus, mokyklas, merginas, where no such restriction exists and the rule does apply]); nor does it apply, as we shall see later, in third-person desinences of the shape -\text{a}. We shall have to make some further modifications as additional parts of speech are examined.
If we examine the accusative singular of Classes 3 and 4, we again note that Class 4 differs from Class 3 in having the H-onset on the final mora of the stem:

(18) dòovan+aa zuïken+aa àviž+aa Veliùon+aa Pelyys+aa Asvij+aa

The METATONY rule again accounts for all differences between Class 3 and Class 4; accordingly, they also must be considered to constitute a single class (henceforth "Class 3-4"). [In the paradigms illustrated in (15), the rule operates in Ns, Is Pelyysà (Pelyysà; cf. Ns, Is dòovana) and in Ap ziemàs (ziemas; cf. Ap dòovanas).]

Classes 1-2 and 3-4 agree in admitting the +H-onset on any mora of the stem; they also agree in the treatment of those stems where this onset is on the final mora, i.e., such stems are subject to the METATONY rule.

The two classes 1-2 and 3-4 do not agree, however, in an important respect. While in Class 1-2, except for the effects of the METATONY rule, the stem is stressed throughout, in Class 3-4 the stem is stressed in some cases and unstressed in others. We shall reflect this fact in our description by two additions. First we shall add a rule that removes the lexically supplied [+H]. This rule, to be called here the H-REMOVAL rule, is not part of the phonological component; instead it is part of the morphology (word-formation). It applies therefore, before any of the phonological rules; in particular, before the H-DISTRIBUTION and the rest of the rules developed above. Moreover, the H-REMOVAL rule applies only to certain lexically marked stems in morphologically specified environments.

Before we pass on to the environments, let us briefly reflect on terminology. In the past, a number of terms have been employed to contrast Class 1-2 with Class 3-4, e.g., barytone vs oxytone, +/- strong susceptible, +/- mobile, etc. All of these terms carry implications which we would like to avoid. Instead we shall use the term +/- labile, i.e., we shall call Class 1-2 "-labile," and Class 3-4 "+labile," our intent being to focus attention on the removability vs nonremovability of the high pitch ([+H]) from the stem and not on "shifts of accent," which we view as effects and not as basic processes in their own right.

Removing [+H] from labile stems leaves us with strings that will undergo none of the other rules postulated so far. An inspection of the actual forms in (15) shows, however, that in the cases where H-REMOVAL has applied (cf., e.g., Ls, Gp, Ip, Lp) the last mora of the word has high pitch. We conclude that in words without any high-pitched segments, [+H] is assigned by an arbitrary H-ASSIGNMENT rule, to the last mora:
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(19) \[ \xrightarrow{[+H]} /X \quad C_0^\# \quad \text{where } X \text{ contains no } [+H], \]

e.g., the prejunctural mora has to be high pitched.

In the above examples, rule (19) will produce doovanà and doovanòòs, the
desired result. Inspecting the rest of the form in which the H-onset is removed,
we note that the postulated rules (H-REMOVAL and H-ASSIGNMENT) can handle
all cases except the dative plural desinence, which is acute in labile stems, i.e.,
ends in -öms, and the like. Accordingly, we postulate that the dative plural
desinence has an H-onset of its own, unlike other endings, which have none. In
other words, we assume that not only stems but also suffixes may have an inher-
etent \(+H\) on some intonable segment. In the Appendix, we show how this fact
plays a considerable role in the derivational morphology of the language. Note
that the Dp forms are thus doubly marked; in addition to having a desinence
with an inherent \(+H\), the stems of nouns in the Dp are subject to the H-REMOVAL
rule.

A casual inspection of the paradigms in (15) and in (5) may make it appear that the
H-REMOVAL rule is conditioned by grammatical categories, i.e., that the stem is
unstressed in Ns, Gs, Ls, and plural oblique (other than NA) cases. An examination
of other nominal paradigms, however, shows that this is not quite true, and that in
several instances H-REMOVAL must take into account the specific shapes of desi-
nences; e.g., the Nsm vēlnias [+labile] is unaffected by the rule, while Nsm žaltyys
((žalt[+labile] + yys) follows it. Thus, at times a reference to the specific shape
of the desinence (yys as against as, in this case, both being Nsm) is neces-
sary.

The following desinences "cause" H-removal in the labile noun stems:

(20) a. All plural desinences (except direct cases that end in -s)
b. NGL singular (except for the shapes -as and -oo)
c. The non-productive Ip in -mi.

All told, then, the variety in Lithuanian accentual paradigms is a consequence of
three factors – the lability of the stem (and the H-REMOVAL rule), the lexical posi-
tioning of the H-onset (and the METATONY rule), and the occasional presence of an
independent H-onset in the suffix, as in the Dp. The table that follows illustrates the
various possible combinations of lability, stem-final \(+H\) in their underlying forms and
the rules that provide for the surface forms.\(^7\)

We now extend our survey to adjectives and pronouns. A partial paradigm of

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<table>
<thead>
<tr>
<th>Underlying form</th>
<th>H-REMOVAL (Gs and Dp only)</th>
<th>H-DISTRIBUTION</th>
<th>METATONY</th>
<th>H-ASSIGNMENT</th>
<th>ORTHOGRAPHY</th>
</tr>
</thead>
<tbody>
<tr>
<td>skûten (-lab)</td>
<td>-a Is</td>
<td>skûtênà</td>
<td></td>
<td></td>
<td>skûtenà</td>
</tr>
<tr>
<td>skûten (-lab)</td>
<td>-oos Gs</td>
<td>skûtênòès</td>
<td></td>
<td></td>
<td>skûtenos</td>
</tr>
<tr>
<td>skûten (-lab)</td>
<td>-ôoms Dp</td>
<td>skûtênòôms</td>
<td></td>
<td></td>
<td>skûtenoms</td>
</tr>
<tr>
<td>dòovan (+lab)</td>
<td>-a Is</td>
<td>dòóvànà</td>
<td></td>
<td></td>
<td>dòvana</td>
</tr>
<tr>
<td>dòovan (+lab)</td>
<td>-oos Gs</td>
<td>doovanoos</td>
<td></td>
<td></td>
<td>doovanòs</td>
</tr>
<tr>
<td>dòovan (+lab)</td>
<td>-ôoms Dp</td>
<td>doovanòôms</td>
<td></td>
<td></td>
<td>doovanôms</td>
</tr>
<tr>
<td>mookyŷkl (-lab)</td>
<td>-a Is</td>
<td>mookyŷklà</td>
<td></td>
<td>mookyŷklà</td>
<td>mokyklà</td>
</tr>
<tr>
<td>mookyŷkl (-lab)</td>
<td>-oos Gs</td>
<td>mookyŷkloôs</td>
<td></td>
<td></td>
<td>mokýkllos</td>
</tr>
<tr>
<td>mookyŷkl (-lab)</td>
<td>-ôoms Dp</td>
<td>mookyŷkloôms</td>
<td></td>
<td></td>
<td>mokýkloms</td>
</tr>
<tr>
<td>Pelyŷš (+lab)</td>
<td>-a Is</td>
<td>Pelyŷšà</td>
<td></td>
<td>Pelyŷšà</td>
<td>Pelyšà</td>
</tr>
<tr>
<td>Pelyŷš (+lab)</td>
<td>-oos Gs</td>
<td>Pelyŷsoós</td>
<td></td>
<td>Pelyŷsoós</td>
<td>Pelyšós</td>
</tr>
<tr>
<td>žiem (+lab)</td>
<td>-ôoms Dp</td>
<td>žiemôôms</td>
<td></td>
<td>žiemôôms</td>
<td>žiemôms</td>
</tr>
</tbody>
</table>
nonderived indefinite adjectives is given in (23).

\[(23) \text{ Non-stem-final } +H\text{-onset} \quad \text{Stem-final } +H\text{-onset} \]

\[
\begin{array}{cccc}
\text{Nsm} & \text{jāunas} & \text{gardūs} & \text{gēras} & \text{slidūs} \\
\text{Gsm} & \text{jāunoo} & \text{gārdaš} & \text{gēroo} & \text{slidāuš} \\
\text{Dsm} & \text{jaunām} & \text{gardžiām} & \text{gerām} & \text{slidžiām} \\
\text{Asm} & \text{jāunu} & \text{gārdžiu} & \text{geru} & \text{slidžiu} \\
\text{Ism} & \text{jaunāmē} & \text{gardžiamē} & \text{geramē} & \text{slidžiamē} \\
\end{array}
\]

We note immediately that in view of the desinential stress in the Dsm, Lsm forms, all nonderived adjectives must be categorized as [+labile].\(^8\) Once this is done, the accentual facts are handled by the rules developed above, except that the desinence -ām Dsm (with inherent [+H]) which requires H-REMOVAL, has to be added to the list in (20).

As expected, the NGL forms (unless exempted) have final stress being subject to H-Removal, while in the other forms we get desinential stress only in the case of stems with [+H] on the final mora; these are subject to metatony in the appropriate circumstances, e.g., in Is.

Inspecting the pronoun, we note that some pronouns are [-labile]: (štitas 'this' [no rules apply; it is a composite of šis + tas]; nièkas 'nothing, no-one' [METATONY rule applies]. Others are [+labile]: (viènas 'one, some', [H-REMOVAL rule applies]; kitas 'other' [H-REMOVAL and METATONY rules apply]). Illustrative partial paradigms follow.

\[(24) \text{ Nsm} \quad \text{štitas} & \text{nìekas} & \text{viènas} & \text{kitas} \\
\text{Gsm} \quad \text{štito} & \text{nìeko} & \text{viènoo} & \text{kitoo} \\
\text{Dsm} \quad \text{štītam} & \text{nìekam} & \text{viènam} & \text{kitàm} \\
\text{Asm} \quad \text{štīqas} & \text{nìekqas} & \text{viènaq} & \text{kitąq} \\
\text{Ism} \quad \text{štīuo} & \text{nieku} & \text{vienu} & \text{kitù} \\
\text{Lsm} \quad \text{štīame} & \text{nìekame} & \text{viename} & \text{kitame} \\
\]

As far as the accent is concerned, the above paradigms present nothing new. There are, however, a few pronouns which never accentuate the stem, and thus differ from nouns, adjectives and other pronouns. We would expect such pronouns to have "assigned" pitch (on the last mora of the word). The H-ASSIGNMENT rule, in fact, accounts for forms like

\[(25) \text{ Nsm} \quad \text{kurīlis 'who'} \\
\text{Gsm} \quad \text{kurīdo} \\
\text{Dsm} \quad \text{kuriām (-am has its own H-onset)} \\
\text{Asm} \quad \text{kurīl} \\
\text{Ism} \quad \text{kuriuo} \\
\text{Lsm} \quad \text{kuriąmē} \]
and so forth. There is only one apparent exception:

(26) Dsf kurīāi

The unexpected acute is usually explained as an innovation, analogized from Dsm.\(^9\) (The form kurāl, in fact, exists in S and E dialects, but is said to be in retreat.) Regardless of the history, these pronouns show that -āi (and possibly all Datives) has an inherent H-onset. Since -āi does not require H-REMOVAL from labile stems, its inherent H-onset has no phonetic consequences anywhere, except in the case of the very few stems which have no inherent high pitch.

The notion that possibly all datives have to have inherent high pitch on the penultimate mora is strengthened by paradigms such as that of āv 'I': here the stem again is without an inherent H-onset.

(27) N āv

G manēgēs
D mān
A manē
I manimē
L manyyjē

Throughout the paradigm an assigned end pitch is self-evident except for the Dative, even though in this instance it is hard to view it as a desinence.

The definite adjective is a fairly transparent composite of an adjective stem with its case ending, followed by the pronominal stem j- with its case ending. Since the accent is never on the pronominal element, we shall assume that a major boundary intervenes between nominal and pronominal elements, that blocks the assignment of stress to the pronominal element:

(28) Gsm mūyilm + oo # j + oo

In derived nonlabile stems, accent is fixed (i.e., no rules apply), e.g., Nsm draugiskas, Gsm draugiskokojo, Dsm draugiskajam, etc.

In labile stems, only five forms out of 24 have the accent on the stem (Gsm, Asm, Dsf, Asf, and Npf).\(^{10}\)

<table>
<thead>
<tr>
<th>masc.</th>
<th>fem.</th>
<th>masc.</th>
<th>fem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ns myylimāsis</td>
<td>myylimooji</td>
<td>Np myylimēji</td>
<td>myylimoojē</td>
</tr>
<tr>
<td>Gs myylimoojoo</td>
<td>my ylimoòsios</td>
<td>Gp myylimùjju</td>
<td>myylimùjju</td>
</tr>
<tr>
<td>Ds myylimāajam</td>
<td>my ylimajāi</td>
<td>Dp myylimēsiems</td>
<td>myylimōsiooms</td>
</tr>
<tr>
<td>As myylimajājī</td>
<td>my ylimajājas</td>
<td>Ap myylimūsius</td>
<td>myylimāssias</td>
</tr>
<tr>
<td>Is myylimūoju</td>
<td>my ylimāja</td>
<td>Ip my ylimalsiai</td>
<td>my ylimōsloomis</td>
</tr>
<tr>
<td>Ls myylimāajame</td>
<td>my ylimoojoo</td>
<td>Lp my ylimūsioose</td>
<td>my ylimōsioose</td>
</tr>
</tbody>
</table>
In the remainder of the cases, accent is on the desinence. As in the nouns, we shall assume that in labile stems inherent accent is removed in especially designated cases, which in the definite adjectives comprises all but the five listed immediately above.

The Dsm and Dp desinences have inherent H-onsets, and retain them as expected. In the remaining forms, the removal of the [+H] from the nominal stem creates totally pitch-less forms, where high pitch will be assigned by the H-ASSIGNMENT rule to the last mora:

\[(30) \text{ Ip}m \rightarrow \text{mŷylim+ais}^#j+ais \rightarrow \text{myylim+ais}^#j+ais \rightarrow \text{myylim+ais}^#j+ais\]

The application of the H-ASSIGNMENT rule leads to the right results in all cases except the following six: Ism, Nsf, Isf, Npm, Apm, and Apf, producing forms like Ism *my ylimǔjo, where my ylimǔjo is wanted. To account for these six cases a further H-ADJUSTMENT is needed, namely: if the H-ASSIGNMENT rule assigns high pitch to the word penultimate mora, [+H] must be assigned to the desinence initial mora as well (31):

\[(31) \begin{align*} -H & +H \# CVC_o \#\# \\ & +H \# CVC_o \#\# \\ \end{align*}\]

as, e.g., in the Ism:

\[(32) \text{mŷylim+uo}^#j+u \rightarrow \text{myylim+uo}^#j+u \rightarrow \text{myylim+uo}^#j+u \rightarrow \text{myylim+uo}^#j+u\]

which is the desired result.\(^{11}\)

As we shall eventually see, the occurrence of [+H] on the word-penultimate mora in Lithuanian is nontypical. All instances of it are limited to either morph-specific exceptions (as e.g., the Nsm in -as which is exempt from the METATONY rule), or to nontypical results of some rule that otherwise does not assign [+H] to the penultimate (Nsm def. in [29] is a case in point).

The rule order, by way of recapitulation, is the following:

\[(33) \begin{align*} \text{H-REMOVAL} & \quad (\text{in the morphology}) \\ \text{H-DISTRIBUTION} & \quad (\text{producing the contour}) \\ \text{METATONY} & \quad (\text{shift to the right}) \\ \text{H-ASSIGNMENT} & \quad (\text{end pitch}) \\ \text{H-ADJUSTMENT} & \quad (\text{shift to the left}) \end{align*}\]

Taking up the verb next, let us first examine the future tense (34).

\[(34) \begin{align*} 4 \text{ moras from end} & \quad 2 \text{ moras from end} & \quad \text{stem-final} \\ 1s \ mòokyysi & \ gáusi & \ gyvënsi & \ pîrksi & \ mëgsi \\
 2s \ mòokyysi & \ gáusi & \ gyvënsi & \ pîrksi & \ mëgsi \\ 1p \ mòokyysi & \ gáusim & \ gyvënsim & \ pîrksim & \ mëgsim \\
 2p \ mòokyysi & \ gáusit & \ gyvënsit & \ pîrksit & \ mëgsit \\ 3p \ mòokyysi & \ gãus & \ gyvëns & \ pîrks & \ mëgs \end{align*}\]
We note that stems with a lexical [+H] on the penult undergo metatony, as did nouns exemplified in (17), above, i.e., *gyy\textsubscript{vėns} gyyve\textsubscript{n}s. This metatony is not affected by the presence or absence of the reflexive clitic, as the following additional example illustrates: "girsiuos 'I shall brag' but 3p girsis (*girsi\textsubscript{s}s#). We see, furthermore, that it is not true that every \(~H+H+H\) sequence is subject to metatony, as the 2s pirk\textsubscript{s}i illustrates. Metatony is blocked when the last vowel is preceded by a morpheme initial consonant.

We now have all the phonetic detail needed to formulate the metatony rule precisely:

\[
(35) \quad [+H] \rightarrow [-H] / \quad X \left\{ C+V(C) \right\} \left\{ V(C)+C \right\} \left\{ V#C \right\}##
\]

The last parenthesized portion of the rule \((V#C)\) takes formal note of the fact that the reflexive verb is accentuated like the nonreflexive. There are two points to note concerning the expressions within braces:

(a) part of the environment of the metatony, as indicated, must be the "\(+\)" boundary; this is necessary to rule out accentual shifts within a desinence, e.g., in the Ds kr\textsubscript{ā}m 'to whom' [and not *kr\textsubscript{ā}m];

(b) the shift must not take place across a desinence-initial consonant, as the form gir\textsubscript{s}i 'you brag' [and not *gir\textsubscript{s}i] shows.

In addition, there are the morpheme-specific exceptions, namely the Nsm in \(-s\), the Vocative, and, as we shall see, the third person in \(-a\), which fit the definitions of the METATONY rule, but where the rule still does not apply.

Turning to the present tense, we encounter the following paradigms in the primary verbs:

\[
(36) \quad \begin{array}{cccc}
1s & sapn\textsubscript{u}oju & ëugu & ved\textsubscript{u} & gyven\textsubscript{u} & rand\textsubscript{u} \\
2s & sapn\textsubscript{u}oji & ëugi & vedi & gyveni & randi \\
1p & sapn\textsubscript{u}ojame & ëgame & vėdame & gyvename & randame \\
2p & sapn\textsubscript{u}ojate & ëgate & vėdate & gyvenate & randate \\
3p & sapn\textsubscript{u}oja & ëga & vėda & gyvėna & randa \\
\end{array}
\]

Generalizing from what we have learned in the nouns, we observe that the METATONY rule operates in 1s and 2s, under the same circumstances where it would operate in nouns, i.e., when the penultimate \(+H\) in \(*\text{ved}u\) and \(*\text{gyvenu}\), is removed. The third person, then, must have a morpheme-specific exemption, since it otherwise fits the definition of the METATONY rule.

Inspecting the reflexive (in [37]) we note that it is indeed METATONY and not some other process that explains the shift in \(+H\) onset in (36):
(X. LINGUISTICS)

(37) 1s juokìùos 'I laugh'
     2s juokìes
     1p juòkiames
     2p juòkiates
     3 juòkias

The option in (35) that allows the shift in 1s and 2s is

(38) C + VV # C ##

No comparable provisions exist in any other rule.

We can, accordingly, view the subparadigms inspected up to this point as analogs to the nominal accentual paradigms 1 and 2, i.e., belonging to the same class, and differentiated solely by the effects of the METATONY rule.

The METATONY rule, however, cannot explain the present tense of the third conjugation verbs, where the stress shifts to what is patently not a short ending.

(39) 1s valgau mataù
     2s valgai matal
     1p valgame matome
     2p valgote matome
     3 valgo mato

To account for the accentuation of these forms we must assume that they are subject to H-REMOVAL. Because of this they will be supplied with high pitch on the last mora by the H-ASSIGNMENT rule. We recall that only forms marked [+labile] are subject to H-REMOVAL. The examples under discussion show that lability cannot be a feature of all words having a particular stem or a particular suffix; instead, it appears to be a property of specific forms, words in the narrow sense.

All verbs with +H-onset on the final mora, and only such verbs, are subject to H-REMOVAL in certain forms of the present and past tense. Lability in verb forms is, therefore, redundant; unlike nouns, verbs need not be lexically marked for lability. H-REMOVAL, when it occurs, is linked to specific subparadigms, according to the following schedule:

(40) 1s and 2s 1s and 2s
     i(e), u(o) au, ai
     Metatony
     (analog of Class 2)
     H-Removal
     (analog of Class 4)

Lexical +H on final mora

Lexical +H on prefinal mora

No rules apply in present or past
(analog of Class 1)

The whole set of the present and past alternations is illustrated in (41) below.
We end our discussion of Lithuanian inflectional morphology with a brief note on two types of infinitives, illustrated in (42) and (43) below.

(42) laikôme : laiky̆yi
gy̆dome : gy̆dy̆yi

The above examples appear to operate in a way analogous to the -m datives in the substantives. If the stem is stressless as in laiky̆yi, the inherent +H of the suffix may appear in the output; if the stem has an +H-onset, the latter takes precedence over that of the suffix, as in gy̆dy̆yi. In the case of infinitives in +yy̆i, lability is apparently assigned to verb stems on the same basis as it was to the paradigms in (39) - stem-final +H-onset means redundant lability.

In examples that follow, we see that lability can be assigned regardless of the place of the lexical +H-onset as well:

(43) stővime : stovėeti
galĭme : galė̆eti

This is apparently the case in the infinitives in -ė̆eti, where the stems are affected in the same way as nouns of Classes 3 and 4, respectively.

Example (43) is of no particular consequence as far as inflectional morphology is concerned, and is, at most, an example of how lability in the verb, while not lexical, is assigned to individual subparadigms, and sometimes involves phonological criteria (+H-onset on final mora), at other times not. Example (43) will acquire additional significance when the derivation of nouns and adjectives is discussed in the Appendix.

Appendix: The Accentuation of Nominal Derivatives

We have noted in the preceding text that word-class (part-of-speech) membership has bearing on accentuation; e.g., we have noted that nonderived adjectives are
redundantly [+labile] (accentual paradigms 3-4), and that in verbs information on lability depends on the individual subparadigm.

In contrast to nonderived adjectives, derived adjectives can belong to accentual paradigms 1, 2, or 3 (not 4), e.g.

(44) laimìngas 'happy, lucky' (acc. parad. 1; cf. laimë)
    medinis 'wooden' (2)
    drùskinas 'salted' (3)

Two observations can be made immediately:
(a) the feature [-labile] can be introduced by derivation.
(b) some suffixes have an inherent [+H], which takes precedence over the inherent [+H] of the nonderived stem (as in laimìngas); i.e., when such suffixes are attached to the stem, the stem becomes subject to H-REMOVAL. In fact, an examination of stressed noun and adjective-forming suffixes shows that the inherent [+H] of the suffix takes precedence over that of the stem in all clear cases.

Examples:

(45) laìmë (1) : laimìngas 'happy' (1)
    pavoðjus (2) : pavoojìngas 'dangerous' (1)
    naudà (3) : naudingas 'useful' (1)
    bailìys (4) or bailùs (4) : bailìngas 'cowardly' (1)

In all instances the +H-onset of the derivative suffix and its [-labile] character has taken precedence over all characteristics of the nonderived stem. Some further examples illustrate the above with various suffixes of accentual paradigm (2) (that is, H-onset on last mora of stem, [-labile]):

(46) -oons vilña (1) : vilnoónis (2) 'woolen'
    -lkë kiaûlë (2) : kiaûlë (2) 'piglet'
    -èlis koûtas (3) : kootèlis (2) 'handle'
    -umas gèras (4) : gerùmas (2) 'goodness'

Nouns and adjectives derived with suffixes not having inherent +H belong to either accentual paradigm (1) or to accentual paradigm (3), the choice of paradigm being determined by the suffix. In all cases, the H-onset is on the original mora, unless the H-REMOVAL rule applies. The suffixes -in- and -um- give adjectives of paradigm (3)

(47) âmûzûs (-labile) : âmûzûnas (+labile) 'eternal'
    dumblas (-labile) : dumblinas (+labile) 'muddy'
    zëmas (+labile) : zëmumas (+labile) 'lowness'

In nouns and adjectives formed with stressless suffixes and not requiring lability, the
resulting form belongs to paradigm (1), with the H-onset on the same mora as in the nonderived form:

(48) mòoteriskas 'feminine' from a root of Class 1
dirviškas 'field adj.' from a root of Class 2
ărkiškas 'equine' from a root of Class 3
valkiškas 'childish' from a root of Class 4.

Word-forming suffixes accordingly belong to four separate types, depending on whether or not they form [+labile] words, and whether or not they have inherent [+H]. We recall that, unlike a desinence, a noun- or adjective-forming suffix with inherent [+H] subjects the stem to H-Removal.

Type I has inherent [+H] and forms words that are [-labile]; words derived with such suffixes are stressed on the suffix and belong to accentual paradigms (1) and (2).

(49)  

Type II has inherent [+H] and forms [+labile] words; words derived with the sole suffix of this class belong to accentual paradigm (4) [paradigm (3) is logically possible, but not attested].

(46)  

Type III has no inherent [+H] and forms [-labile] words; words derived by means of such suffixes keep the original H-onset.

(47)  

Type IV has no inherent [+H] and forms [+labile] words; such words keep the original H-onset in those forms where it is not removed by the H-REMOVAL rule. The resulting words, then, belong to accentual paradigm (3).

(48)  

We note again that the information about the lability of the original stem plays no role whatever in the derivational process; i.e., the derivational suffix alone determines the feature +/-labile of the derived word in the same way in which it determined the lexical category of the derived word.

Reflecting on the implications of the fact that in nominal and adjectival derivation suffix stress takes precedence over stem stress, we cannot escape the conclusion that
nominal derivation by itself could be best described with a falling pitch contour, i.e., __________, the type encountered in Slavic. Then no H-REMOVAL rule need apply, as the dominance of the [+H] of the desinence would occur as the natural consequence of the H-DISTRIBUTION rule, or, graphically:

\[ \_l\_m + \_ngas \]

A falling pitch contour in the derivation would, furthermore, permit this additional generalization: in both declension and nominal derivation the information concerning the lability of a paradigm accompanies the low portion of the contour; in the nonderived noun and the nonderived adjective lability is determined by the stem; in the derived forms, by the suffix.

The possibility of a falling contour raises more questions that we are at present able to answer. If derivation can be interpreted as having a falling contour, should it be so interpreted? If not, that is, if our initial account of derivation is to be preferred, then on what grounds? (We brought up the possibility of a falling contour only to reject it.) The one question of major general interest is the following: assuming for the sake of argument that both pitch contours coexist (the rising in inflection, the falling in derivation), which of the two is the older?

At the outset of this Appendix we made the observation that in derived adjectives the +H of the suffix dominated in clear cases. One of the cases that is not clear may provide a small clue towards the solution for, if not necessarily the age problem, then at least the problem of the direction of the change.

This case is the accentuation of words derived with the suffix -inis/-inis (2). According to Senn, at least in the 'twenties, this suffix differed from all others in that it followed the dominance pattern of the inflection, and assumed the accent if the stem was [+labile]. Since this observation subsequently became incorporated in the literary norm, later developments are not, strictly speaking, natural. At the same time it cannot be denied that an increasing number of new words derived with this suffix stress the suffix regardless of the lability of the original stem, to the point where Dabartines lietuvių kalbos žodynas advises that no general rules are applicable. If the example is to the point, and it seems to be, then the domain of words best accommodated by a falling contour is spreading.

V. J. Zeps, M. Halle

References

1. We have relied primarily on descriptions of Lithuanian accentual paradigms in Alfred Senn, Handbuch der litauischen Sprache, I (Heidelberg, 1966), and the Lithuanian Academy Grammar, Lietuvių kalbos gramatika, I (Vilnius, 1965).
2. In these observations we follow the Academy Grammar, op. cit., pp. 130-141, although their method of summarizing kymographic tracings creates some problems of interpretation.

3. The following titles are merely illustrative of the voluminous literature that exists on the subject:


   We were not able to consult the Ph. D. Dissertation of Michael Kenstowicz, "Lithuanian Phonology," in time for this report.


5. Intonable segments or moras are constituted by vowels, and by sonorants preceded by a single vowel and followed by a consonant or by a word boundary.

6. In contemporary colloquial Lithuanian, as well as in dialects, the mora structure of long monophthongs has been lost, and no accentual distinctions are possible. Since this distinction is crucial for the METATONY rule, i.e., it makes a difference whether a long vowel has [+H] on the final mora or on the penultimate, it follows that the phonological basis for the operation of the METATONY rule has disappeared. As observed by the late Tamara Buch, a merger of the accentual paradigms (1) with (2) and (3) with (4), is consequently in progress ("Entwicklungstendenzen in der Akzentuierung der Substantive im Litauischen," IJSLP 13, 1-10 (1970).

7. We have proceeded to this point on the assumption that, as Lithuanian phonetics seem to indicate, the pitch contour is rising, and is a two-level -H +H structure, unlike the falling +H -H contour suggested by Halle's work on Russian. It could easily be argued that the phonetic reasons are not compelling, and that some type of falling contour could be made to account for Lithuanian accent as well. Thus, examples in (13) and (14) could be interpreted to read

   \[ \text{kò} \text{oja} \]
   \[ \text{žoò} \text{dis} \]
   \[ \text{u} \text{pè} \]
There is, however, an additional reason for adopting the rising contour. Given the rising contour, no special explanation is needed as to why the H-onset of the stem takes precedence over that of the suffix: the rising contour provides for assemblages such as

\[ \overline{\text{döovan} + \text{ôoms}} \text{ and } \overline{\text{mooky} + \text{ôoms}} \]

which obtain the correct H-contour by the operation of the H-DISTRIBUTION rule, with no special provisions necessary. (See, however, the Appendix.)

8. Derived adjectives can be labile as well as nonlabile, e.g., laimingas 'lucky' and medinis 'wooden' are nonlabile, whereas drūskinas 'salted' is labile.


10. At first sight the definite adjective paradigm may seem to be a summary of paradigms (2) and (3), with the [+H] removed from the stem in all cases where it can be removed in either paradigm (2) or (3). There are discrepancies, however: baltāsis in face of baltas vs gardūs seems to have generalized end pitch; whereas brangoojoo in face of bāltoo and brangauš seems to have generalized stem stress.

11. There are other ways of handling the tendency toward ante-penultimate high pitch in the definite adjective. Of the several that we considered, the above seemed to involve the fewest other assumptions.

12. It is not true that every suffix with inherent [+H] causes H-REMOVAL from the stem. We have just seen that the Dsf desinence has inherent [+H] (as shown by the pronouns) but does not cause H-REMOVAL.

13. With the possible exception of Infinitives in -ỳyi.

B. ON ALGORITHMS FOR APPLYING PHONOLOGICAL RULES

Sound Pattern of English Algorithm: "To apply a rule, the entire string is first scanned for segments that satisfy the environmental constraints of the rule. After all such segments have been identified in the string, the changes required by the rule are applied simultaneously."¹ Let us call this the principle of simultaneous application. It makes the claim that information about the application of a rule at one point in a string cannot be relevant to its application at another point in the same string. This is a strong claim, and certainly a desirable goal. We have found,² however, that to achieve this situation we must introduce the parentheses-star notation, and this notation does not sufficiently delimit the class of iterative processes. We can obtain a better and more restricted theory by allowing at least some rules to reapply to their own outputs, and disallowing the parentheses-star notation.

This, however, does not exhaust the problem of defining the notion "applying rule R to form F." What happens when a rule, even without ( ), applies at more than one point? Consider a rule

\[ V \rightarrow [^{+\text{stress}}] /\left[ ^{+\text{syl}} \right] ^{-\text{stress}} C_{0} \]

as it applies to a string like

/CVCV/CVCV/

We can make at least two choices: apply it everywhere we can at once, in which case we stress all but the initial syllable; or apply it at only one place at a time, reapplying it after each such simple operation. The second alternative can lead to several possible results, including alternation of stress.

A case in which simultaneous application will not work has been discussed by François Dell.³ French contains several rules to treat schwa (ə), including the optional rule

\[ θ \rightarrow Φ / (#) C \]

Given a form like tu devenais ( /tu # dəvane/ ), the rule can apply to either one of the θ's. The possible outputs are [túdəvane] and [túdoñve], but not [túdvne]. This shows that the rule can apply to only one of the two schwas, not to both. In this case, we can explain this exclusion by appealing to disjunctive order: the two are affected by different sub rules of the rule

\[
\begin{align*}
\text{TRI-C a:} & \quad θ \rightarrow Φ / V \# C \\
\text{b:} & \quad θ \rightarrow Φ / V \_ C
\end{align*}
\]
TRI-C_a precedes TRI-C_b; it is optional, and the pair is disjunctive. Thus applying part_a to delete the first θ precludes the deletion of the second θ by part_b; only if we choose not to apply TRI-C_a can we apply TRI-C_b, and this prohibits the bad output.

A more complex case, however, is the following: Jacque redevenait (gai) has three pronunciations; [...k#rødøvene..], [...k#rødøve..], and [...k#rødøve..], but not [...k#rødøve..]. That is, the first θ may not be deleted at all because it does not satisfy the rule, and either of the other two may be deleted but not both. Similarly, envie de te le demander has the form

/...vi#da#ta#jø#dam../

Vowel 1 cannot undergo the rule, of course, but the others can. If we symbolize deletion by - and nondeletion by +, we can characterize the possible outputs as follows:

\[
\begin{array}{ccccc}
2 & 3 & 4 & 5 \\
+ & + & + & + \\
- & + & + & + \\
+ & - & + & + \\
+ & + & - & + \\
+ & + & + & - \\
- & + & - & + \\
+ & - & + & - \\
- & + & + & - \\
\end{array}
\]

All other possible outputs are ungrammatical. The generalization to be maintained here is that the rule can apply freely, as long as it does not apply in adjacent syllables. Observe, first, that simultaneous application is hopeless here; there is no way of stating the restriction to nonadjacent syllables, and the Sound Pattern of English algorithm will give all of the wrong outputs as well as the right ones.

What kind of application principle will work? Suppose we apply the rule at only one point at a time, and work our way across the word from left to right. Then we shall get the right results because the rule will never be applied to any syllable until the preceding syllable has been passed. If we applied the rule to the preceding syllable, it will no longer have a vowel, so the structural description of the rule will not be met for the syllable under consideration. Thus we can never apply the rule to two successive syllables, as we would like.

C. D. Johnson has recently proposed that all rules apply in this fashion, either from right to left or from left to right, with the direction being a property of each rule.
It might or might not be possible to predict formally in which direction a rule will apply. In the French case, applying the rule sequentially, from left to right gives the correct result; other examples discussed by Johnson require right-to-left application under a sequential theory.

Is it possible to construct an alternative to the sequential theory, and if so, is it possible to decide between the two? Let us consider the direction such an alternative might take: Suppose we claim that the following generalization limits the scope of an application convention essentially like that of the SPE algorithm.

**Principle 1.** A rule may not apply simultaneously in two places if the environment necessary for one application includes a segment affected by another application.

This principle asserts essentially that it is not permissible to use something to condition the application of a rule to some segment unless you know that the environment will still be present after you have applied the rule. This is a sort of 'recoverability' condition for phonological derivations analogous to, but distinct from, similar conditions proposed in syntax.

Our next task is to incorporate principle 1 into the application algorithm of SPE.

**Revised Simultaneous Application Convention (RSAC):**

Scan the string for segments that satisfy the constraints of the rule. When such a segment is found, identify it, and associate with that identification an identification of the environmental analysis that makes the rule applicable to that segment. Then principle 1 applies: If any environment contains a segment marked as undergoing the rule (other than the one with whose applicability this environment is associated), mark that as a violation. Then erase the minimal number of applicability identifications and their associated environment specifications that will eliminate all of the violations. Apply the rule simultaneously to the segments remaining marked as undergoing the rule.

Observe how RSAC applies to *envie de te le demander*: First the string is identified as follows, where an arrow indicates the segment that is to undergo the rule, and an underline the 'enabling' environment. Violations of principle 1 are marked with an asterisk:

```
/ ....i#da#ta#le#dam... /
```

Since the rule itself is optional, we can omit any of these applications. To see if RSAC works, however, let us assume that we try to apply it everywhere. According to the
erasure principle in RSAC, we must erase either the first or the second application to get rid of the first violation. We also have to erase either the third or the fourth application to get rid of the third violation. Now unless we have chosen the first and fourth to eliminate, we shall also have eliminated the middle violation, and none will remain. It can be confirmed that the only combinations that principle RSAC allows are those in the chart above, namely, all and only the correct outputs.

It therefore appears that RSAC, as a modification of the SPE algorithm, will also give the correct results in this case, and it is therefore a possible alternative to the left-right sequential theory. We must now look for a case that will help us decide between these two alternatives.

We take as our case an example from Acoma, in which there are complex accentual phenomena. We have transcribed the language with \( \check{\text{V}} \) to mark 'high pitch', and have left the other tone features unmarked. This distortion does not affect the structure of the example.

In certain morphological categories, all vowels receive high tone. Thus, we have suwagéní 'I got dressed', but suwágéní 'when I got dressed'. There is also a rule of tone loss, stating that

\[
V \rightarrow [-\text{high tone}] / [+\text{obst}] \left[ -\text{long} \right] [+\text{obst}] \text{C}_o \check{\text{V}}
\]

The operation of this rule can be seen, for example, in sisíusdyání 'when I repel him', for the expected síísíusdyání. This rule can apply in adjacent syllables in the same word: Thus we have ³sípekáawání 'when I chopped wood', for the expected ³sípekáawání, where each of the first two syllables loses tone. In this example, the sequential theory gives the right result if the rule applies from left to right, and the wrong result if it applies from right to left (giving incorrect ³sípekáawání); thus a sequential rule must apply left to right.

How is this example treated under RSAC? We see that the rule analyzes the string as follows:

\[
\begin{align*}
\text{³} & \check{\text{í}} \ p \ é \ k \ á \ w \ á \ n \ í \\
\text{*}
\end{align*}
\]

Since in this analysis there is only one violation of principle 1, erasing either application of accent loss will eliminate the violation. Now suppose that accent loss is an iterative rule, and can thus apply to its own output. Then two alternative derivations can be imagined:
underlying form /sípékáawání/ /sípékáawání/
accent loss (first time) /sípékáawání/ /sípékáawání/
accent loss (reapplied) — — /sípékáawání/

These two derivations differ in which application of accent loss we choose to erase on the first pass of this rule. One choice allows another pass to have an effect; the other does not. RSAC by itself does not make a principled choice between these two derivations. Obviously, the second derivation is the correct one; we might, therefore, propose the following additional convention:

**Principle 2:** When, in applying RSAC, two or more possibilities exist for eliminating the violations in an analysis of a form with respect to a rule, and each is minimal, in that it eliminates the smallest possible number of applications of the rule within the form, and the rule is an iterative one, choose that elimination set which allows the rule to reapply over one that does not allow reapplication.

Principle 2, combined with RSAC, then becomes part of the (universal) definition of "how to apply a rule to a form." This convention makes the correct choice of the second derivation above for /sípékáawání/. Although it may appear complex and unmotivated, principle 2 can actually be seen to be a special case of a much more general principle, according to which rules apply so as to maximize their utilization in the grammar unless they are explicitly prevented from doing so.\(^6\),\(^2\)

Thus far we have managed to make both left-right sequential application and application according to RSAC (supplemented by principle 2) consistent with all of the facts. But our task was to decide between them. Are there additional facts that will assist us? Let us consider what happens when three consecutive syllables in an Acoma word satisfy the conditions for accent loss. From underlying /súcítístääní/ 'when I was thinking', we obtain sucítístääní. Observe that, although all three of the first syllables of the word satisfy the rule, only the first and third, and not the second, undergo accent loss. Such a result is inconsistent with the left-to-right sequential application of the rule which should eliminate any number of consecutive accents, treating three or more syllables in the same way that it treated two syllables. Accordingly, the left-to-right rule will not account for sucítístääní. Now consider the way this form is analyzed by RSAC:

\[
\begin{array}{c}
\text{súcítístáání} \\
\text{*} \\
\end{array}
\]

Here the three applications give rise to two violations of principle 1. In this case,
RSAC can countenance only one way of eliminating the violations: By eliminating just the middle application, both violations disappear, while any other way of eliminating the violations will involve deleting at least two applications. Since RSAC requires us to minimize applicability deletions, there is only one possible derivation, giving sucústáamí. Principle 2, which only decides between equivalent minimal deletions of applicability marks, does not come into play here, since there is only one such minimal procedure. After this pass at the string with the accent loss rule, there are no places left in the string where the rule could apply on a second pass. The correct result is thus obtained.

Thus we see that RSAC, supplemented by principle 2, correctly predicts the difference between two and three potential applications of the Acoma accent loss rule, in a way that seems beyond the capacity of sequential rules. Some additional procedure might be envisioned that would also be consistent with all of these facts, and would be preferable on some other grounds, but until some such procedure is proposed and justified, we propose to take RSAC, together with principle 2, as constituting the definition of "how to apply a rule to a form," supplanting the paragraph from SPE quoted at the beginning of this report.

S. R. Anderson

References


