71-21,151

KENSTOWICZ, Michael John, 1945-
    LITHUANIAN PHONOLOGY.

    University of Illinois at Urbana-Champaign,
    Ph.D., 1971
    Language and Literature, linguistics

University Microfilms, A XEROX Company , Ann Arbor, Michigan

LITHUANIAN PHONOLOGY

BY

MICHAEL JOHN KENSTOWICZ

B.A., San Jose State College, 1966

THESIS

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Linguistics
in the Graduate College of the
University of Illinois at Urbana-Champaign, 1971

Urbana, Illinois

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

THE GRADUATE COLLEGE

January, 1971

I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY

SUPERVISION BY___MICHAEL JOHN KENSTOWICZ

ENTITLED___LITHUANIAN PHONOLOGY

BE ACCEPTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR

THE DEGREE OF___DOCTOR OF PHILOSOPHY

Charles W. Kisseberth

In Charge of Thesis

Acting Head of Department

Recommendation concurred in†

Committee

on

Final Examination†

† Required for doctor's degree but not for master's.

D517

ACKNOWLEDGMENT

PREFACE

The description of Lithuanian phonology presented in this dissertation represents a refinement of an earlier draft, which was distributed in unpublished mimeo form over a year ago. The description presented here differs from the earlier version in two respects.

First it is somewhat shorter. I do not provide a full description of the segmental phonology of the nominal desinences, although a partial analysis is given in section 3.4. Also I have omitted a section on verbal accentuation, which was never complete to begin with. Most of the material of this earlier section is present in Kenstowicz (1970a). Finally, I have omitted a section of the notation of vowel length. This is available in Kenstowicz (1970b).

Secondly, my ideas on the overall phonology of Lithuanian have changed in two rather significant ways since the earlier draft. First, in my original description I postulated an underlying short o̱ phoneme. I now consider this an error for the reasons given in section 2.3. Secondly, I originally described the Lithuanian accentual system in terms of morae. However, recent unpublished work by Halle (1970) suggests a new treatment of accent, which is discussed in sections 3.6 - 3.8.

I have essentially two goals in this dissertation. First, I try to formulate a description of a wide variety of data about the phonology of contemporary Standard Lithuanian within the theoretical framework of generative grammar, a framework which permits a surprising amount of insight into the data. This goal is not trivial since, although there are several traditional phonemic descriptions such as Senn's <u>Handbuch der Litauischen</u>

Sprache, Stang's Das Slavische und Baltische Verbum, and Otrebski's

Gramatyka Jezyka Litewskiego, the latter being by far the most informative,

they fail, except for fairly low level and transparent phenomena, to bring

any significant generalizations to bear upon the data. For this reason I

do not present any new additional data in this description, but rather

provide an analysis of some of the facts already given in the above works,

which, along with the excellent Lithuanian dictionary Dabartinės Lietuviu

Kalbos Žodynas, have served as my primary source of data.

My second goal has been to confront the theory of generative phono-

logy, which has been most systematically presented in Chomsky and Halle's

The Sound Pattern of English, with a rather diverse set of data from still

another language. In some of the cases where the theory does not, in my

opinion, permit the proper insight into the data, I have attempted to

extend it along lines which will allow for such insight.

It should be admitted at the outset that these goals have only

partially been attained. With regard to the first, the description pre-

sented here is far from complete, there being many aspects of the language

which I have omitted from consideration. Thus, derivational morphology is

only touched upon sporadically, and several of the nominal declensions and

verbal paradigms are not treated. In general I have concentrated on those

phenomena which either would be essential to any phonological description of

Lithuanian or those which are of inherent interest. However, in spite of this

limitation, I believe that most of the rules I have formulated would be re-

tained in essentially unaltered form if more data were considered. I there-

fore feel that the description presented here is, on the whole, a fairly

faithful reflection of the phonological structure of the language. As far as

the second goal of confronting the theory with a fresh set of data is

concerned, here too it must be admitted that there are many features of the language which I don't think are properly illuminated in my description. In some of these cases this lack of insight can be attributed to the theoretical framework within which the description is formulated and my inability to extend it in such a way as to achieve the necessary insight.

For those readers who may not be familiar with it, I will now give a brief summary of the Lithuanian orthography, since I will usually cite forms in it rather than a phonetic transcription.

There are three accent signs in the orthography. An acute, which indicates a falling contour on the accented syllable, a circumflex indicating a rising contour, and a grave accent sign which merely indicates stress or accent without any perceptable contour on the syllable.

Lithuanian employs a Latin alphabet with a few modifications. Unless otherwise noted, the letters stand for what is the usual phonetic value (i.e. "p" indicates a voiceless, bilabial stop, etc.). Exceptions are "c" and "dz" which are voiceless and voiced dental affricates, and "dž," the voiced counterpart of "č," a palatal affricate. All consonants except "j," a front glide, can be palatalized or soft and velarized or hard. Consonants are palatalized (i.e. "sharped") when followed by a front vowel letter, either "i" or "e." When palatalized consonants occur before a back vowel, the palatalization is indicated by inserting the letter "i" between them and the following back vowel letter, this "i" representing no additional sound, but merely the palatalization of the preceding sound. Thus, bliauti is [b'l'aut'i]. Also since the sound [i] never occurs before a back vowel, whenever the letter "i" occurs before a back vowel letter it always indicates merely the palatalization of the preceding consonants, the only exceptions to this being obvious foreign borrowings like biologia, where the "i"s do represent

high front vowels.

There are six vowel letters: "a," "e," "i," "o," "u," and "y." These have the usual phonetic value except that "y" represents [i:]. These letters are modified in various ways to indicate vowel length. There are three ways in which vowel length is represented in the orthography. First, a given letter may always represent a long vowel. There are two such letters: "y," which regardless of diacritics always stands for long [i:], and "o," which always designates a long, tense [o:], except in obvious foreign borrowings like poètas and in the diphthong "uo," in which cases it is short and lax. Secondly, a vowel length may be indicated by means of a diacritic. The letter "ė" always represents long, tense [e:], while "ū" represents long [u:]. The other diacritic used to represent length is a nasal hook written under the letter. Note that this hook does not represent nasalization of the vowel since all vowels are oral in contemporary Standard Lithuanian. Thus, "ą" = [a:], "ę" = [ɛ:], "į" = [i:], and "ų" = [u:]. The letters "ę̇" and "ǫ" do not occur. Finally, a letter can indicate a long vowel by virtue of its accent sign. This only happens with the letters "e" and "a," which designate long vowels when the acute or circumflex is written over them. Here the long "e" is open and lax [ɛ:]. For example, lė̃das is [lʹɛ:das] and rãtas is [ra:tas]. Also, gérti is [gʹɛ:rʹtʹi] and lángas is [la:ngas]. In all other cases the vowel letters indicate short vowels.

For ease of reference I give a short list of the vowel sounds and the letters which are used to represent them.

[i]	i, ì	[i:]	y, ỹ, ý, į, į̃, į́
[u]	u, ù	[u:]	ū, ū̃, ū́, ų, ų̃, ų́
[ɛ]	e, è	[e:]	ė, ė̃, ė́
[a]	a, à	[o:]	o, õ, ó

$$[a:] \quad \tilde{a}, \acute{a}, \c{e}, \tilde{\c{e}}, \acute{\c{e}}$$

$$[\epsilon:] \quad \tilde{e}, \acute{e}, \c{e}, \tilde{\c{e}}, \acute{\c{e}}$$

One final point. When the letters "i" and "u" form a mixed diphthong with an immediately following liquid or nasal in a closed syllable and in addition the syllable has a falling accent, instead of writing an acute over the "i" or "u," a grave is written. Thus, for example, in <u>dìrbti</u> and <u>qìmti</u>, the first syllable has a falling contour and the letter "i" represents a short vowel. This is the only case in which the grave accent is used to indicate a pitch contour. Evidently the rational behind this is the desire to preserve the generalization that acute accent over a vowel letter means that that vowel is pronounced long.

TABLE OF CONTENTS

I. GENERAL PHONOLOGICAL PROCESSES

I.I The Vowel Inventory

The following vowels appear in a broad phonetic transcription of Standard Lithuanian.

(I)   i: i   u: u

           e: o:

           ɛ:ɛ   o

           ä: a: a ɑ: ɑ

The symbols e: and o: represent long tense mid vowels, which are closer in articulation than the lax open mid vowels o and ɛ. In the low vowel series ä: is front, a centalized, and ɑ back. The symbols i and u represent the usual feature matrixes, i.e. a high front unround and a high back rounded vowel respectively.

Some of the features defining the phonetic differences between these vowels are clearly allophonic. Thus, a and ɑ are in complementary distribution such that the latter only occurs before hard (velarized) consonants, while the former appears elsewhere. Similarly, ɛ: and ä: are in complementary distribution such that the latter occurs before hard consonants and the former elsewhere. Finally, short open o, except when it occurs in the diphthong uo, where it may be treated as a variant of a, only appears in foreign borrowings, and hence may be removed from the inventory of native sounds.

On the basis of these considerations we may tentatively assume an underlying vowel system which displays a fair degree of symmetry, as the following shows.

(2) i: i   u: u

e: o:

ɛ:ɛ   a: a

The status of the non-high vowels in this system will be modified as the
analysis proceeds. From now on unless otherwise stated, the symbol e̲ will
be used to represent the lax open ɛ̲. The tense closed e̲: will now be designated
by ė̲.

Phonetically, the following diphthongs occur: ai̲, au̲, ei̲, ie̲, ui̲, and
uo̲. Although these sounds are articulated in one vocal gesture and therefore
are both members of the same syllable, phonologically they act like separate,
individual vowels, and are so treated. These diphthongs will be termed
"vocalic" in order to distinguish them from the "mixed" diphthongs, which are
vowels followed by a liquid or nasal in a closed syllable.

1.2 Secondary Lengthening

In Lithuanian there is a quite general process whereby lax non-final
open e̲ and a̲ are lengthened when accented. Due to the mobility of the accent
this gives rise to alternations like the following.

(3) nom. sg.   lẽdas [l'e:das] 'ice'   rãtas [ra:tas] 'wheel'

loc. sg.   ledè   [l'ed'e]   ratè   [rat'e]

1 sg. pres. metù [m'etu]   'throw' kasù   [kasu]   'dig'

3 sg. pres. mẽta [m'e:ta]   kãsa   [ka:sa]

This lengthening also occurs in diphthongs, both of the vocalic and the mixed
type.

(4)

nom. sg.	káimas	[ka:imas]	'village'
nom. sg.	vaĩkas	[vaikas]	'child'
nom. sg.	lángas	[la:ŋgas]	'window'
loc. sg.	langè	[laŋ'g'e]	
nom. sg.	bérnas	[b'e:rnas]	'servant'
nom. pl.	bernaĩ	[b'ernai]	

In addition to not applying word finally, this lengthening does not occur in prefixes: e.g. àtneša from /at=neša/, where = is used to represent the prefix boundary, 3 pres. 'bring near'.

There are two sorts of exceptions to secondary lengthening. First, a very few lexical items like màno 'mine', and foreign borrowings like poètas 'poet'. Secondly, within the verb there are several environments in which this lengthening does not occur if the accented e and a are in the stem final syllable. These are the infinitive, the future, and the imperative, in addition to several other verbal formations which are not considered here. All of these environments where secondary lengthening blocks are characterized by the fact that the suffix following the verb stem begins with a consonant.

(5)

inf.	kàsti	'dig	nèšti	'carry'
imper. pl.	kàskite		nèškite	
I sg. fut.	kàsiu (from /kas+si+u/)	nèšiu (from /neš+si+u/)

But even in these environments lax a and e are lengthened if they appear as the accented member of a diphthong. In the following the roots are [ka:u-] and [g'e:r-].

(6)

inf.	káuti	'beat	gérti	'drink
imper. pl.	káukite		gérkite	
I sg. fut.	káusiu		gérsiu	

Since all of the environments in which lengthening systematically does not occur are characterized by post-stem morphemes beginning with a consonant, one might expect that the rule is restricted to apply only in open syllables with the proviso that a resonant may intervene, and thus formulated as follows.

(SL)   + syllabic
         - high   ---> + long / ___ + sonorant   C V
         + accent

However, forms like the following show that this restriction cannot be maintained.

(7)   nom. sg.   rãktas   instr. sg.   raktù   'key'

      3 pres.   mẽzga   inf.   mègzti   'bind'

      3 pres.   rẽzga   inf.   règzti   'knit'

These forms indicate that the lengthening can take place if the consonants following the accented vowel are members of the same morpheme as in mẽzga, but not if one of the consonants belongs to a different morpheme, as in the infinitive mègzti. But even this formulation is incorrect. There is a general derivation pattern whereby intransatives are formed with the addition of a suffix -s.

(8)   inf.   knabsóti   3 pres.   knãbso   'brood'   cf. knabìs 'glum person'

      inf.   snapsóti   3 pres.   snãpso   'gape'   cf. snãpas 'bill, beak'

A form like knãbso would therefore be represented as /knab+s+o:/, where the s belongs to a different morpheme from the b. Nevertheless, the lengthening still takes place.

From these data it appears that the environment for lengthening must be characterized as follows. Accented open e and a are lengthened non-finally, except if these vowels are in the stem final syllable of a verb and the ending immediately following the verb stem begins with a consonant with no resonant

intervening. Since it is clear that there is a general process of lengthening non-finally, instead of attempting to build this restriction into the rule, these environments in the verb where the lengthening blocks will be treated as exceptions.

In The Sound Pattern of English several ways of treating exceptions are distinguished. First, individual formatives can be marked as exceptions to a rule. In the present instance the morpheme màno would fall into this class, since there is nothing about the phonological or syntactic character of the word to indicate that it should be exceptional with regard to the lengthening rule. Such treatment for individual morphemes is of the highest cost, correctly expressing their idiosyncratic behavior.

Second, the fact that an item is an exception to a rule is often predictable from other properties which are associated with it. These properties can be phonological as well as non-phonological in nature. For example, foreign borrowings are exceptions to the lengthening rule. Since there are many other rules which these same forms do not undergo, an across the lexicon catagorization into / ± NATIVE / is made, and a lexical redundancy rule of the form / - NATIVE / ---> / - Secondary Lengthening / is established, thereby distinguishing forms like poètas from the truly idiosyncratic ones like màno. Exceptional behavior with regard to a given rule can also be predicted from the phonological character of the item in question. This is accomplished by readjustment rules,[1] which mark a segment as not undergoing a rule it otherwise would depending on the context in which it occurs. Thus, in the present case we can block forms like kàsti kàskite, kàsiu, etc. from undergoing the Secondary Lengthening rule by formulating a readjustment rule of the following form.

$$\text{(RR1)} \quad +\text{syllabic} \longrightarrow -\text{SL} / \underline{\quad} \left[\text{- sonorant} \right]_1 \boxed{\vphantom{\big|}} + C \, V$$
$$\underset{\text{verb stem}}{}$$

It is assumed here that the syntactic structure of a Lithuanian verb form consists of a stem plus an ending and that phonological rules can make reference to this syntactic structure.

The Secondary Lengthening rule itself can now be formulated as follows.

$$\text{(SL)} \quad \begin{array}{l} +\text{syllabic} \\ +\text{accent} \\ -\text{high} \end{array} \longrightarrow +\text{long} / \underline{\quad} \begin{array}{l} \left[\text{- sonorant} \right]_1 \left[+\text{syllabic} \right] \quad \text{a.} \\ \left[+\text{sonorant} \right] \qquad\qquad\qquad \text{b.} \end{array}$$

The forms k̃asa, k̀asti, gérti, m̃ezga, m̀egzti, and kn̆abso are derived as follows.

	/kás]+a/	/kás]+ti/	/gér]+ti/
RR1	------	-SL	-------
SLa	ká:s+a	-------	-------
SLb	------	-------	gé:r+ti

	/mézg]+a/	/mégz]+ti/	/knáb+s]+o/
RR1	-------	-SL	---------
SLa	mé:zg+a	--------	kná:b+s+o
SLb	-------	--------	---------

In order to prevent the Secondary Lengthening rule from applying to a form like àtneša from /át=neša/, it will be assumed that the occurrence of the = boundary blocks this rule. This in turn suggests another possible analysis for blocking the Secondary Lengthening rule in forms like k̀asti. We could set up a special boundary between the stem and the consonant initial suffixes, and constrain the rule from applying across it too. The viability of this alternative depends upon what independent evidence can be adduced for setting up this boundary. As the analysis develops we shall encounter a number of other rules which fail to apply across the boundary

between the stem and the consonant initial verb suffixes. However, there are

in addition a number of rules which do apply in this context, and so for the

moment at least I will assume that the readjustment rule solution is correct.

1.3 The Consonant Inventory

The following non-vowels appear in the phonetic output of Standard

Lithuanian.

(9)

p	t		k
b	d		g
f	s	š	ch
v	z	ž	
	c	č	
	dz	dž	
m	n	ñ	ŋ
	l, r		
		j	h

All these sounds occur in palatalized and non-palatalized varieties except

for j, which is always palatalized. However, three of these sounds are

limited to foreign words. These are f, which appears in such words as

fãbrikas 'factory' and frõntas 'front'; ch, occurring in such words as

chaòsas 'chaos' and chòras 'chorus'; and h, as in hòtelis 'hotel' and

hìmnas 'hymn'. The dental affricates c and dz appear in onomatopoetic forms

or in borrowings. Most occurrences of č and dž are predictable from dental

stops, the remaining occurring in onomatopoetic formations or in borrowed

words. The palatal and velar nasals are predictable variants of the dental

nasal. I will also provisionally claim that v derives from an underlying w,

which in turn along with j derives from an underlying high vowel, and that it

is possible in general to predict the palatalization of consonants. This
then limits the underlying consonant inventory in native words to the following.

(10)   p   t   k

              b   d   g

                     s   š̌

                     z   ž̌

              m   n

                     l, r

1.4 Palatalization and Voicing Assimilation

In Lithuanian there are a couple of phonological processes which dis-
tribute a feature throughout a string of segments. One of these is consonant
sharping, which palatalizes any number of consonants before front vowels and i̯.

(Sharping)   +cons. | ---> + sharp / ____   - cons.
                                                  - back

Due to subsequent rules the palatalized consonant may come to stand before
a back vowel, in which case phonetically the degree of palatalization is
stronger than before front vowels.

Another such rule is that of Voicing Assimilation, which specifies a
single value for voicing for any number of obstruents in sequence, depending
on the value for voicing of the last member of the sequence.

(Voice)   - sonor. | ---> α voice / ____   - sonor.
                                                          α voice

The only exception to the latter rule is the segment v, which allows a voice
contrast before it, as in tvãnas 'flood', dvãras 'estate', kvė̃pti 'to peck',
and gvéra 'slattern'. Hence with respect to voicing assimilation v behaves
like a sonorant such as r: trámda 'retardation', draũgas 'friend', kraũjas
'blood', and graudùs 'sad'. The surface obsruent v is also strange in that it

does not occur before a consonant or at the end of a word. The only other sound having this distribution is the glide _j_, which in addition does not occur after a consonant either. Finally, there are a number of contexts in which _u_ alternates with _v_ and _i_ alternates with _j_. The latter alternations will be explained in the next chapter, where I will formulate a glide rule converting the high vowels _u_ and _i_ to the non-syllabics _w_ and _j_, when they are followed by a vowel. Later rules will then convert _w_ to _v_ and delete _j_ after a consonant.

This treatment automatically explains why _v_ and _j_ never occur before a consonant or at the end of a word. The reason is that these segments are only generated by means of the glide rule, which applies only when these sounds are followed by a vowel. Furthermore, if the w-v rule is ordered before the voicing assimilation rule, we can naturally explain why _v_ is the only obstruent which allows a voice contrast before it, since at the point voicing assimilation applies, the surface _v_ is structurally a sonorant, and hence like _r_ does not condition assimilation.

Thus, in addition to the glide rule and the voicing assimilation rule, the following two rules will be entered into the grammar.

(w-v) $\begin{bmatrix} - \text{syllabic} \\ + \text{back} \end{bmatrix}$ ---> $\begin{bmatrix} - \text{sonorant} \end{bmatrix}$

(j-) $\begin{bmatrix} - \text{syllabic} \\ - \text{back} \end{bmatrix}$ ---> ϕ / C ___

1.5 Nasal Assimilation

The dental nasal _n_ assimilates in point of articulation to a following stop or affricate, while the labial nasal _m_ does not suffer such assimilation.

(11)　　　　inf.　　　　pìnti　　　　...nt...　　　'plait'

　　　　　　3 pres.　　　pìna　　　　...n...

　　　　　　imp. pl.　　pìnkite　　　...ŋk...

　　　　　　nom. sg.　　sẽnas　　　　...n...　　　'old'

　　　　　　nom. sg.　　sénbernis　　...mb.͎..　　'old fellow'

　　　　　　nom. sg.　　dantìs　　　　...nt...　　'tooth'

　　　　　　dat. sg.　　dañčiui　　　...ñč...

　　　　　　nom. sg.　　šìmtas　　　　...mt...　　'one-hundred'

　　　　　　inf.　　　　témti　　　　...mt...　　'darken'

　　　　　　imp. pl.　　témkite　　　...mk...

　　　　　　3 past　　　témo　　　　...m...

The assimilation of n̲ is accounted for by a rule of the following form.

(Nasal Assim.)　　$\begin{array}{l} + \text{nasal} \\ - \text{grave} \end{array} \longrightarrow \begin{array}{l} \alpha \text{ grave} \\ \beta \text{ compact} \end{array} \Big/ \underline{\quad\quad} \begin{array}{l} - \text{contin.} \\ \alpha \text{ grave} \\ \beta \text{ compact} \end{array}$

It is worth observing that on the basis of this data it is possible to construct an argument parallel to Halle's celebrated argument against the taxonomic phoneme. Thus, in taxonomic phonemics the allophones n̰ and ŋ̲ can be grouped together with n̲ into the phoneme /n/ on the basis of complementary distribution. An allophonic rule of the form /n/ assimilates in point of articulation to a following palatal or velar would then be required. On the other hand, it is not possible to treat the change of n̲ to m̲ before a following labial as allophonic, since it would merge with an underlying m̲ and thus violate biuniqueness. Rather the shift of n̲ to m̲ must be accommodated as a morphophonemic rule. Thus, taxonomic phonemics makes the claim that the change of n̲ to n̰ and ŋ̲ is a phonological phenomenon of a fundamentally different nature from the change of n̲ to m̲, and that the co-occurrence of these two rules in the same grammar is quite accidental and no more to be expected than pure

chance. However, there is no evidence for this, and all other things being equal one would be forced to treat both assimilations as instances of exactly the same process: assimilation of a nasal in point of articulation to a following phonetic stop. Hence, this is a strong argument against the claim that the taxonomic phoneme defines a linguistically significant level of representation in the grammar.

It is not known whether n̲ assimilates to non-vowels other than stops and affricates, since there is another rule which elides n̲, (compensatorily) lengthening the preceding vowel, when the n̲ is followed by j̲, v̲, s̲, z̲, š̲, ž̲, l̲, r̲, m̲, n̲; i.e. fricatives or non-syllabic sonorants. This is shown most clearly by forms containing the prefix sán-.

(12) sámbūris   'gathering, assembly'   cf.   būrỹs   'crowd'

sámpilas   'store, stock'   pìlnas   'full'

sándora   'covenent'   dorà   'virtue'

sántaka   'confluence'   tekéti   'flow

sánkaba   'coupling, clamp'   kãbė   'hook'

są́junga   'union'   jùngas   'yoke'

są́voka   'idea'   vókti   'understand'

są́skambis   'harmony'   skambéti   'ring'

są́šlavos   'sweepings'   šlúoti   'sweep'

są́žinė   'conscience'   žinóti   'know'

są́lytis   'clash, contact'   lýti   'rain'

są́rašas   'list, register'   rašýti   'write'

są́mokslas   'conspiracy'   mókslas   'skill'

są́narys   'joint'   narỹs   'link'

Before discussing the operation of this rule, I will formulate its context

$(n\text{-}\phi)$

$$\begin{array}{l} - \text{ sonorant} \\ + \text{ contin.} \end{array}$$

$$\overline{}$$

$$\begin{array}{l} - \text{syllabic} \\ + \text{ sonorant} \end{array}$$

The actual process of Nasal Elision can be formalized in a number of different ways. In traditional terms, the lengthening is considered compensatory upon the elision of the nasal. Implicit in this traditional formulation is a dependency relation between these two operations such that the lengthening is dependent upon and evoked by the elision. However, it is not possible to adopt this formulation into a generative grammar since, after the nasal elides, there is no way to distinguish forms which had the nasal from those that didn't in order to compensatorily lengthen the preceding vowel. In order to accomplish this distinction it would appear to be necessary for the rules to apply in a "non-markovian" fashion, such that the lengthening rule could "remember" which forms had the nasal present and which did not. But such applications for phonological rules are not permitted in the present theory.

What seems to be implicit in the traditional formulation is a preservation of length within the syllable such that the n counts as one unit of length and upon its deletion the equilibrium of length is preserved by a lengthening of the vowel. This in turn would imply that there is a general principle of length preservation which can be called into play when the equilibrium is disturbed by the application of a phonological rule. I shall present further evidence below that the traditional formulation is correct. But before doing so let us consider other possible analyses that might be given to these data.

Within generative grammar there are essentially three different ways in which this process of nasal elision can be described. First, the traditional

description can be reversed such that the vowels are first lengthened in the environment where n̲ elides and then the elision is formulated as a separate rule.

(V-V:)   V ---> + long / _____ n $\begin{bmatrix} -\text{syllabic} \\ +\text{sonorant} \end{bmatrix}$

$\begin{bmatrix} -\text{sonorant} \\ +\text{continuant} \end{bmatrix}$

After the vowel has been lengthened the n̲ can be deleted by a rule of the following form.

(n-∅)   n ---> ∅ / _____ $\begin{bmatrix} -\text{syllabic} \\ +\text{sonorant} \end{bmatrix}$

$\begin{bmatrix} -\text{sonorant} \\ +\text{continuant} \end{bmatrix}$

There are at least two criticisms of this description which I think are serious enough to reject it out of hand. First, the two rules must be stated with essentially the same environments and yet they cannot be collapsed, thus claiming that there is no significant connection between them. But it is obvious that there is such a connection, which is shown, among other things, by the fact that if a morpheme is an exception to one of the rules, then it also is to the other. Thus, for example, the future morpheme /-si/ does not condition nasal elision and the preceding vowel remains short as in mínti, mĭnsiu 'remember', and not mynsiu as would be predicted by this description. Secondly, this description seems to claim that the elision of the nasal is somehow dependent upon the prior lengthening of the vowel, contrary to the traditional formulation and intuition.

A second way of treating this problem would be to use a rule of transformational character which operates upon more than one segment in a word simultaneously. This would allow collapsing of the two processes into one and thus avoid the problem of having exceptions to both rules encountered in the previous description. (For simplicity's sake we shall denote the

environment of fricatives and non-syllabic sonorants by the cover symbol Z.)

$$V \quad n \quad Z \quad \longrightarrow \quad 1 \quad \phi \quad 3$$

$$1 \quad 2 \quad 3 \qquad +long$$

However, this description also denies the traditional claim that the

lengthening is conditioned by the elision, since both are lumped together

into one rule.

Recently, another analysis for these data has been proposed in Lightner

(1970). In this analysis two rules are involved. First a rule which nasalizes

a vowel when followed by a nasal before Z. Secondly, there is a rule com-

pletely assimilating the nasal to the preceding nasalized vowel.

$$V \longrightarrow +nasal \quad / \underline{\qquad} N \; Z$$

$$N \longrightarrow \alpha F's \quad / \underset{\alpha F's}{V} \underline{\qquad}$$

Lightner proposes that such assimilation rules be explicitly interpreted

by phonological theory as _not_ referring to suprasegmental features, this

being indicative of a "general split between segmental and suprasegmental

phonology." A subsequent rule denasalizes all vowels, as there are no

nasalized vowels in present-day Standard Lithuanian.

One of the features which superficially supports this analysis

involves a problem which heretofore has not been mentioned. This has to do

with the preservation of accent on a syllable which loses its nasal. As

will be proposed later, rising and falling accents are to be interpreted

as high pitch on the final and initial mora of a syllable respectively.

Thus, bréndo 3 past 'ripen' and breñto 3 past 'rot' are represented as

/bréndo/ and /breñto/, since when a nasal occurs in a closed syllable it

may count as a mora. The corresponding infinitive forms for these verbs

are brésti and breṣti, where the stem final dental stops have been turned

into s, which conditions the loss of the underlying n. Notice that the accentuation of the syllable remains constant. Assuming the mora representation, the output of the nasal elision process required would have to be /brēesti/ and /breēsti/. Lightner's analysis accomplishes this, as the following derivation shows.

	/brēns+ti/	/breñs+ti/
(V-ỹ)	brẽns+ti	breñs+ti
(N-ỹ)	brẽes+ti	breẽs+ti
(ỹ-V)	brēes+ti	breēs+ti

Despite its attractiveness, I think there are several objections that can be raised against this analysis. First, given the fact that there are no nasalized vowels in the present-day language, the reasons for introducing a contrast between oral and nasalized vowels in the course of a derivation and then later neutralizing this contrast are not at all clear and require justification. Presumably what is involved here is the true premise that frequently in human language long nasalized vowels correspond to underlying oral vowel-nasal consonant sequences. Given the frequent and widespread character of the correlation, it is reasonable to assume that there is some universal underlying process involved in order to account for the striking similarity in language after language. And when one comes across similar but not identical underlying-surface correlations, it is assumed that the same universal process of vowel nasalization is at work, but that there are other, language particular factors which obscure the situation (denasalization in the present case).

It is important to note that the introduction of the nasalized vowels in the present case is based solely on such universal considerations. But I think that there is another such consideration which tends to show just the opposite in this case: namely, that vowel nasalization is not at work here.

This is the fact that it is only the dental nasal n̲ and not the labial nasal m̲ which drops out before Z. Thus, parallel to the forms br̨ésti, bréndo, we find pairs like the following: krim̃sti, krim̃to 'chew'; grim̃zti, grim̃zdo 'sink'; glám̌žyti 'rumple'; etc. where m̲ remains before the fricative. But vowel nasalization before n̲ and not m̲ strikes me as being rather atypical and un-characteristic of the universal process of vowel nasalization. Hence, it is rather doubtful that nasalization underlies the dropping of the n̲ in Lithuanian. One could, of course, attempt to circumvent this consequence by permitting nasalization of vowels before both m̲ and n̲, but then restrict the loss of the nasal consonant to just n̲, with subsequent denasalization of all vowels. But given such latitude of analysis, the claim that nasalization underlies the Lithuanian data becomes rather trivially true, and hence loses much of its initial interest.

Another objection that can be raised against this analysis involves its appeal to the notion of complete assimilation. Notice that in the assimilation of the nasal, no trace of the original segment, the n̲, is re-tained. But it is reasonable to suppose that assimilation is of a continuous nature, in which one segment becomes more and more similar to another to the limiting case of complete identity. Furthermore, it seems that clear cases of complete assimilation arise only when the two contiguous segments are phonet-ically similar to begin with. For example, in the next section a rule will be formulated which turns dental stops to continuants before dental stops. This rule also applies before dental continuants. Thus, beside the 3 past and the infinitive forms mẽto and mèsti 'throw', we find the I future form messiu from /met+si+u/. Here we can say that the root final t̲ is completely assimilated to the following s̲, but only by virtue of the fact that t̲ and s̲ share a fair number of features in common to begin with. Finally, it is reasonable to

assume that a hierarchy is involved in assimilation, such that complete assimilation implies partial assimilation, but not vice versa. Thus, dentals and velars assimilate to a palatal point of articulation when adjacent to high or front vowels. But $t/k \longrightarrow i$ is clearly impossible.

If these remarks are correct, then the assimilation analysis for Lithuanian vowel-nasal sequences becomes rather suspect. Now only are there no properties of the dental nasal left behind, but it is rather difficult to imagine what such traces might be in a case such as this, where the distance between n, a consonant, and a vowel is rather great, involving a transition across most of the feature properties, a fact which by itself casts suspicion on the analysis, since there are few clear cases of direct conversion between consonants and vowels in human language.[2]

The traditional analysis of elision of the dental nasal with compensatory lengthening of the preceding vowel provides a much more straight-forward treatment of the data, and furthermore expresses the intuition that the lengthening of the vowel is dependent upon the elision of the nasal. Although it might be argued that on the basis of just one rule it is not possible to tell if such a dependency relation obtains here, there are actually several other places in the grammar where n is elided, and in each of these cases the preceding vowel is lengthened. One such place is word finally, where in the phonetic output n does not in general occur. This is shown most clearly by participial forms like nesã from /nes+an/ nom. pl. pres. act. part. 'carry' (cf. nesãs nom. sg. and nesanti acc. sg.), and in the nominal declension: e.g. gen. pl. galvų from /galv+un/ 'head' (cf. the allative pl. galvumpi from /galv+un+pi/ via nasal assimilation).

There are several other places where such compensatory lengthening takes place though they are more sporadic in nature, occurring primarily in

the old n̲ and r̲ stem declensions. For example, nom. sg. akmuõ, acc. sg. ãkmenį 'stone'. Here the root is underlying /akmen-/ and there is a special minor rule which backs the root vowel e̲ to o̲. When the n̲ elides this o̲ is lengthened and eventually shows up as the diphthong u̲o̲ again by a minor rule. In this connection also compare duktẽ, dùkterį 'daughter' and sesuõ, sẽserį 'sister'.

In each case then, when the nasal is elided in a closed syllable, the preceding vowel is lengthened compensatorily, thereby preserving the length equilibrium. Since this phenomenon occurs in several quite different parts of the grammar, it would seem that the co-occurrence of lengthening with the elision of the nasal is not accidental.

I suggest dealing with this along the following lines. Analogous to the marking conventions proposed in The Sound Pattern of English, I set up a convention in the Lithuanian grammar which says that upon the elision of a sonorant in a closed syllable, the preceding vowel is lengthened. This convention is not universal, but rather language particular in character, though it does possess certain universal features. This description of the process overcomes the difficulties and criticisms of the prior analyses in what seems to me a natural way. First, in accord with the traditional insight, it renders the lengthening concomitant with and dependent upon the elision. Secondly, since marking conventions apply in a "non-markovian" fashion, it overcomes the problem of distinguishing which forms have undergone elision of the nasal and which have not by means of an already existing apparatus. This then will permit the Nasal Elision rule to be formulated simply as

(Nasal Elision) $\begin{bmatrix} + \text{nasal} \\ - \text{grave} \end{bmatrix} \longrightarrow \emptyset / \_\_\_\_ Z$

Aside from foreign borrowings (e.g. <u>sanskrītas</u> 'Sanskrit'), there is
at least one other context in which the <u>n</u> does not elide. This is before the
future morpheme /-si/, which does not induce elision, as the following forms
show.

(13) inf.   gyvénti   I sg. fut.   gyvénsiu   'live'

            mìnti   mìnsiu   'trample'

            gìnti   gìnsiu   'defend'

Notice that this then is another rule which fails to apply across the boundary
between the verb stem and a following consonant initial suffix, and hence
might be interpreted as supporting the claim that there is a special boundary
in this context which blocks the application of regular phonological rules
unless specifically mentioned in their structural description. However, it
is to be observed that the Voicing Assimilation and Consonant Sharping rules
do apply in this context, as shown by the forms <u>dìrba</u> [d'irba] and <u>dìrbti</u>
[d'ir'p't'i] 'work'. In addition, we shall encounter a number of other rules
which do apply in this context, which makes it rather difficult to argue for
the presence of such a boundary symbol. Therefore, it would probably be
better to simply treat the failure of elision in this context as exceptional
and mark the future morpheme as idiosyncratically failing to induce elision.
Notice that if this approach is adopted it appears to be necessary to allow
for exceptions to the environments of rules, as well as for exceptions to the
structural change of rules. However, there are other places in the description
of Lithuanian where this seems to be necessary.[3]

1.6 Assibilation

The old Indo-European rule assibilating dental stops survives in a
somewhat altered form in Lithuanian. According to this rule dental stops

become strident continuants. In Lithuanian this process occurs in three
environments: before dental stops, before dental continuants, and before k̲.
This is shown by the varying pronunciations of verb stems ending in dental
stops.

(14)   3 sg. pres.   mẽta   vẽda   kãsa   lẽsa

       inf.   mèsti   vèsti   kàsti   lèsti

       1 sg. fut.   mèsiu   vèsiu   kàsiu   lèsiu

       3 sg. freq.   mèsdava   vèsdava   kàsdava   lèsdava

       2 pl. imp.   mèskite   vèskite   kàskite   lèskite

       gloss   'throw'   'lead'   'dig'   'peck'

However, as the following nominal forms show, assibilation before k̲ is
limited to the imperative, while the rule applies generally before dental
stops and fricatives in these other environments.

(15)   sprústis   /sprúd+tis/   'crowded mass'   cf. sprústi, sprúdo 'crush'

       narsas   /nart+sas/   'anger'   nertéti   'rage'

       smársas   /smard+sas/   'smell'   smardìnti   'stink'

       sandètkas

       susiedka   'neighbor'

Initially, two possible analyses present themselves. First, we could have
in addition to a regular rule of assibilation defined to operate before dental
stops and continuants, another minor rule assibilating dental stops just
before the k̲ of the imperative. Or secondly, we might formulate a single
phonological rule of assibilation, but treat the rule conjunctively as
follows.

$$/t, d/ \longrightarrow /s, z/ \ / \ \underline{\hspace{1cm}} \ \begin{matrix} /k/_{\text{imperative}} \\ /t, d, s, z/ \end{matrix}$$

However, there is one additional fact that casts some doubt upon
either of these possible analyses. This is that within the Lithuanian verbal

system all of the consonant initial suffixes which can be added to the verb
stem begin with a dental (either t, d, or s) except for the imperative -ki,
there being about ten such suffixes in all. Thus, all these suffixes, except
for the imperative, condition assibilation in the normal environment, since
they all begin with either a dental stop or continuant.

Traditionally, this is described by associating with each verb three
different stem shapes, one of them, called the "infinitive" stem, being that
which occurs after all consonant initial suffixes, including the imperative.
This formulation claims that for a verb stem like /met-/ there must be at
least two lexical representations, i.e. /met-/ and /mes-/. A rule then selects
the latter alternant when the stem appears before a consonant initial suffix.
This is obviously incorrect, since there is only one lexical representation
for the stem, /met-/ in this case, the other alternant being derived by the
phonological rule of assibilation. However, in a way, this analysis does
appear to make sense of the fact that assibilation occurs before the impera-
tive suffix, while the prior two treatments do not. This is because the rule
selecting the assibilated stem alternant refers to consonant initial suffixes.

What seems to be happening here is that given first the normal rule
of assibilation (just before dentals), and second the fact that all consonant
initial suffixes appearing after the verb stem begin with a dental except for
the imperative, it follows that in all of these environments except the
imperative, a stem final dental stop will be assibilated. It would appear
that there is analogy or pressure here for the dental stop to also be assibi-
lated in the imperative.

It is possible that this situation might have arisen as follows. At
one point in the history of the language there was a rule assibilating dental
stops before dental obstruents. Also at this point it just so happened that

all the consonant initial suffixes which followed the verb stem began with a dental obstruent and thus conditioned assibilation. (The imperative suffix /-ki/ is quite recent. Formerly, the imperative was realized by vocalic suffixes, as it is in Latvian and Slavic.) Now perhaps for some reason this property of conditioning assibilation reached linquistic consciousness and was expressed in a more direct fashion by a statement or information to the effect that verb stems with a final dental stop were pronounced with a final continuant when followed by a consonant initial suffix. Then when the imperative suffix was changed to being consonant initial, this general statement projected upon the imperative too.

Thus, the chief criticism to be made of the first two analyses is that they identify the reason for assibilation in the imperative with the velar character of the suffix. Rather, it seems to me, that first, it doesn't make any difference whether the imperative begins with a velar or any other consonant for the purposes of assibilation, and second, the real reason for assibilation in the imperative is that it takes place in all the other forms of the verb stem when a consonant initial suffix follows.[4] If this is correct, then what is needed is to formulate the phonological rule of assibilation as taking place just before dental obstruents, and then to somehow make it apply in the imperative too, even though the latter does not meet phonologically the structural description of the rule, and finally to attribute this aberrant behavior to the fact that all other consonant initial suffixes condition assibilation.

Towards this end one might first set up a readjustment rule which marks all consonant initial post verb stem suffixes as conditioning the assibilation rule. Secondly, one might allow for the possibility of rules applying to forms which do not meet the phonological specifications of the rule, if these

forms are specifically marked as either undergoing or conditioning the rule. Such markings might be idiosyncratic lexical properties or, as in the present case, assigned by a rule. The Assibilation rule itself is now formulated as follows.

(Assibilation)
$$\begin{bmatrix} -\text{ sonorant} \\ -\text{ grave} \\ -\text{ contin.} \end{bmatrix} \longrightarrow \begin{bmatrix} +\text{ contin.} \\ +\text{ strident} \end{bmatrix} / \underline{\hspace{1cm}} \begin{bmatrix} -\text{ sonorant} \\ -\text{ grave} \\ -\text{ compact} \end{bmatrix}$$

The application of Assibilation must precede that of Nasal Elision, as shown by the following derivations.

	/brend+ti/	/brend+o/
Assibilation	brenz+ti	-------
Nasal Elision	bre:z+ti	-------
Voice	bre:s+ti	-------
Sharping and SL	b'r'e:s'+t'i	b'r'e:nd+o

Since there are no double consonants in the phonetic output of Lithuanian, it is necessary to formulate a degemination rule. This rule is ordered very late in the grammar after all rules which have an effect on the feature composition of consonants, such as Assibilation, Voicing Assimilation, Sharping, etc. It is formulated as follows.

(Degemination) $\quad C_x C_y \longrightarrow C_z \qquad$ (where x=y=z)

Thus, kàsiu and mèsiu are derived as follows.

	/kas+si+u/	/met+si+u/
Assibilation	--------	mes+si+u
Voice	--------	--------
Sharping	kas'+s'i+u	m'es'+s'i+u
Glide and j-∅	kas'+s'+u	m'es'+s'+u
Degemination	kas'+u	m'es'+u

1.7 Palatal Leveling

If a dental continuant s̲ or z̲ is bounded by a palatal, then the dental continuant becomes a palatal.

(16) 1 sg. fut.   nèšiu   /neš+si+u/   cf. nèšti   'carry'

      1 sg. fut.   vèžiu   /vež+si+u/   vèžti   'convey'

      nom. sg.   saušsala   sausala   saũsas   'dry', šaltis 'cold'

      nom. sg.   saušžemis   sauž'em'is   žẽmė   'land'

      1 sg. subj.   mèščiau   m'eš'č'au   mèsti   'throw'

Since the assimilation operates both progressively and regressively, the mirror image notation is used in the formulation of the rule.[5]

(Pal. Lev.)   − sonorant
                 − grave   −−−→   + compact   / + compact
                 − compact   − grave
                 + contin.

This rule operates after assibilation as shown by mèščiau (from /met+t'au/) and before degemination as evidenced by nèšiu.

1.8 Consonantal Metathesis

There is a rather curious process in Lithuanian which reorders a fricative (s̲, z̲, š̲, or ž̲) after a velar stop if a consonant follows the velar. This is most clearly shown in verb paradigms like the following.

(17) 3 pres.   dréškia   'bind'   mẽzga   'bind'   blãškia   'toss'

      3 past   dréškė   mẽzgė   blõškė

      inf.   dréksti   mègsti   blõksti

      1 sg. fut. dréksiu   mègsiu   blõkšiu

      imp. pl.   drékskite   mègskite   blõkškite

It also operates in nouns: eg. Russian Moskva 'Moscow' is Maksvà in Lithuanian. These alternations will be accounted for by a rule of the following form.

(Cons. Met.) $\begin{array}{l} \text{- sonor.} \\ \text{+ contin.} \end{array}$ $\begin{array}{l} \text{+ grave} \\ \text{+ compact} \\ \text{- contin.} \end{array}$ $\begin{array}{l} \text{+ cons.} \end{array}$ $\longrightarrow 2\ 1\ 3$

1	2	3

This rule precedes Palatal Leveling and Degemination, as shown by the following derivation of <u>blokšiu</u>.

	/blo:šk+si+u/
Consonantal Metathesis	blo:kš+si+u/
Sharping	blo:k'š'+s'i+u
Glide and j-∅	blo:k'š'+s'+u
Palatal Leveling	blo:k'š'+š'+u
Degemination	blo:k'š'u

1.9 The Rule Ordering

Listed below in abbreviated form are the rules established in this chapter.

(18) Readjust. Rule I $V \longrightarrow - SL\ /\ \underline{\quad} \begin{bmatrix} - \text{sonor.} \end{bmatrix}_1 + C\ V$

Glide Rule $i,\ u \longrightarrow j,\ w\ /\ \underline{\quad} V$

Sharping $C \longrightarrow C'\ /\ \underline{\quad} i,\ e,\ j$

Voicing Assim. $- \text{sonor.} \longrightarrow \alpha\ \text{voice}\ /\ \underline{\quad} \begin{array}{l} - \text{sonor.} \\ \alpha\ \text{voice} \end{array}$

w-v $w \longrightarrow v$

j- $j \longrightarrow \emptyset\ /\ C\ \underline{\quad}$

Sec. Length. $\overset{+}{a},\ \overset{+}{e} \longrightarrow + \text{long}\ /\ \underline{\quad} \begin{bmatrix} - \text{sonor.} \\ + \text{sonor.} \end{bmatrix}_1 V$

Nasal Assim. $n \longrightarrow \begin{array}{l} \alpha\ \text{grave} \\ \beta\ \text{compact} \end{array}\ /\ \underline{\quad} \begin{array}{l} - \text{contin.} \\ \alpha\ \text{grave} \\ \beta\ \text{compact} \end{array}$

Nasal Elision $n \longrightarrow \emptyset\ /\ \underline{\quad} \begin{array}{l} - \text{syllabic} \\ + \text{sonorant} \end{array}$

$\begin{array}{l} - \text{sonorant} \\ + \text{continuant} \end{array}$

Assibilation	t, d ---> s, z / ___ t, d, s, z

Assibilation: $t, d \longrightarrow s, z \;/\; \underline{\quad}\; t, d, s, z$

Degemination: $C_x C_y \longrightarrow C_z \quad x=y=z$

Pal. Level.: $s, z \longrightarrow \check{s}, \check{z} \;/\; \check{c}, d\check{z}, \check{s}, \check{z}$

Cons. Met.: $\begin{matrix} s, z \\ \check{s}, \check{z} \end{matrix} \; \begin{matrix} k \\ g \end{matrix} \longrightarrow \begin{matrix} k \\ g \end{matrix} \; \begin{matrix} s, z \\ \check{s}, \check{z} \end{matrix} \;/\; \underline{\quad}\; C$

The ordering relations for these rules that I have been able to establish are as follows.

(19)   Glide Rule precedes: w-v, j-$\emptyset$

   Assibilation precedes: Nasal Elision, Degemination, Palatal Leveling

   Nasal Elision precedes: Degemination

   Voicing Assimilation precedes: w-v, Degemination

   Sharping precedes: Degemination

   Consonantal Metathesis precedes: Palatal Leveling, Degemination

   Palatal Leveling precedes: Degemination

These ordering relations constitute information that must be specified in the grammar to insure well-formed derivations.

At this point it is necessary to ask whether these particular relations are to be expected and therefore natural, or is it an essentially arbitrary fact about the grammar that the rules are ordered in this way. That is, if the same rules occurred in another grammar, would these same relations be expected? And if so, are there any general properties about ordering relations which would allow one to characterize for any set of rules some relations as being more natural than others?

In order to even begin an answer to this question it is necessary to determine the different ordering relations between rules which are of potential linguistic significance. For the moment I shall be content with the following rough distinctions.

First, in the derivation of forms the application of one rule may be irrelevant to the application of another. For example, they may apply to or in the environment of completely different segments, as with the rules of Secondary Lengthening and Voicing Assimilation. Or they may apply to (exactly) the same segments, but in ways such that the application of one has no effect on the application of the other. Thus, Assibilation and Voicing Assimilation both apply to obstruents. Yet the application of one has no effect on the application of the other. I shall call this kind of relation between rules an UNORDERED RELATION.

Secondly, rules may be said to be ORDERED with respect to one another. In what follows I distinguish two different kinds of ordered relations. Two rules are FREELY ORDERED with respect to one another when the correct derivations result by merely requiring that the strings to which the rules apply meet the structural descriptions of the rules, and that only this condition is needed to guarantee that the two rules apply in the correct order. For example, Assibilation and Nasal Elision are ordered in this way. For only a string of the shape ...V n $\begin{bmatrix} t, & d \end{bmatrix}$ $\begin{bmatrix} t, & d, & s, & z \end{bmatrix}$ is subject to application by both rules. The correct derivations result merely by virtue of the structural descriptions of the two rules. Thus, given such a string only Assibilation may apply, yielding ...V n $\begin{bmatrix} s, & z \end{bmatrix}$ $\begin{bmatrix} t, & d, & s, & z \end{bmatrix}$. And to this string only Nasal Elision and not Assibilation may apply, giving ...V: $\begin{bmatrix} s, & z \end{bmatrix}$ $\begin{bmatrix} t, & d, & s, & z \end{bmatrix}$.

These two rules also occur in Ancient Greek, and are ordered in the same way, as shown by the forms <u>giga:s</u>, <u>gigantos</u> 'giant' and <u>elpis</u>, <u>elpidos</u> 'hope'. The nom. sg. forms are derived as follows.

	/gigant+s/	/eipid+s/
Assibilation	gigans+s	elpiz+s
Nasal Elision	giga:s+s	-------

Voicing Assim.	--------	elpis+s
Degemination	giga:s	elpis

In Latin, on the other hand, it is only underlying and not derived s which conditions Nasal Elision. Thus, the two rules are ordered such that Nasal Elision precedes and may not follow Assibilation, as evidenced by the forms sanguis, sanguinis 'blood' and pons, pontis 'bridge', which are derived as follows.

	/sanguin+s/	/pont+s/
Nasal Elision	sangui+s	------
Assibilation	--------	pons+s
Degemination	--------	pons

I will call this type of ordering relation RESTRICTIVELY ORDERED. Here the correct derivations are not obtained solely by the requirement that the strings meet the structural description of the rules. Rather an additional statement to the effect that Nasal Elision precedes and may not follow Assibilation must be given.

I think that it would be generally agreed that the kind of ordering found in Lithuanian and Greek is more natural than that of Latin. Indeed, it appears that the notions of "freely ordered" rules and "restrictively ordered" rules corresponds quite closely with Kiparsky's concepts of unmarked or "feeding order" and marked or "bleeding order."[6]

Now if I am correct in assuming the ordering in Lithuanian and Greek to be more natural, this suggests a way, at least as a first approximation, of characterizing this ordering in the grammar as being more natural. When it is felt that the co-occurrence of phenomena in a grammar is not acci-dental, but expected or natural, this is expressed by formulating conventions such that the occurrence of the two phenomena can be stated in less symbols

than would be needed to state each separately. This is why the rules of the grammar and the representations of the words are stated in the feature notation, and also why abbreviatory devices like the brace notation are employed. In keeping with this procedure, it is necessary to formulate conventions which will allow the more natural ordering to be stated in less symbols, thereby making it cost less. Now the distinction between freely ordered and restrictively ordered rules does just this, at least in a rudimentary way, since it is possible in the grammars of Greek and Lithuanian to guarantee the correct derivations with regard to the Assibilation and Nasal Elision rules without explicitly stating any ordering restrictions on them. The correct derivations will result solely from the way in which the rules are formulated. In Latin, where the rules are formulated identically, it is necessary to state explicitly an ordering relation in order to guarantee correct derivations.

Being somewhat more precise, the distinction between the two kinds of rule orderings could be characterized as follows. Suppose we say that unless otherwise specified, all rules are applicable in the derivation. This corresponds to the situation where the rules are freely ordered. Thus, in Lithuanian and Greek no additional information, other than the formulation of the rules themselves, need be given in the grammars. On the other hand, in Latin, where the rules are restrictively ordered, an additional piece of information, costing the grammar, is required. This piece of information could be considered a constraint on the derivations, specifying that a derivation where Assibilation precedes Nasal Elision is ill-formed. One could then consider linguistic change towards the free, unmarked order as a form of simplification in the grammar, in the sense that a piece of information costing the grammar is eliminated. This is apparently what happened in Latin popular speech, where _mens_ became _mes_.

At this point it is necessary to mention a difficulty which this approach gives rise to. This is that it leaves open the possibility of rules applying any number of times in the course of a derivation. That is, it could be said that rules are freely ordered in the sense that they can apply at any point in the derivation when the string meets their structural description. In effect, this would claim that in the unmarked instance all rules are "anywhere" rules. There are certain types of processes such as voicing assimilation for which this has a certain degree of plausability. However, there are many rules, perhaps the majority, for which this is undesirable, since it allows for iterative application. In such cases then it would be necessary to constrain the rule from applying more than once. If this is the normal situation, then the distinction between freely and restrictively ordered rules could still be saved by introducing a further restriction that a rule may apply only once in the course of a derivation, barring cyclical application, which of course is not at issue. Finally, it might be the case that this restriction is necessary for only certain rules and not for others. At this point it is too premature to make any claims one way or the other.

Returning to the other ordering relations established in this chapter, it can be determined by inspection that all of the relations except the following are free. First, the precedence of Voicing Assimilation over w-v is restrictively ordered and hence marked. This seems to me to be the correct claim here. Secondly, Degemination bears a variety of relations with most of the other rules. Note that it is fed by the Voicing Assimilation and Sharping rules, the natural situation, which is captured by the notion of freely ordered. But it is also bled by many of the rules. For example, given /met+ti/ Assibilation applies to bleed Degemination. On the other hand,

if Degemination were to apply first, it would bleed Assibilation. Thus, we
must include information in the grammar that Assibilation precedes Degemination.
But intuitively, it would seem that this ordering should be cost free. Per-
haps, here one might appeal to the fact that if Degemination were to apply
to the underlying form, it would remove all occurrences of t+t, and then
Assibilation before stops would no longer be a rule in the grammar. But such
an appeal will not be sufficient, since there are cases where Degemination is
both in a bleeding and a feeding relation with respect to the same rule. For
example, given the underlying form /drèsk+si+u/ Consonantal Metathesis
applies to yield /drèks+si+u/ which feeds into Degemination to give /drèksiu/.
But given underlying /drèsk+ki+te/ Consonantal Metathesis bleeds Degemination
by applying to derive /dreks+ki+te/, with the double k+k now split by the s.
Hence our concepts of feeding and bleeding or free and restrictively ordered
relations would predict that this situation is marked and less natural. But
this is counterintuitive. Probably at the basis of this intuition is the
feeling that Degemination really expresses an output condition on phonetic
representations, and that all other rules may apply freely without regard
to whether they feed or bleed this rule. After all such rules have applied,
Degemination serves to guarantee that there are no double consonants in
phonetic representations. If this is correct then it shows that the concepts
of feeding and bleeding, etc. really only just scratch the surface and that
something much more complex is involved in expressing the notion of a
natural rule ordering. Indeed, the example with Degemination suggests that
one cannot determine the natural ordering of a rule without considering
what "function" the rule plays in the grammar. Obviously, this important
topic bears further investigation, which is well beyond the scope of this
study.[7]

Footnotes

[1] For discussion of this device, see Chomsky and Halle, (1968:371).

[2] It should be pointed out in this connection that in Latvian, to underlying VNC sequences there corresponds the original vowel followed by a high vowel (equal in gravity to the original preceding vowel) plus the consonant. Thus, enC gives eiC, anC gives auC, inC gives iiC, and unC gives uuC. The resultant ei and au sequences metathesize to ie and uo. For details, see Halle (1965). It might be thought that these data support the "assimilation" analysis, where the rule could be

$$n \longrightarrow \begin{array}{l} + \text{syllabic} \\ + \text{high} \\ \alpha \text{ back} \end{array} \quad / \quad \begin{array}{l} + \text{syllabic} \\ \alpha \text{ back} \end{array} \quad \underline{} \ C$$

But this would be true only if [+ high] could be construed as a trace of the original n. Furthermore, the dialectal evidence from Lithuanian shows a great deal of variation in the height of vowels before the eliding nasals, thus indicating that the height of the resultant vowel is essentially unrelated to the original n which it replaces. For the details on the dialectal variation, see Senn (1966).

[3] This is discussed in my description of the third person future, see Kemstowicz (1970a). Also in this connection, see Coats (1970). The problem with the retention of the accent will be postponed until accentuation in general is treated.

[4] A somewhat parallel situation exists in Slavic, again involving reflexes of the Assibilation rule. In Slavic most verb stems ending in an obstruent end in a dental stop t or d or a dental continuant s or z. Due to Assibilation and Voicing Assimilation, t and d show up as s before the infinitive ending ti. Thus we find forms like the following in Old Church Slavic: meto, mesti 'sweep', vedo, vesti 'lead', etc. However, there are a few stems ending in labial stops, such as grebo 'row' and tepo 'beat'. In Old Church Slavic these forms show up with the stop deleted in the infinitive: greti, teti, etc. On the other hand in Russian, where the Assibilation rule is still retained (cf. metu, mesti and vedu vesti), in place of greti we find gresti. One could easily expand the Assibilation rule to also convert a labial stop to s before t, but clearly this would miss the point. After all, a change of b to a dental fricative is quite strange on independent grounds. The real question is why we should find s in place of b. Again the answer seems to lie in the fact that of the approximately fifty verbs which end in a consonant before the infinitive suffix most show up with s, either by virtue of the continuant being underlying as in nesti, nesu, or via Assibilation, as in mesti, metu. Here again there seems to be pressure in the system to force the otherwise unnatural replacement of b with s. Serbo-Croatian is also interesting in this regard, since here the outcome is slightly different. Instead of replacing the stem-final labial with a fricative s on analogy with kradem, krasti, we find the s intercalated between the labial and the infinitive ending: crpsti, crpem; dupsti, dubem; grepsti, grebem; tepsti, tepem; etc.

[5]See Bach (1968).

[6]See Kiparsky (1968b).

[7]See now Anderson (1969).

2. VERBAL PHONOLOGY

2.1 Glide Formation

Consider the following forms.

(20)

	inf.		3 past		
		iýti		lìjo	'rain'
		pūti		pùvo	'rot'
		pýkauti		pýkavo	'anger'
		dantýti		dantìjo	'indent'
mas.		dù	fem.	dvì	'two'

Here it can be seen that when a high vowel stands before another vowel, the high vowel appears as a simple glide if it is short, as in <u>dvì</u>; but it appears as a short vowel followed by a homorganic glide if it is long, as in <u>lìjo</u> and <u>pùvo</u>. The resultant <u>w</u> then becomes <u>v</u> by the w-v rule.

Depending upon how vowel length is represented, this process of glide formation can be formulated in two different ways. If long vowels are represented with the feature + long , then the rule would have to be stated in the following rather offensive way.

(Glide)
$$\begin{bmatrix} + \text{syll.} \\ + \text{high} \\ \langle + \text{long} \rangle \end{bmatrix} \longrightarrow \left\langle \begin{matrix} 1 \\ - \text{long} \end{matrix} \right\rangle - \text{syll.} \ / \ \underline{\quad} + \text{syll.}$$

In addition, certain other ad hoc specifications would be needed to insure that underlying long acute vowels show up as surface grave accent.

On the other hand, if long vowels are represented as sequences, then the rule can be stated in the more elegant form of the following.

(Glide)
$$\begin{bmatrix} + \text{syll.} \\ + \text{high} \end{bmatrix} \longrightarrow - \text{syll.} \ / \ \underline{\quad} + \text{syll.}$$

Additional support for the latter treatment comes from a consideration of

accent. It will be proposed later that acute accent (falling) be represented as high pitch on the initial mora of a syllable, and grave accent as high pitch on syllables containing a single short vowel, i.e. syllables with a single mora. Thus, líti, púti, líjo, and púvò would be represented as /líiti/, /púuti/, /líijo/, and /púvo/. If we also accept these sequence representations as those upon which the glide rule operates, then there is no trouble in deriving the grave accent in the past tense forms: /líi+o:/ ---> /líij+o:/, /púu+o:/ ---> /púw+o:/, etc.

However, despite its inherent attractiveness, this proposal that the glide rule operate on vowel sequences does have a certain difficulty associated with it. Note that as the rule now stands we should derive glides from the initial vowels of the high vowel sequences in the infinitive forms of these verbs; i.e. /lii+ti/ ---> /lji+ti/, etc. Thus, the combination of the glide rule and the sequence notation for length would have the effect that long high vowels would never occur phonetically: either their final or their initial components would be changed into glides.

One way of obviating this difficulty and still retaining the sequence notation would be to restrict the glide rule to apply only across morpheme boundaries, i.e. in the context ___ + V. This would then prevent the rule from applying in the derivation of the infinitive forms.

There is an objection to this proposed solution; however, its validity is far from clear. It will be recalled that the sounds j and w have the distributional property that they never occur before a consonant or #. This property could be explained if we derive all occurrences of the glides from high vowels by the glide rule, since it only applies in the context before a vowel. But, according to this objection, if we restrict the glide rule to applying only across morpheme boundaries, then we will have to set

up _j_ and _w_ as independent phonemes in forms like jaũtis 'ox' and tvãnas · 'deluge', thereby failing to capture the distributional similarity of glides within and across morpheme boundaries.

However, the assumption that the distribution of glides within morphemes can't be captured is far from clear. A redundancy rule could easily be formulated which would predict the value for syllabicity for segments which are [- cons., + high] by virtue of whether or not they are followed by vowels. Now it might be countered that this is to repeat the glide rule. However, such "repetition" is not at all uncommon. For example, most languages which have a voicing assimilation rule like Lithuanian also have the constraint that sequences of obstruents with morphemes must agree in voicing. The latter is a significant property which must be captured by a redundancy rule, which recapitulates the regular phonological rule of voicing assimilation. Since such repetition of constraints by phonological rules and redundancy rules is not atypical, this objection to restricting the glide rule to apply only across morpheme boundaries is not too strong. Hence, we will opt for the following formulation of the glide rule.

(Glide)   + syll   --->   - syll / ___ + [+ syll]
             + high

2.2 Ablauting Verbs and the Underlying Vowel System

It will be recalled that there were two rules formulated in the first chapter, Secondary Lengthening and Nasal Elision, which have the effect of deriving long vowels from underlying short vowels. On the basis of these two rules it is now possible to derive all occurrences of surface long open _e_ and _a_ from underlying short vowels. This in turn permits us to remove these vowels from the underlying system of (2), leaving us with the following inventory.

(21)
	i:	i	u:	u
		e:		o:
		e		a

As can be seen a certain degree of asymmetry has been introduced into the system by the removal of the open long vowels. For now there is a contrast between long and short high vowels, but the remaining vowels do not match up into long and short pairs. Considerations of universal vowel patterns would lead us to strongly suspect that there may be evidence internal to Lithuanian for grouping together /e:/ and /e/, and /o:/ and /a/ into single underlying phonemes of the same height where the only basic difference between them would be length. And, indeed, there is abundant evidence to indicate that this is the case.

The first source of such evidence comes from a relatively large number of verbs which are called "ablauting" in traditional terminology. Verbs of this pattern are distinguished by having a lengthened root vowel in their non-present forms. Depending upon the shape of the underlying root, these verbs fall into several sub-classes.

To the first subclass belong roots with an underlying short vowel followed by one or more obstruents. The lengthened a and e in the present tense are of course derived from underlying short vowels by Secondary Lengthening, since these vowels show up as short when the accent moves off them.

(22)
inf.	3 pres.	3 past	gloss
tũpti	tùpia	tũpė	'perch'
pũsti	pùčia	pũtė	'puff'
drėbti	drėbia	drėbė	'splash'
drėksti	drėskia	drėskė	'tear'

inf.	3 pres.	3 past	gloss
võgti	vãgia	võgė	'steal'
blõkšti	blãškia	blõškė	'fling'

To account for the lengthening in the non-present forms it is necessary to mark these roots as undergoing a special minor rule which will lengthen the root in the non-present. Note that when the short open e and a are lengthened, they appear as the tense mid vowels e: and o:. This suggests that there is a rule in the grammar, which I will call Tensing, which has the effect of raising and tensing long, non-high vowels.

(Tensing)
$$\begin{bmatrix} + \text{syll.} \\ - \text{high} \\ + \text{long} \end{bmatrix} \longrightarrow \begin{bmatrix} - \text{low} \\ + \text{tense} \end{bmatrix}$$

I will assume a marking convention rounds the raised a. The Tensing rule will have to be ordered before the rules of Nasal Elision and Secondary Lengthening, since the lengthened open vowels derived by these rules remain open and lax. By entering the Tensing rule into the grammar we can now restore the underlying vowel system to the more balanced and symmetric pattern of (23).

(23)   i: i   u: u

           e: e   a: a

Hence, tenseness is no longer an underlying feature, and the phonemic vowel system is now defined by three phonetic features: length, height, and gravity.

The Tensing rule is probably functionally related to the Secondary Lengthening and Nasal Elision rules, in the sense that the latter two rules derive long open vowels, which would otherwise merge with the underlying vowels of the same character. To prevent this merger the Tensing rule assigns these vowels a slightly different quality in the phonetic output. In this

connection it is interesting to observe that Latvian has no rule equivalent

to the Lithuanian Tensing rule. But in addition, as far as I know, neither

does it have a rule like Secondary Lengthening; furthermore, although it

does have a rule of Nasal Elision, its outcome with the non-high vowels is

quite different from Lithuanian, as mentioned in footnote 2 of the first

chapter. Aside from these differences, the vowel systems of the two languages

are quite parallel. These facts about Latvian vowels, then, strengthen my

belief that the Tensing rule serves the function of avoiding too much merger

in the vowel system.

Additional evidence for deriving surface tense mid vowels from

underlying long lax open vowels comes from the numerous shortening rules in

the language. In each case when the underlying long open vowel is shortened

we find the open lax counterpart. Hence in Lithuanian there are numerous

cases of alternations between ê and lax open e, which may be secondarily

lengthened when accented; and of o with a, which also may show up as a:

when secondarily lengthened. At this point I will discuss two such rules,

delaying treatment of the others until later.

The first of these rules is active in the derivation of verbs

belonging to the second subclass of the ablauting pattern. All verbs of

this group contain an underlying short vowel followed by a resonant (R),

which may be a liquid or a nasal.

(24)	inf.	3 pres.	3 past	gloss
	gélti	gẽlia	gélė	'sting'
	gérti	gẽria	gérė	'drink'
	lémti	lẽmia	lémė	'doom'
	kárti	kãria	kórė	'hang'
	gìrti	gìria	gýrė	'praise'

inf.	3 pres.	3 past	gloss
mìnti	mìna	mýnė	'trample'
kùlti	kùlia	kúlė	'thresh'
dùmti	dùmia	dúmė	'blow'

These roots are also marked to undergo the minor rule lengthening the root

vowel in the non-present. However, the root vowel appears with a reflex

of a short vowel when the root is followed by a consonant, as in the

infinitive, future, imperative, etc. (Phonetically, the vowels in gélti

and kárti are long, but this is due to Secondary Lengthening). In order to

account for the shortening of the root vowels when in a closed syllable,

I postulate a rule shortening a vowel before a resonant in a closed syllable.

Since I will argue that all shortening rules in Lithuanian are really rules

of elision operating on vowels represented in the sequence notation for

length, this rule will be formulated as follows.[1]

(Osthoff's Law) $+$ syll. $\longrightarrow \emptyset /$ $+$ syll. ___ $\begin{matrix} - \text{ syll.} \\ + \text{ sonor.} \end{matrix}$ $- $ syll

I have been able to find only one verb which corroborates the sequence

notation for length for this rule (pùlti, púola, púolė 'fall'), but it

is at least consistent with the generalization that all shortening rules

are rules of elision; since there are no short tense vowels in Lithuanian,

this rule of Osthoff's Law will be ordered before the Tensing rule. This

shortening rule also explains the distributional fact that in Lithuanian

tense mid vowels do not generally occur before sonorants in closed syllables

phonetically.

Before proceeding further let us look at some derivations for these

ablauting verbs.

	/tŭ⁺p+ti/	/tŭ⁺p+ia/	/tŭ⁺p+e:/
Ablaut	tŭ⁺:p+ti	------	tŭ⁺:p+e:
Tensing	-------	------	tŭ⁺:p+ė:
Sec. Length.	-------	------	------
	/drĕ⁺b+ti/	/drĕ⁺b+ia/	/drĕ⁺b+e:/
Ablaut	drĕ⁺:b+ti	-------	drĕ⁺:b+e:
Tensing	drė⁺:b+ti	-------	drė⁺:b+ė:
Sec. Length.	--------	drė⁺:b+ia	-------
	/vă⁺g+ti/	/vă⁺g+ia/	/vă⁺g+e:/
Ablaut	vă⁺:g+ti	------	vă⁺:g+e:
Tensing	vŏ⁺:g+ti	------	vŏ⁺:g+ė:
	/gĕ⁺l+ti/	/gĕ⁺l+ia/	/gĕ⁺l+e:/
Ablaut	gĕ⁺:l+ti	------	gĕ⁺:l+e:
Osthoff's Law	gĕ⁺l+ti	------	------
Tensing	------	------	gė⁺:l+ė:
Sec. Length.	gė⁺:l+ti	gė⁺:l+ia	------
	/kă⁺r+ti/	/kă⁺r+ia/	/kă⁺r+e:/
Ablaut	kă⁺:r+ti	------	kă⁺:r+e:
Osthoff's Law	kă⁺r+ti	------	------
Tensing	------	------	kŏ⁺:r+ė:
Sec. Length.	kă⁺:r+ti	kă⁺:r+ia	------
	/gĭ⁺r+ti/	/gĭ⁺r+ia/	/gĭ⁺r+e:/
Ablaut	gĭ⁺:r+ti	------	gĭ⁺:r+e:
Osthoff's Law	gĭ⁺r+ti	------	------
Tensing	------	------	gĭ⁺:r+ė:
Sec. Length.	------	------	------

There is a third group of verbs which are also traditionally classed as ablauting. These verbs are of the shape CVu.

(25)

inf.	3 pres.	3 past	gloss
káuti	káuja/káuna	kóvè	'beat'
ráuti	ráuja/ráuna	róvè	'tear'
bliáuti	bliáuja/bliáuna	blióvè	'bleat'
griáuti	griáuja/griáuna	gri óvè	'thunder'

However, it is not really clear that these roots contain underlying short vowels which become lengthened in the non-present by the Ablaut rule. This is because forms derived from these verbs show underlying reflexes of long vowels (cf. for example, kovè 'battle'), while forms derived from the first group generally show reflexes of short vowels (cf. vagis 'thief'). Hence it is probable that the roots in (25) contain underlying long root vowels.

In any event, I assume the v of the past tense forms to be derived from an underlying u, which appears in the non-past forms, by the glide rule. The length of the underlying root vowel only shows up when the u has become a glide, i.e. when it is followed by a vowel. When the root is followed by a non-vowel, and hence the root vowel is in a closed syllable, the root vowel shortens. This shortening can be accommodated quite nicely by Osthoff's Law if we expand the class of resonants in the context of the rule to include the high vowels.[2] These forms are now derived as follows:

	/kā:u+ti/	/kā:u+ia/	/kā:u+e:/
Glide	-------	kā:u+ja	kā:w+e:
Osthoff's Law	kău+ti	kău+ja	------
Tensing	------	------	kō:w+è:
Sec. Length.	kā:u+ti	kā:u+ja	------

The analysis of forms like bliáuti, blióvė is considerably more difficult. The problem is to explain the palatalization of the root consonants. One possible analysis is to simply set up these roots with underlying palatalized consonants. However, I should like to avoid this at all costs, since sharping of consonants is generally predictable from a following front vowel or glide. Another possibility consistent with the rules developed so far would be to set up the roots as containing a j; and to predict the palatalization from it. Still another possibility would be to essentially recapitulate the historical development of these forms and postulate a root of the shape /ble:u-/, (cf. Old Church Slavic blevati). We would then require a rule backing e to a when it appears before the u/w. Thus, the derivation might look like the following.

	/blé:u+ti/	/blé:u+e:/
Glide	--------	blé:w+e:
Sharping	b'l'é:u+t'i	b'l'é:w'+e:
Backing	b'l'á:u+t'i	b'l'á:w'+e:
Osthoff's Law	b'l'áu+t'i	----------
Tensing	----------	b'l'ó:w'+ė:
Sec. Length.	b'l'á:u+t'i	----------
w-v	----------	b'l'ó:v'+ė:

Elegant though this analysis may be, there are some indications that this analysis cannot stand up. First, it involves setting up a sequence e:u which never appears phonetically. However, I have violated the spirit of this objection several times already, so perhaps it is not too strong. More important are the following considerations. There is a derivational pattern in Lithuanian in which a root diphthong loses its first component in the derived form. For example, keĩsti, keĩčia, keĩtė 'change', kìsti, kiñta, kìto

'change oneself'; daũžti, daũžia, daũžė 'destroy', dùžti, dũžta, dùžo

'destroy oneself'. When a verb like bliáuti undergoes this derivation, the

root consonants remain palatalized: džiaũgti, džiaũgia, džiaũgė 'gladden',

pradžiùgti, pradžiuñga, pradžiùgo 'rejoice'. The underlying consonant here

is d. Sharped dental stops are converted to palatals when followed by a

back vowel. If the root vocalism eu were to be held responsible for the

palatalization, this would imply that the sharping rule applies before the

presumably "morphological" rule which alters the stem shape of the underlying

form. But all other things being equal, one would expect that such deriva-

tional rules would apply well before the point at which an assimilation rule

like Sharping does. This indicates that the palatalization of the root

consonants in these forms cannot be attributed to the postulated e vocalism.

Hence, we are forced back into chosing between the analysis which says that

the palatalization of the consonants has been lexicalized, or else to the

solution which attributes the sharping to and underlying j. I shall opt

for the latter solution, and assign bliauti an underlying shape /blja:u-/.

2.3 Metathesis

In this section we will be concerned with verbs like the following.

(26)

inf.	3 past	gloss
dúoti	dãvė	'give'
šlúoti	šlãvė	'sweep'
telefonúoti	telefonãvė	'telephone'
klýkauti	klýkavo	'scream'
dalyváuti	dalyvãvo	'participate'

Since a v appears in the past tense forms of these verbs in the context

before a vowel, it is reasonable to derive this from an underlying u, which

shows up in the infinitive forms, by the Glide rule. It now becomes necessary

to decide on how to derive the alternant stem shapes duo-, šluo-, etc., and

on how to distinguish these from stems like klvkau-, etc. Essentially

three analyses are possible.

First, we might assign forms like 'give' the underlying shape /dou-/.
After the glide rule has applied, we could then have a rule of Metathesis

of the form ou --> uo, which would metathesize all ou's which have not

undergone the glide rule. Another rule would then be required to take o

to a. Since there are no instances of surface short o in native words, this

rule could apply with no contextual restriction. This would give duati for

the infinitive, and so another rule rounding and raising the a after the u

would be needed to derive duoti. This would entail derivations like the

following:

	/dou+ti/	/dou+e:/	/kli:k+au+ti/	/kli:k+au+o:/
(Glide)	------	dow+e:	-----------	kli:k+aw+o:
(Metathesis)	duo+ti	-----	-----------	----------
(o-a)	dua+ti	daw+e:	----------	----------
(a-o)	duo+ti	-----	----------	----------

There are several objections which can be raised against this analysis.

First, it involves setting up a segment, short o, which never occurs phoneti-

cally, except after u. It might be claimed that this really is not a case

of "absolute neutralization,"[3] since we are assigning a shape to the under-

lying stem in which all of the sounds do occur phonetically -- just in a

different order. But the o color of the vowel can easily be attributed to

the preceding u, and therefore be taken as a variant of underlying a, rather

than descending from underlying o. Secondly, setting up an underlying o

introduces a lot of assymmetry back into the underlying vowel system, and

hence, all other things being equal, should be avoided.

Another possible analysis that could be given would be to say that the underlying shapes for verbs like 'give' and 'scream' both have au vocalisms, and that the different behavior of these two types of verbs with respect to Metathesis is not phonetic in nature, as in the preceding analysis, but rather is essentially arbitrary and non-phonetic. That is, for example, in learning the language a person does not distinguish the two types by assigning them an underlying phonetic difference; rather he assigns them the same underlying shape with au and merely memorizes which stems undergo metathesis and which do not.

There is a third possible analysis which seems to avoid the problem of setting up underlying o and is still able to distinguish the two types in a non-arbitrary way. However, it has problems of its own. According to this analysis stems like 'give' will be assigned an underlying shape /dua-/, effectively distinguishing them from the other type, which has the shape /kli:k+au-/. The Metathesis would now have to occur in the opposite direction and be restricted to apply only when a vowel followed: ua --> au/ __ V. Then the Glide rule would apply. Hence, davė would go through the following stages: /dua+e:/ --> /dau+e:/ --> /daw+e:/, etc.

Though this analysis avoids the problems of the first two, there are still several objections to it, which reduce its plausability considerably. First, it will now be necessary to mark such stems as /dua-/ as exceptions to the Redundancy rule about the predictability of the feature syllabicity within morphemes, since here we have u before a full vowel. (Note that if the glide rule were held to apply within as well as across morpheme boundaries, then it would be necessary to say that such stems are exceptions to the rule when they fail to metathesize, but regularly undergo the rule when they suffer metathesis.) Secondly, the rule of Metathesis itself is stated in a rather unnatural fashion, since it is restricted to apply only before vowels. Such

an objection may not be too strong if it were not for the fact that we have

independent evidence from Latvian that the rule is formulated quite differently.

As mentioned in footnote 2 of the first chapter, in Latvian nasals in closed

syllables are replaced by high vowels equal in gravity to the preceding

vowel. In addition, when the vowel before the nasal was low, a low-high

sequence resulted from Nasal Elision. This sequence was then subject to

Metathesis. Thus, to Lithuanian ranka corresponds Latvian ruoka from rauka

by Metathesis. Hence, Metathesis applies to the output of Nasal Elision in

Latvian in the direction au --> ua; also, the context is preconsonantal, and

not prevocalic as required by the third analysis.

One might counter this argument with the objection that the facts of

Latvian are irrelevant to a synchronic description of Lithuanian. However,

I think the data from Latvian is relevant in the following sense. The

Metathesis rule for Lithuanian is quite old and evidently was present in the

grammars of both Lithuanian and Latvian, if not Common Baltic. In Lithuanian

the data to which the rule applies is such that it does not directly enable

one to choose between the third analysis and either of the first two. In

Latvian, on the other hand, due to the peculiarities of Nasal Elision, new

data has come under the control of Metathesis. And the structure of this

new data is sufficient to rule out the third analysis. Now if we assume that

the rule of Metathesis has remained essentially unchanged in both Lithuanian

and Latvian, then we can rule out the third analysis for Lithuanian too.

Hence, we are left with a choice between the first analysis, which

sets up underlying o, and the second, which distinguishes the stems in an

arbitrary, non-phonetic fashion. Although I can bring no really strong

arguments to bear upon the matter, I shall select the second analysis, since

it seems to involve the least number of assumptions, and in addition retains

the symmetrical underlying vowel pattern. Since the number of forms which undergo metathesis seems to be smaller than those which do not, the Metathesis rule will be formulated as a governed or minor rule.[4] Hence, it will apply only to morphemes specifically marked to undergo it. This rule will of course be ordered after the Glide rule and formulated as follows.

(Metathesis) a u ---> u a

In addition, we will require a rule of Raising, which will take a to o after u, and will be ordered after Metathesis.

(Raising) a ---> o / u ____

2.4 Derived Intransitives and Nasal Infixes

There are a fair number of derived intransitives (mostly inchoatives) which have phonological manifestations of their derived character in the present tense. These verbs are two in kind. First, those which add the suffix /st-/ to the present tense stem; and second, those which infix a nasal in the present tense. What is interesting about these verbs is the distribution of the suffix vis-a-vis the nasal infix. This distribution goes as follows.

First, if the root contains a long vowel or diphthong, either mixed or vocalic, the suffix is added.

(27)	inf.	3 pres.	3 past	gloss			
	dýgti	dýgsta	dýgo	'sprout'	cf.	dygùs	'thorny'
	álkti	álksta	álko	'hunger'		aĩkis	'hunger'
	gaĩšti	gaĩšta	gaĩšo	'tarry'		gaišlùs	'slow'

Second, if the root vowel is underlyingly short and the second consonant is a stop, the dental nasal n is infixed between the vowel and stop.

(28) | inf. | 3 pres. | 3 past | gloss | | | |
|------|---------|--------|-------|--|--|--|
| àkti | aňka | ãko | 'become blind' | cf. | akìs | 'eye' |
| šlàpti | šlampa | šlãpo | 'get wet' | | šlapias | 'moist' |
| gèsti | geňda | gẽdo | 'spoil' | | | |
| ràsti | raňda | rãdo | 'find' | | | |

Third, if the root vowel is basically short and the second consonant is a fricative, then the root vowel appears as a lengthened circumflex, and the suffix is added.

(29) | inf. | 3 pres. | 3 past | gloss | | | |
|------|---------|--------|-------|--|--|--|
| šàšti | šãšta | šãšo | 'grow scabby' | cf. | šãšas | 'scab' |
| grìsti | grỹsta | grìso | 'be tired of' | | | |
| glèžti | glẽžta | glẽžo | 'weaken' | | glẽžras | 'weak' |
| mìšti | mỹšta | mìšo | 'mix' | | mìšris | 'hybrid' |

Finally, if the root vowel is short and the final consonant is a sonorant, there are two possibilities. If the consonant is a nasal, the form is suffixed; but if the consonant is a liquid, then either the form is suffixed or the root vowel is lengthened to circumflex.

(30) | inf. | 3 pres. | 3 past | gloss | | | |
|------|---------|--------|-------|--|--|--|
| kìmti | kìmsta | kìmo | 'become hoarse' | cf. | kimùs | 'hoarse' |
| bálti | bãla/bálsta | bãlo | 'whiten' | | báltas | 'white' |
| šìlti | šỹla/šìlsta | šìlo | 'grow warm' | | šìltas | 'warm' |
| kérti | kẽra/kérsta | kẽro | 'protrude' | | kértė | 'angle' |

What is interesting about these forms is the distribution of the suffix. The only place in which it cannot appear is in verbs of the second group, which end in a stop. It just so happens that because of Nasal Elision, stops are the only consonants before which n can appear phonetically. On the other hand, roots of the third class, which end in a fricative, take the

suffix. But still they behave like they also have a nasal infix, which of course gets lost by Nasal Elision. Not only is this indicated in the orthography, but also by the following considerations.

First, note that whenever the infix occurs in the second group, it carries the accent. The fact that the infix is accentually marked prevents the accent from being thrown back to the prefix, when these verbs are prefixed. For example, compare atmèsti – àtmeta and atràsti – atrañda. Normally, roots of the shape CVC with a short vowel such as /met-/ yield the accent to the prefix in the present tense. What is important here is that verbs of the fricative class, which also have underlying short vowels, behave in the same exceptional way in failing to release their accent to the prefix in the present tense: cf. atgrìsti – atgrỹsta. This parallel behavior of the fricative and stop class verbs can be explained by also infixing a nasal in the former and then deleting it by Nasal Elision, which, it will be recalled, preserves the accentuation of the syllable.

A second fact which can be explained by having the fricative class verbs undergo infixing is the length of the vowel in the present tense. Although the long circumflex ã and ẽ in šãšta and glẽžta could be attributed to Secondary Lengthening, this will not explain the length when the accent occurs on the desinence: šąštù, glẹžtù, etc. Also, since Secondary Lengthening only applies to non-high vowels it is of no help in explaining forms like grỹsta, mỹšta, etc. But if these verbs are treated as having an infixed nasal, the length of the vowel can be attributed to the compensatory lengthening effect of Nasal Elision.

Finally, if one were to attribute the lengthening of the root vowels in the fricative class verbs to a minor rule, one would be at a loss to explain why the lengthened low vowels do not show up as tense mid vowels by the

Tensing rule, since all other things being equal, minor rules, like Ablaut, generally occur before the general phonological rules. But again, by attributing the length to Nasal Elision, this problem does not arise, since Nasal Elision is independently ordered after Tensing.

Hence, although the nasal infix never occurs phonetically in the fricative class verbs, a good case can be made for treating these roots as undergoing the process of infixation. Similar evidence can be brought to bear on an analogous treatment for roots of the fourth class with a final liquid.

But such an analysis is still at a loss to make sense of the distribution of suffixation and infixation, for it would appear a complete accident that there are some forms which undergo both processes and that these can be characterized by the context for the phonological rule of Nasal Elision. Rather it should be evident that the distribution of these processes is conditioned by this phonological rule. This may strike one as rather peculiar, since typically morphological processes are stated at the under-lying level of representation and are not sensative to the structure of strings after the application of phonological rules.

In any case, perhaps this situation arose somewhat along the following lines. At an earlier stage of the language before the rule of Nasal Elision was added to the grammar, the distribution of suffixation and infixation was as follows. If the root contained two morae and was thus long, the suffix /st-/ was added in this derivational pattern to the present tense stem. But if the root was short and contained only a single mora, then it underwent infixation. Then the Nasal Elision rule was added to the grammar and roots of the third and fourth classes lost the infix and compensatorily lengthened the root vowel.

Perhaps at this point these roots with derived long vowels were re-interpreted as belonging to class I, and hence underwent suffixation. Or if not this, perhaps they were felt to not be sufficiently characterized or marked for this derivational pattern, and hence underwent suffixation. Whatever the reason, we now have the situation in which the fricative class verbs undergo both processes. One might have expected the liquid class verbs to behave the same, and hence to derive something like šylsta for the present form of šilti. Instead we find both šýla from /si-n-l+a/ and šilsta. It might be thought that the latter could be derived from /ši-n-l+st+a/ by an application of Osthoff's Law after Nasal Elision. However, the acute accent in šilsta belies this treatment, since the nasal infix is invariably associated with circumflex accentuation. Hence, the underlying form is more likely just /šil+st+a/.

2.5 The Present Tense

Traditionally, Lithuanian verbs are divided into three conjugations depending upon the vowel which ends the third person form. An example of a first conjugation or a-stem verb is dìrbti 'work', which, like many other verbs, occurs in both a reflexive and non-reflexive form.

(30)

		non-reflexive			reflexive	
	sg.	dual	pl.	sg.	dual	pl.
1	dìrbu	dìrbava	dìrbame	dìrbuosi	dìrbavos	dìrbamės
2	dìrbi	dìrbata	dìrbate	dìrbiesi	dìrbatos	dìrbatės
3	dìrba	dìrba	dìrba	dìrbas	dìrbasi	dìrbas

This verb is analyzed into four parts: a root dirb-; a present tense theme vowel a; person-number endings uo, ie, ∅, vo:, to:, me:, and te:; and finally an optional reflexive marker s(i).

All of the endings but the third person, which is the same in all numbers, show an alternation between the reflexive and non-reflexive form, where the latter either lacks a final vowel contained in the former, or else has a shortened counterpart of the reflexive's long tense final vowel. The analysis of the dual and plural endings is quite straight-forward. In the dual the endings are basically /va:/, and /ta:/. When this morpheme is word final its vowel is shortened, while if the reflexive marker follows it undergoes the Tensing rule to o:. Similarly, in the plural the endings are /te:/ and /me:/. When word final, the long e: is shortened, while if not in word final position it is tensed to é:. In the singular forms word final u and i alternate with the diphthongs uo and ie in the reflexive. Evidently the shortening of the underlying long vowels in the dual and plural and the loss of the final vowels in the diphthongs of the singular are part of the same process, and therefore constitute evidence for representing the long vowels as sequences in which the final member is truncated at the end of a word. Since the final a of the third person does not undergo this final reduction, it is necessary to mark it as an exception. Presumably the retention of the a here can be attributed to the fact that the third person ending was originally t as it is in Slavic and Indo-European generally. I will call the rule responsible for this reduction Final Shortening and formulate it as follows.

(Final Shortening)   + syllabic $-\!-\!\rightarrow$ $\emptyset$ / _____ #

This rule will of course have to be ordered before Tensing.

It is now necessary to enquire further into the underlying nature of the singular endings. They differ from the other endings in that the theme vowel does not appear before them; in addition, they are the only endings beginning with a vowel. Furthermore, since uo and ie have high vowels before

vowels, they must either be treated as exceptions to the redundancy rule which predicts the value of syllabicity for underlying segments which are [+ high, - cons] , or else they must have originated from underlying au and ei sequences via the Metathesis rule. I prefer the latter alternative and generalize the Metathesis rule as follows.

(Metathesis)

$$\begin{bmatrix} + \text{syll.} \\ - \text{high} \\ \alpha \text{ back} \end{bmatrix} \quad \begin{bmatrix} + \text{syll.} \\ + \text{high} \\ \alpha \text{ back} \end{bmatrix} \quad \text{---}\rightarrow \quad 2 \ 1$$

1   2

Thus, at a deeper level the first and second singular endings are au and ei. It is now necessary to account for the absence of the theme vowels in these forms. This can be done quite easily by Osthoff's Law, if we formulate it to delete the first mora of a long vowel in the context ___ R $\overset{C}{\#}$.

	/dirb+a+au#/	/dirb+a+au+si#/
Osthoff's Law	dirb+au#	dirb+au+si#
Metathesis	dirb+ua#	dirb+ua+si#
Final Shortening	dirb+u#	----------5
Raising	------	dirb+uɔ+si#
	/dirb+a+ei#	dirb+a+ei+si#
Osthoff's Law	dirb+ei#	dirb+ei+ei#
Metathesis	dirb+ie#	dirb+ie+si#
Final Shortening	dirb+i#	----------

An example of a second conjugation or i-stem verb is mylḗti 'love'.

(31)

	non-reflexive			reflexive		
	sg.	dual	pl.	sg.	dual	pl.
1	mýliu	mýliva	mýlime	mýliiuosi	mýiivos	mýlimēs
2	mýli	mýlita	mýlite	mýliesi	mýlitos	mýlitēs
3	mýli	mýli	mýli	mýlisi	mýlisi	mýlisi

This verb is analyzed as being of the same structure as <u>dìrbti</u> except that the theme vowel is <u>i</u>. The 1 and 2 singular are derived as follows.

	/mi:l+i+au#/	/mi:l+i+ei#/
Glide	mi:l+j+au#	mi:l+j+ei#
Metathesis	mi:l+j+ua#	mi:l+j+i.e#
Final Shortening	mi:l+j+u#	mi:l+j+i#
Sharping	m'l:l'+j+u#	m'i:l'+j+i#
j-$\emptyset$	m'i:l'+u#	m'i:l'+i#

To the third conjugation belong such verbs as <u>matýti</u> which is conjugated as follows.

(32)   non-reflexive   reflexive

	sg.	dual	pl.	sg.	dual	pl.
1	mataũ	mãtova	mãtome	mataũsi	mãtovos	mãtomės
2	mataĩ	mãtota	mãtcte	mataĩsi	mãtotos	mãtotės
3	mãto	mãto	mãto	mãtosi	mãtosi	mãtosi

Here the theme vowel is underlying <u>a:</u> which shows up as <u>o:</u> via the Tensing rule in the dual, plural, and third person forms. However, the 1 and 2 singular forms present a slight problem. First, we have to account for the reduction of the long theme vowel to a short vowel. Such reduction is not readily accommodated by Osthoff's Law, which, it will be recalled, was modified to apply in a closed syllable, in order to handle the 1 and 2 singular of <u>dìrbti</u>. This suggests that we formulate a new rule which I will call Vowel Truncation. This rule is formulated to elide the first of three consecutive vowels, where vowel length is represented in the sequence notation. In addition this rule is easily extendable to handle the reduction of the short theme vowel in the 1 and 2 singular of <u>dìrbti</u>, which probably shouldn't have been handled by Osthoff's Law in the first place, since I

feel quite confident that reduction would have occurred in these verbs even if the desinence were not in a closed syllable, as required by Osthoff's Law.

(Vowel Truncation) $V \longrightarrow \emptyset / \underline{\quad} V V$

Thus, we have derivations like the following for mataũ, mataĩ, and dìrbu.

	/mat+aa+au#/	/mat+aa+ei#/	/dirb+a+au#/
Metathesis	mat+aa+ua#	mat+aa+ie#	dirb+a+ua#
Vowel Truncation	mat+a+ua#	mat+a+ie#	dirb+ua#
Final Shortening	mat+a+u#	mat+a+i#	dirb+u#

A second problem associated with the third conjugation forms is the fact that the low vowel components of the 1 and 2 singular endings do not appear in the reflexive forms: matausi, mataisi, etc. However, if the Vowel Truncation rule is given a mirror image expansion, these forms can be handled without any new machinery.

	/mat+aa+au+si/	/mat+aa+ei+si/
Metathesis	mat+aa+ua+si	mat+aa+ie+si
Vowel Truncation$_1$	mat+a+ua+si	mat+a+ie+si
Vowel Truncation$_2$	mat+a+u+si	mat+a+i+si

2.6 The Past Tense

There are essentially only two kinds of past tense in Lithuanian, although the shape of the stem may be altered (see below). Here once again the two different conjugations are named after the vowel which ends the third person form, being either a: or e:.

The verb dìrbti falls into the first class and is conjugated as follows.

(33)   non-reflexive   reflexive

	sg.	dual	pl.	sg.	dual	pl.
1	dìrbau	dìrbova	dìrbome	dìrbausi	dìrbovos	dìrbomės
2	dìrbai	dìrbota	dìrbote	dìrbaisi	dìrbotos	dìrbotės
3	dìrbo	dìrbo	dìrbo	dìrbosi	dìrbosi	dìrbosi

Since this conjugation is exactly the same as the present of matýti, it

will be treated the same, and hence nothing more need be said about it here.

As might be expected, verbs which take the a: theme in the present,

have the e: theme in the past tense.

(34)   non-reflexive   reflexive

	sg.	dual	pl.	sg.	dual	pl.
1	mačiaũ	mãtėva	mãtėme	mačiaũsi	mãtėvos	mãtėmės
2	mateĩ	mãtėta	mãtėte	mateĩsi	mãtėtos	mãtėtės
3	mãtė	mãtė	mãtė	mãtėsi	mãtėsi	mãtėsi

Again, the derivation of all forms but the 1 and 2 singular follows quite

straightforwardly from the analysis already given. The 1 singular form

mačiau shows a reflex of the sound change backing e before u which was

mentioned above in the discussion of bliáuti. Since all of the other verb

forms we have treated so far can be derived from an underlying structure

root + theme + ending, I am loath to depart from such a structure here.

Hence I will assume that there is indeed a rule which backs e to a when

followed by u. This rule will be called Backing. The forms mačiaũ and mateĩ

are now derived as follows.

	/mat+ee+au#/	/mat+ee+ei#/
Metathesis	mat+ee+ua#	mat+ee+ie#
Final Shortening	mat+ee+u#	mat+ee+i#
Vowel Truncation	mat+e+u#	mat+e+i#
Sharping	mat'+e+u#	mat'+e+i#
Backing	mat'+a+u#	--------

A late rule, which I will call Softening, converts palatalized dental

stops into palatal affricates when they stand before back vowels.

(Softening)
$$\begin{matrix} - \text{ grave} \\ - \text{ contin.} \end{matrix} \longrightarrow \begin{matrix} + \text{ compact} \\ + \text{ strident} \end{matrix} / \underline{} \begin{matrix} + \text{ syll.} \\ + \text{ back} \end{matrix}$$

By virtue of this rule /mat'+a+u/ becomes /mač+a+u/. It is to be observed

that the high components of the 1 and 2 singular endings also do not

appear in the past tense of the reflexive verbs. Since all of the enrivon-

ments in which these vowels do show up are characterized by preceding

long theme vowels, this strengthens the case for the mirror image expansion

of the Vowel Truncation rule. In this regard the observant reader will have

noticed that in the derivation of macĭaũ the Final Shortening rule was

applied before Vowel Truncation, while in the derivation of dìrbu Final

Shortening applied after Truncation. The former ordering was necessary

since, if Truncation applied first to /mat+ee+ua/, by the mirror image

application we would derive /mat+e+u/ to which Final Shortening would apply

yielding the incorrect /mate/. On the other hand, the latter ordering was

needed for dìrbu since, from underlying /dirb+a+ua/, if Final Shortening were

to apply first we would derive /dirb+a+u/, to which Truncation could no longer

apply, giving final-derived /dirbau/. However, this difficulty can be

obviated quite straightforwardly by virtue of the fact that it is necessary

to associate an underlying accent with the high vowel components of the 1 and

2 singular endings. Hence, we may retain the ordering of Vowel Truncation

before Final Shortening, by placing a restriction on the latter that it may
not elide accented vowels. However, such a restriction on a reduction rule
like Final Shortening is not at all unnatural, and indeed might even be
expected. Hence, Final Shortening will be revised to look like the following.

(Final Shortening)   + syll. ---> $\emptyset$/ ____ #
                      - accent

The forms mačiaŭ and dìrbu are now derived as follows.

	/mat+ee+aŭ#/	/dírb+a+aŭ#/
Metathesis	mat+ee+úa#	dírb+a+úa#
Vowel Truncation₁	mat+e+úa#	dírb+úa#
Vowel Truncation₂	mat+e+ú#	-------
Final Shortening	-------	dírb+ú#
Sharping	mat'+e+ú#	d'írb+ú#
Backing	mat'+a+ú#	-------
Softening	mač'+a+ú#	-------

A late accentual rule deletes the accent from the desinence of /dírb+ú/
to yield final derived /d'írb+u/.

2.7 The Future Tense and the Imperative

The future tense is formed from the same stem alternant as the
infinitive (see below). It is characterized by the suffix si- plus the
personal endings of the verb, with an optional reflexive particle -s(i). Thus
dìrbti is conjugated in the future as follows.

(35)   non-reflexive   reflexive

	sg.	dual	pl.	sg.	dual	pl.
1	dìrbsiu	dìrbsiva	dìrbsime	dìrbsiuosi	dìrbsivos	dìrbsimės
2	dìrbsi	dìrbsita	dìrbsite	dìrbsiesi	dìrbsitos	dìrbsitės
3	dir̃bs	dir̃bs	dir̃bs	dir̃bsis	dir̃bsis	dir̃bsis

The dual and plural are derived in the usual way. In the singular the derivations proceed as follows.

	/dirb+si+au#/	/dirb+si+ei#/	/dirb+si#/
Glide	dirb+sj+au#	dirb+sj+ei#	-------
Metathesis	dirb+sj+ua#	dirb+sj+ie#	-------
Vowel Truncation	----------	----------	-------
Final Shortening	dirb+sj+u#	dirb+sj+i#	dirb+s#
Sharp	d'ir'b'+s'j+u#	d'ir'b'+s'j+i#	d'irb+s#
j-∅	d'ir'b'+s'+u#	d'ir'b'+s'+i#	-------

Unlike the present or past, the future exhibits several alternations in the shape of the preceding stem. Most of these can be attributed to the fact that the suffix following the stem begins with a consonant s. Thus, in the future there is Assibilation (mèsiu from /met+si+u/; Metathesis (dreksiu from /dresk+si+u/); Palatal Leveling (nèšiu from /neš+si+u/); Voicing Assimilation [d'ir'p's'u] from /dirb+si+u/); Degemination (lèsiu from /les+si+u/); etc. The shift from acute to circumflex accentuation in the 3 person (cf. dìrbsiu, dirbs) is discussed in detail in Kenstowicz (1970a). The imperative is of the same constituent structure as the future, except that it only occurs in basically the second person. The imperative marker is /ki-/, the i being lost in the simple singular form by Final Shortening: dìrbk, dìrbkite, dìrbkis, dìrbkitès, etc. The analysis readily accounts for these forms and so they require no further comment.

2.8 The Verbal Constituent Structure

In any non-derived Lithuanian verb four parts may be isolated. In order they are the root, the verb suffix (VS), the tense/aspect marker, and the personal endings. In addition, at the beginning of this string

of morphemes an optional prefix may appear, and at the end an optional reflexive marker, the occurrence of these latter two of course depending upon the meaning of the verb in question. However, if both the prefix and the reflexive marker occur, the latter is moved between the prefix and the root. For example, the transative verb ké́lti 'lift' has an intransative reflexive counterpart ké́ltis 'get up'. To each of these verbs may be added the prefix at-, resulting in atké́lti 'raise up' and atsiké́lti 'rise up'.[6]

Each of these parts is assumed to be a phonological reflection of certain semantic and syntactic information of the verb. The only constituent requiring comment in this regard is the verb suffix. I assume this suffix to be a reflection of the node or feature Verb, chiefly on the basis of the fact that when verbs are formed from nouns, some affix appears in this position, presumably as a reflection of the rule forming the derived verbs.

Since I have no evidence as to the structural relationships of these parts to one another in the surface structure, I will assume that they are merely conjoined by formative boundaries. Hopefully, investigation of derivational morphology and syntax would reveal more structure here. When there is a choice as to particular phonological segments realizing these formatives, some of the alternants are predictable from information about the others in the string. The phonological shape of the root, of course, is unpredictable, this information constituting part of the idiosyncratic or distinctive part of the lexical entry. In non-derived forms, the same is basically true of the VS, which has four possible underlying forms: /φ/ dìrbti, /e:/ mylé́ti, /i:/ matýti, and /a:/ žinóti. On the other hand, the phonological character of the tense/aspect marker is by and large predictable from the information already specified. In fact, except for

the present and past tense markers, all these morphemes are of one basic shape:
the future is /si-/, the infinitive /ti-/, the imperative /ki-/, etc. The
same is true of the verbal endings.

The present tense marker has three possible underlying shapes, /a/,
/i/, and /a:/, corresponding to the three conjugations; in the past only two
occur -- /a:/ and /e:/. In most cases which particular alternant occurs
is predictable from the VS. First, if the VS is /i:/, then the present
is /a:/ and the past is /e:/:e.g. matýti, mãto, mãtė. Second, if the VS
is /e:/, the past will be /a:/, but the present may be either /i/ or /a/:
e.g. myléti, mýli, mylėjo; kalbéti, kaĩba, kalbėjo 'speak'. However, most
of the latter are derived (cf. kalbà 'speech') and I will assume that the
occurrence of /a/ as the present marker is predictable from the derivational
pattern. Third, if the VS is /a:/, then the past is /a:/, and the present
can be either /a:/ or /a/: e.g. žinóti, žìno, žinójo 'know'; vagóti, vagója,
vagójo 'furrow'. The latter may be cognate with the Slavic /a:j/ VS as in
OCS čitati, čitajetŭ 'read'; and hence one might take the VS in Lithuanian
here to be not /a:/, but /a:j/. We would then need a rule similar to the
Slavic rule of Sonorant Truncation,[7] in order to delete the j before con-
sonant initial post stem suffixes. Perhaps, one might go further and claim that
the ėj of kalbėjo is from /e:j/ (cf. OCS bělěti, bělějetŭ 'whiten'. However,
the fact that /a:j/ shows up in the present vagójo, while we have žìno
(cf. OCS zĭnajetŭ) and kaĩba rather than žinojo and kalbėjo makes such an
analysis difficult to maintain. Finally, if the VS is /∅/, the present will
be /a/, and the past either /a:/ or /e:/. However, a great many verbs in
this class have a j augment in the present tense (e.g. the ablauting verbs
drė̃bti, drė̃bia, drė̃bė; káuti, káuja, kóvė) and these verbs invariably take
the /e:/ past. This might be grounds for considering the /ė/ here to be a

contraction of /j+a:/. However, forms like žinójo and vagójo, and kalbéjo and mylėjo seem to belie this approach. In any case the occurrence of the /e:/ past for most verbs with a /∅/ VS can be predicted on the basis of the j augment, whose occurrence in turn can be predicted on the basis of the fact that they are Ablauting verbs and hence marked to undergo the minor rule of Ablaut which lengthens the root vowel in the non-present. Nevertheless, there remain a few verbs such as nèšti, nẽša, nẽšė 'carry'; kàsti, kãsa, kãsė 'dig'; etc. for which the occurrence of the /e:/ past must be provided for in the lexicon.

It is now necessary to specify the distribution of the VS. First, it always appears before consonant initial tense/aspect markers, such as the infinitive: mylėti, matyti, žinóti, etc. Before the vowel initial present and past suffixes the VS sometimes appears and sometimes does not. In non-derived forms it does not appear in the present tense: mýli, mãto, žĭno. In the past tense, the non-high VS (/e:/ and /a:/) are retained and a j occurs between them and the following theme vowel: mylėjo, žinójo. But if the VS is high, then it does not occur in the past: mãtė.

The best way to treat these alternations in stem shape, it seems to me, is to first formulate a rule of VS Truncation.

(VS Truncation)   V   ----> ∅/ ____ + V
                  verb
                  suffix

In forms like mylėjo and žinójo the VS can be retained by another rule ordered before VS Truncation. This rule will insert a j between a non-high VS and a following past tense marker.

∅ ---> j /   V   ____ + V
           - high   past
           verb
           suffix

These rules are ordered to apply before the regular phonological
rules of Glide, Metathesis, Vowel Truncation, etc., and merely function to
adjust the verb to the shape required by these regular rules. Aside from
the generalization that the VS does not occur before a vowel, there is
little insight that they provide, and hence I would be reluctant to defend
this treatment very strongly. It might be thought that on the basis of the
work of Halle and Lightner[8] on Slavic, that a structure of the form /root+
VS+theme+endings/ could be more directly shown to underlie Lithuanian verbs.
Although in Slavic such a structure can be shown to have important consequences
for the phenomena of accentuation and transative softening, I have been able
to find little comparable evidence in Lithuanian which would justify a similar
treatment.

2.9 The Rule Index

Listed below in abbreviated form are the major rules established in
this chapter.

(36) Ablaut (minor)

$$V \longrightarrow + long$$
$$root$$

Glide

$$i, u \longrightarrow j, w / \underline{\quad} + V$$

Metathesis (minor)

$$au, ei \longrightarrow ua, ie$$

Vowel Truncation

$$V \longrightarrow \emptyset / V \, V$$

Final Shortening

$$V \longrightarrow \emptyset / \underline{\quad} \#$$
$$- accent$$

Osthoff's Law

$$V \longrightarrow \emptyset / V \underline{\quad} R C$$

Tensing

$$e:, a: \longrightarrow \dot{e}:, o:$$

Raising

$$a \longrightarrow o / u \underline{\quad}$$

Backing

$$e \longrightarrow a / \underline{\quad} u$$

Softening

$$t', d' \longrightarrow \check{c}, d\check{z} / \underline{\quad} \begin{array}{l} + syll. \\ + back \end{array}$$

The important ordering relations among these rules and some of those of
the first chapter are as follows.

(37)   Glide precedes: Metathesis

        Metathesis precedes: Vowel Truncation, Raising

        Vowel Truncation precedes: Final Shortening, Osthoff's Law

        Final Shortening precedes: Tensing

        Osthoff's Law precedes: Tensing

        Tensing precedes: Nasal Elision, Secondary Lengthening

        Sharping precedes: Backing

        j-∅ precedes: Softening

Footnotes

[1]This is a synchronic reflex of a sound change known as Osthoff's
Law.

[2]For an interesting discussion of the resonants, see C. J. Bailey
(1968).

[3]See Kirparsky (1968a).

[4]For a discussion of minor rules in phonology, see Lightner (1968).

[5]The reason for the blockage of Final Shortening here is not obvious,
especially since the rule does apply in the dual and plural. However, as
we shall see there is another rule which elides a vowel in roughly the
context V __(s)#. Note that the 1 and 2 singular endings are acute, and
hence would be subject to this further reduction. Perhaps the lack of
Final Shortening in these enrivonments can be attributed to the desire to
protect these endings from further reduction.

[6]It is interesting to observe that when the reflexive marker is
moved from the end of the verb, it does not undergo the glide rule in a form
such as užsiėmė. This might be interpreted as indicating that the glide
rule applies before the movement rule.

[7]See Jakobson (1948).

[8]See Halle (1963) and Lightner (1967).

3. NOMINAL ACCENTUATION

3.1 The Accentual Unit

Phonetically, Lithuanian is like Russian in that generally speaking there is only one accent per word. But unlike Russian, Lithuanian has three kinds of accent: a falling accent (indicated by the acute), a rising accent (indicated by the circumflex), and a simple "raised" accent (indicated by the grave accent sign). However, the distribution of these accents is quite restricted. First, the contour accent, i.e. the acute and circumflex, only fall on long syllables. There are two kinds of long syllables in Lithuanian. 1) a syllable is long if it contains a long vowel: eg. matýti inf., matỹs 3 fut. 'see'; myléti inf., mylẽs 3 fut. 'love'. 2) a syllable is long if it contains a diphthong. There are two kinds of diphthongs in Lithuanian. A) vocalic diphthongs, which are defined as a high vowel immediately adjacent to a non-high vowel: e.g. káimas 'village', vaĩkas 'child', dúoti inf., duõs 3 fut. 'give'. B) mixed diphthongs, which are vowels immediately followed by liquids or nasals in closed syllables: e.g., kártis 'pole', kar̃tis 'bitterness', ántis 'duck', añtis 'breast'. The second distributional constraint on the accents is that the grave accent only falls on short syllables, i.e. syllables with a short vowel which is not part of a diphthong: e.g. bìtè 'bee', mùsè 'fly', pìna 3 pres. 'plait'. Because of the Secondary Lengthening rule, the grave accent typically occurs on high vowels, unless in a final syllable, where it may occur on non-high vowels: rankà nom. sg., rankojè loc. sg. 'hand'.

From these distributional constraints the following generalizations emerge. If a syllable is long and accented, it will have a contour accent, and if a syllable has a contour accent, then that syllable will be long; similarly, if a syllable is short and accented the accent will be of the non-contour type, and if a syllable carries a non-contour accent, then the syllable will be short. It follows from this that when the acute and circumflex accent signs occur over vowels which are not members of diphthongs, these accented vowels must be long.

These distributional regularities will fall out automatically if a mora notation is introduced for representing the accent. A long syllable will contain two morae, and acute and circumflex can then be defined as a binary opposition between accent on the initial and final mora of a long syllable, where accent is realized phonetically as high pitch. The grave accent is also interpreted as a realization of high pitch, but I assume that no contour is perceived, because there are no adjacent sonorous elements in the same syllable.

The mora will be defined as follows. Given a string of syllabified segments in which long vowels are represented as sequences of identical vowels, the first vowel in the syllable is specified as a mora as well as an immediately following vowel, or liquid or nasal provided the latter are in a closed syllable. Thus, matýti and matỹs are represented as /mat i̱i̱ti̱/ and /mat i̱i̱s/, where the underlining indicates morae and the ± indicates accent (= high pitch). Similarly, káimas, vaĩkas, ántis, and añtis are represented as /ka̱imas/, /va̱ikas/, /a̱ntis/ and /a̱ntis/ before Secondary Lengthening has applied, but after this rule the acutes are lengthened to /ka̱aima̱s/ and /a̱antis/.

Thus, the mora is the accentual unit and Lithuanian is a "mora language."[1] A priori, however, there is no reason to expect the accentual unit to be the same in all parts of the grammar, especially since during the history of a language it can change from a mora to a syllable notation as in Greek, or from a syllable to a mora notation as in Lithuanian.[2] As the analysis develops, we will see that it may be necessary to operate with both syllables and morae in Lithuanian.

3.2 The Traditional Analysis

Traditionally, Lithuanian nouns have been divided into four accent classes.[3] Examples for the two main declensions follow.

(38)   Feminine a-stems

Sg.		1		2		3		4	
N	várna	'crow'	rankà	'hand'	galvà	'head'	kalbà	'speech'
G	várnos		rañkos		galvõs		kalbõs	
D	várnai		rañkai		gálvai		kaĩbai	
A	várną		rañką		gálvą		kaĩbą	
I	várna		rankà		gálva		kalbà	
L	várnoje		rañkoje		galvojè		kalbojè	
V	várna		rañka		gálva		kaĩba	

Dl.							
NAV	várni		rankì		gálvi		kalbì
D	várnom		rañkom		galvóm		kalbóm
I	várnom		rañkom		galvõm		kalbõm

Pl.							
N	várnos		rañkos		gálvos		kaĩbos
G	várnų		rañkų		galvų̃		kalbų̃
D	várnoms		rañkoms		galvóms		kalbóms

A	vár̃nas	rankàs	gálvas	kalbàs
I	vár̃nomis	rañkomis	galvomìs	kalbomìs
L	vár̃nose	rañkose	galvosè	kalbosè
V	vár̃nos	rañkos	gálvos	kaĩbos

Other examples

1. anýta 'mother-in-law', ãšara 'tear', eĩgeta 'beggar'.

2. arbatà (voc. arbãta) 'tea', lelijà (lelìja) 'lily', kulkà (kuĩka) 'bullet', bibliotekà (bibliotèka) 'library'.

3. Lietuvà (líetuva) 'Lithuania', burnà (búrna) 'mouth', pamokà (pãmoka) 'lesson', karvenà (kárvena) 'cowhide'.

4. ligà (lìga) 'illness', gamtà (gam̃ta) 'nature', lazdà (lãzda) 'stick'.

(39)   Masculine o-stems

Sg.

N	káimas 'village'	rãtas 'wheel'	lángas 'window'	vaĩkas 'child'
G	káimo	rãto	lángo	vaĩko
D	káimui	rãtui	lángui	vaĩkui
A	káimą	rãtą	lángą	vaĩką
I	káimu	ratù	lángu	vaikù
L	káime	ratè	langè	vaikè
V	káime	rãte	lánge	vaĩke

Dl.

NAV	káimu	ratù	lángu	vaikù
D	káimam	rãtam	langám	vaikám
I	káimam	rãtam	langam̃	vaikam̃

Pl.

N	káimai	rãtai	langaĩ	vaikaĩ

G	káimų	rãtų	langỹ	vaikỹ
D	káimams	rãtams	langáms	vaikáms
A	káimus	ratùs	lángus	vaikùs
I	káimais	rãtais	langaĩs	vaikaĩs
L	káimuose	rãtuose	languosè	vaikuosè
V	káimai	rãtai	langaĩ	vaikaĩ

Other examples

1. vandenýnas 'ocean', kóvas 'March', kúiėjas 'thresher', rántas 'nitch'.

2. pieštùkas 'pencil, grañdras 'stork', mẽtas 'time', universitẽtas 'university'.

3. kálnas 'mountain', vãkaras 'evening', ẽzaras 'lake', giñtaras 'amber'.

4. viĩkas 'wolf', stìklas 'glas', lẽdas 'ice', vañdas 'name'.

This system of classification is rather elegant in its own right and quite practical. It is used in textbooks, traditional grammars, and diction-aries. In general, it permits one to predict the superficially complicated accentual pattern of an entire paradigm on the basis of just one form and its associated class marker. This is because in all forms of the paradigm the stem is always accented in the same way, and each ending is always accented the same, regardless of the shape of the preceding stem. Thus, the accentual interplay is between the stem and the ending, and to decline a given noun correctly is just a matter of knowing for the combination of a given stem and ending, whether the underlying stem or desinential accent becomes the word accent. And the latter information is provided by the class marker.

The linguistically significant distributional properties which define membership in this taxonomy are as follows.

(40) 1 a. The accent falls on the same mora of the stem throughout the

paradigm; i.e. the ending is never accented.

b. The accent may fall on any mora of the stem except the last.

2 a. The accent is basically on the stem.

b. When the ending is accented, the accent is grave.

c. If the stem is accented, the accent falls on the last mora.

3 a. The accent is basically on the ending.

b. When the stem is accented, the accent falls on the first syllable.

c. The last mora of the stem is never accented. Thus, if an accented

stem of this class is monosyllabic, the accent will be acute.

4 a. The accent is basically on the ending.

b. When the stem is accented, the accent falls on the first

syllable.

c. If the stem is accented, the accent falls on the last mora of

the stem. Thus, stems of this class are monosyllabic.

There are two main reasons why the traditional analysis cannot be

accepted as a plausable linguistic description of accentuation in Lithuanian

nominals. First, if the accentual pattern of a given noun were an arbitrary

feature of each noun, as essentially is claimed by the class markers 1-4,

then there would be no reason to expect generalizations like those in (40) to

be possible. Rather, the existence of such generalizations suggests that the

accentual pattern of a noun is governed by the accentual shape of its con-

stituents and not some arbitrary non-phonetic information. Second, by in-

spection of the paradigms it can be determined that if a noun of class 2 is

accented on the desinence, then a corresponding noun of class 4 will also be;

and likewise, if a class 3 noun is end accented, then the corresponding class

4 noun will be also. It is the lack of explanation for facts such as these

which leads to a rejection of the traditional analysis as being an adequate
description of the structure of the Lithuanian accentual system. For, by
merely arranging the data in such a way that questions about underlying
regularities can be raised (no easy task in itself), the traditional analysis
only goes part of the way towards an adequate description, since it provides
no reasons for why the data should appear in the way they do, rather than in
some other way. Hence, it lacks explanatory power.

3.3 Heeschen's Analysis

An attempt at an explanation of the Lithuanian accent system has been
made by Heeschen (1967). Although I think that this analysis is fundamentally
in error, it is nevertheless interesting in the approach it takes and deserves
to be discussed in some detail.

The analysis basically constitutes an incorporation of the traditional
taxonomy into a generative description, and therefore can be expected to be
subject to some of the same criticisms. In Heeschen's analysis stems are
categorized into four classes in the lexicon, corresponding to the four accent
classes of the traditional taxonomy, by means of two morpheme features, Strong
Susceptible (SS) and Post Stem (PS).

(41)   Class   1   2   3   4

            SS   -   -   +   +

            PS   -   +   -   +

In addition, the nominal endings are classified into two groups by the morpheme
feature Strong.

In this analysis there is no underlying feature of accent. Rather
accent is assigned to the stems and endings by phonological rules operating
on the basis of the lexical specifications for the three morpheme features.
There are four such rules.

(42)   A.   Accent the second mora of stems which are -PS, i.e. classes I

and 3.

B.   Accent the mora immediately following the stem in +PS stems, i.e.

classes 2 and 4.

C.   Retract the accent by one mora.

D.   If the stem is +SS and the ending +Strong, accent the last mora

of the ending.

The forms káimas, rãtas, lángas, and vaĩkas are derived as follows.

	/kaim+as/ -PS -ST -SS	/rat+as/ +PS -ST -SS	/lang+as/ -PS -ST +SS	/vaik+as/ +PS -ST +SS
A.	kaim+as	-------	lang+as	--------
B.	-------	rat+as	-------	vaik+as
C.	kaim+as	rat+as	lang+as	vaik+as
D.	-------	------	-------	-------

In the nom. pl., where the ending is +Strong, the derivations are the same

up to rule D.

C.	kaim+ai	rat+ai	lang+ai	vaik+ai
D.	-------	------	lang+ai	vaik+ai

Cases like the instr. sg., where the even classes are end accented but the

odd ones are not, are treated by marking these endings as exceptions to the

retraction rule C.

B.	kaim+u	rat+u	lang+u	vaik+u
C.	kaim+u	-----	lang+u	------

There are several fundamental criticisms to be made against this

analysis. First, for some reason it was limited to monosyllabic stems. This

limitation distorts, rather than reveals the underlying structure of the

accentual system. For when longer stems are considered, it becomes apparent

that the analysis cannot be extended in any natural way to account for the accentuation of stems in class 1. It will be recalled that these stems can have accent falling on any mora but the last, while Heeschen's analysis predicts that the accent will always fall on the first, which is the case only when the stems are monosyllabic.

Secondly, the analysis fails to show in any natural way why, for example, classes 2 and 4 behave alike in some respects versus 1 and 3, while in others, it is classes 3 and 4 which parallel one another as opposed to 1 and 2. Rather this parallel behavior is in effect taken to be a basic datum that cannot be explained, but is merely described by giving a name to those elements which behave alike, claiming that the parallel behavior is unmotivated and accidental in that there is no reason why some other grouping of the data should not be expected. This of course is the same criticism directed against the traditional analysis, which should not be surprising as the analysis is essentially an incorporation of the traditional description. Of course this is exactly the correct approach to take in cases where the phonetic properties which morphemes have cannot in any reasonable way be shown to be responsible for their behavior in alternations, etc. In such cases the person learning the language must simply memorize and associate an arbitrary marker with the morphemes, since their behavior is not determined by any other phonetic properties the morpheme has. But it has been a fundamental assumption of generative phonology and traditional morphophonemics that much of the phonological behavior of a morpheme is determined by the essentially phonetic character of its underlying form. Hence, if we can show that the accentual behavior of Lithuanian nouns can be explained by natural rules motivated by the underlying phonetic properties of the morphemes, then we have a strong argument against the approach taken in Heeschen's analysis.

There is one more fundamental criticism that can be leveled against the approach adopted in this analysis. Notice that what has been done is to first categorize morphemes by means of morpheme features for the phonological feature of accent, and then to predict the occurrence of this feature by phonological rules which are conditioned by the morpheme features. The error in this approach can perhaps best be seen by comparing it to a parallel example in another area. We have seen that there are essentially four underlying vowel phonemes in Lithuanian, each occurring in long and short pairs. These four phonemes are defined by two basic contrasts: +/- high and +/- back. Following the approach of Heeschen's analysis, we could eliminate specifications for the phonological feature of vowel height and gravity in the underlying representations and predict their occurrence by phonological rules, which would, of course, have to be conditioned by morpheme features, say High and Back. No one, of course, would ever seriously propose such a description, the reason being that it involves a trivial simplification and makes the false claim that the occurrence of vowel quality is predictable in an interesting and linguistically significant way, when in fact it is not. Similarly, Heeschen's analysis appears to claim that stem accentuation is predictable by rule when it actually is not, which is shown by the fact that the properties which trigger the rules "predicting" the stem accentuation are nothing but categorizations of stem accentuation in the first place. Of course these morpheme features do play a role in defining the various accentual patterns. But this only shows that the accentual shape of the stem is involved in a prediction of the patterns, and not that it itself is predictable.

In what follows I will try to show that by considering all stems and not just those which are monosyllabic, and by specifying what is unpredictable in the underlying forms, the structure of the Lithuanian accent system can be

better revealed. More specifically, I shall claim that the accentual shape
of the Lithuanian nominal is governed in a rather natural way by certain
phonological rules operating upon the accentual shape of the underlying stems
and endings.

3.4 Leskien's Law

Before we can turn to a discussion of nominal accentuation, it will
be necessary to say a few words about the nominal desinences. The endings
which appear on the masculine o-stem nouns, with very few exceptions, also
occur in the masculine adjectives, while the feminine a-stem desinences appear
in the declension of the feminine adjectives. Adjectives occur in two forms
in Lithuanian: a short form and a long form, the latter being composed of
the short form plus a pronominal element, which in turn is complex, having as
constituents a root /i-j/, plus the same desinences of the short form. For
example, the following are the declensions for the long and short forms of the
adjective meaning 'good'.

(43)

		Masculine		Feminine	
		short	long	short	long
Sg.					
	N	gễras	geràsis	gerà	geróji
	G	gễro	gễrojo	gerõs	gerõsios
	D	gerám	gerájam	gễrai	gễrajai
	A	gễrą	gễrąjį	gễrą	gễrąją
	I	gerù	gerúoju	gerà	gerą́ja
	L	geramè	gerãjame	gerojè	gerõjoje

DI.

NA	gerù	gerúoju	gerì	geríeji
DL	geríem	geríejiem	geróm	gerójom
I	geriẽm	geríejiem	gerõm	gerõjom

Pl.

N	gerì	geríeji	gẽros	gẽrosios
G	gerũ	gerũjų	gerũ	gerũjų
D	geríems	geríesiems	geróms	gerósioms
A	gerùs	gerúosius	geràs	gerą́sias
I	geraĩs	geraĩsiais	geromìs	gerõsiomis
L	geruosè	geruõsiuose	gerosè	gerõsiose

Observe that in certain cases the ending of the short form, which appears word finally, is reduced in comparison with the same ending in the long form, which is protected from word final position by the pronominal element.

(44)

I sg. masc.	gerù	gerúoju		N sg. fem.	gerà	geróji	
N dl. masc.	gerù	gerúoju		I sg. fem.	gerà	gerą́ja	
N pl. masc.	gerì	geríeji		N dl. fem.	gerì	geríeji	
A pl. masc.	gerùs	gerúosius		A pl. fem.	geràs	gerą́sias	

Here we see that the alternation involves a short vowel or truncated diphthong alternating with the corresponding long vowel or full diphthong. Furthermore, each of these syllables are distinguished from the rest by having acute accentuation. Since long vowels shorten and diphthongs undergo loss of their final components in exactly the same conditions, we are forced to represent long vowels sequentially and shorten them in final position by a rule which will be called Leskien's Law.[4]

(Leskien's Law) $V \longrightarrow \emptyset / \acute{V} \underline{\quad} (s) \#$

Thus, for example, /-ŭos/ --> /-ús/, /-äas/ --> /-ás/, etc., where of course

the grave accent on the shortened acute follows automatically from the mora

representation.

A few more comments about these endings. The nom. sg. fem. is under-

lyingly /-áa/ which undergoes Leskien's Law to /-á/ when in final position,

and is tensed to /-óo/ when not final. Hence, the Tensing rule must be

ordered after Leskien's Law. The ins. sg. and acc. pl. fem. also have the

underlying vocalism /-áa/, but in addition have to be marked as exceptions

to Tensing. The historical explanation for the lack of tensing to o: here

is that these vowels were originally followed by nasals and as we know Tensing

does not apply to the reflexes of formerly nasalized vowels. However, there

is no synchronic evidence within Lithuanian for setting up these endings with

nasals, and i therefore will treat them as simply being exceptions to the

Tensing rule. The locative ending -e is probably from an underlying particle

/-en/, which shows up in the plural adessive (formed from the loc. plus a

postposition): drauguose, drauguosempi.

3.5 de Saussure's Law

In this section I discuss the parallel behavior of the odd and even

numbered accentual classes of the traditional taxonomy. The principles

underlying this parallel behavior are disclosed by consideration of the

following two distributional properties of the accent. First, it will be

recalled, when the stem is accented, the accent is in complementary distri-

bution between the odd and even numbered classes in the following respect.

In the even classes the accent falls on the last mora of the stem, while

in the odd classes it may not. Second, examination of the endings where

classes 2 and 4 are end accented, reveals that they are underlying acutes,

which are shortened to graves word finally by Leskien's Law.

(45)   <u>Masculine</u>

instr. sg.	káimu	ratù	lángu	vaikù	cf.	gerúoju
loc. sg.	káime	ratè	langè	vaikè		
nom. dl.	káimu	ratù	lángu	vaikù		gerúoju
acc. pl.	káimus	ratùs	lángus	vaikùs		gerúosius

<u>Feminine</u>

nom. sg.	várna	rankà	galvà	kalbà	cf.	geróji
instr. sg.	várna	rankà	gálva	kalbà		gerája
nom. dl.	várni	rankì	gálvi	kalbì		geríeji
acc. pl.	várnas	rankàs	gálvas	kalbàs		gerásias

Putting together these facts about the accentuation of the stems and endings suggests the following analysis. All the stems are accented in the underlying form as they appear on the surface in those cases like the vocative, where the stem accent is the word accent. Furthermore, these endings are analyzed as underlying acutes, which are shortened word finally by Leskien's Law. Finally, the "attraction" of the ictus to the endings is governed by the following rule.[5]

(de Saussure's Law) $\overset{+}{M} \longrightarrow M \; / \; \underline{\hspace{1cm}} \overset{+}{M}$

That is, a dissimilation rule according to which the first of two contiguosly high-pitched morae becomes non-high-pitched. Thus, for example, <u>káimu</u>, <u>ratù</u>, <u>lángu</u>, and <u>vaikù</u> are derived as follows.

	/káim+úo#/	/rát+úo#/	/láng+úo#/	/váik+úo#/
de Saussure's Law	--------	rat+úo#	--------	vaik+úo#
Leskien's Law	káim+ú#	rat+ú#	láng+ú#	vaik+ú#

In order to account for the stem accentuation in the odd numbered forms here it is necessary to formulate another rule, which, following Coats (1970), I will call Accent Adjustment. This rule will delete high pitch from all but

the first accented mora of a word and will have to be ordered after de
Saussure's Law and Leskien's Law.

(Accent Adjustment) $\overset{+}{M}_1 \longrightarrow M \; / \; \# \; X \; \overset{+}{M} \; \underline{\quad} \; \#$ (where X does not contain $\overset{+}{M}$)

This rule then yields final derived: /kaĩmu/, /ratũ/, /lãngu/, and /vaikũ/.

Notice that instead of having to treat this attraction of the ictus
to the desinences in these cases as exceptional (as in Heeschen's analysis),
this superficial complexity of the accent system can be attributed to the
operation of a quite characteristic property of human language, dissimilation
of contiguous high pitches. What makes Heeschen's treatment even more im-
plausable is that de Saussure's Law also operates in verbs. In fact, with
the exception of the dative dual and plural desinences, I know of no cases in
which an underlying acute which is conjoined to a preceding grave or circum-
flex syllable fails to dissimilate the preceding accent. Hence there is nothing
really exceptional about such attraction of the accent at all, as Heeschen's
treatment would have us believe.

Notice that in addition the rule of de Saussure's Law also strongly
corroborates our initial hypothesis that the mora notation is required for
the representation of accent in Lithuanian. Originally, such a proposal was
based on purely distributional factors such as the fact that contour accents
only occurred on long syllables and non-contour accents only on short syllables.
Here we see that by employing the mora notation we can attribute the parallel
behavior of classes 2 and 4 versus 1 and 3 to the characteristic phenomenon
of dissimilation.

Hence we can now reduce the number of accent classes in the traditional
taxonomy by two. Instead of four classes we now have two plus a general
phonological rule: the immobiles (1 and 2), where the accent is basically on
the stem; and the mobiles (3 and 4), where the accent alternates between the

the initial and final positions in the word.

Before proceeding further with the description, let us note a couple

of difficulties. First, we must still account for the desinential accent

in the class 3 forms in the nom. sg. fem. galvà and the loc. sg. masc.

langè. This problem will be discussed in the next section. Second, there

is the fact that, although superficially acute, the dative dual and plural

endings still fail to attract the accent from a preceding class 2 stem:

rãtam, rãtams, rañkom, rañkoms. Note that in the feminine these endings

are peculiar in another respect, in that we have a reflex of a long vowel--

the o: --followed by a resonant in a closed syllable, and hence contrary to

Osthoff's Law. The historical explanation for these forms is that originally

the ending was of the shape /-Vmus/, probably with accent on the u. This

vowel was lost for some reason and the preceding syllable became acute and

failed to shorten by Osthoff's Law. Since I know of no independent evidence

for setting up an underlying shape /-Vmus/, I will simply mark these endings

as exceptions to the environment of de Saussure's Law.

3.6 The Mobile - Immobile Contrast

On the basis of de Saussure's Law we have reduced the number of

accent classes in the traditional taxonomy to two. It is now necessary to

inquire whether the accentual behavior of the mobiles versus the immobiles

is just an arbitrary property of each stem which must be memorized ad hoc for

each stem when learning the language, or whether the accentual behavior

follows from some independent phonological properties of the two classes of

stems. We recall that the immobiles have the property that the accent can

fall on any mora and hence any syllable of the stem, while the accent is

limited to the initial syllable of the stem in the mobile class. This

immediately suggests the following explanation for the difference in mobility.
Since in the immobile class the accent can fall on any mora of the stem, it
is necessary to include this information in the lexical representations of
these morphemes. On the other hand, the mobiles can be treated as being
basically unaccented stems, since when their stems are accented, the accent
predictably falls on the first syllable. Hence, to account for the mobility
of classes 3 and 4 versus 1 and 2 we just have to say that certain desinences
are accented and certain others accentless. When a mobile (accentless) stem
is combined with an accented desinence, the desinential accent becomes the
word accent. When such an accented desinence is combined with an immobile
(accented) stem, the rule of Accent Adjustment will apply to make the stem
accent the word accent. Finally, when an unaccented stem is combined with an
unaccented ending, we will have a rule of Accent Insertion which will insert
accent on the initial syllable of an accentless word.

This, I claim, is the basis for the mobility versus immobility of
accent in Lithuanian. Of course, such an analysis should not be too sur-
prising, as it is essentially what underlies the mobility of accent in
Slavic.[6] Furthermore, such a contrast between accented and unaccented stems/
morphemes is quite typical, being found in languages as diverse as Japanese
and Cupan.[7]

Hence, if this treatment can be made to work, we will have reduced
the number of accent classes in the traditional taxonomy to null and will be
able to explain the accentual behavior of the four types of stems quite
straightforwardly in terms of two underlying accentual contrasts in the shapes
of the stems, and several quite natural phonological rules. That is, there
will be a contrast between accented and unaccented stems and the rules of
Accent Insertion and Accent Adjustment, which will explain the Mobile -
Immobile contrast; and second, the contrast between accent on the final

versus non-final mora of the stem and the rule of de Saussure's Law.

However, despite the naturalness and inherent elegance of such an analysis, there are several difficulties in making it viable for Lithuanian. Essentially, these difficulties center around the representation of accent in terms of which the mobile – immobile contrast is to be treated. For purposes of discussion, I will delimit the types of accent that can be found in the initial syllable of mobile nouns in the following array.

(46) A. acute diphthongs: pìlnas 'full', dáigas 'germ'.

B. circumflex diphthongs: vi͂lkas 'wolf', vai͂kas 'child'.

C. long acute vowels: tévas 'father', óras 'weather'.

D. (underlying) short circumflex and grave vowels: le͂das 'ice', nãmas 'house', stìklas 'glass'.

E. long circumflex vowels: jėgà (je͂gą) 'strength', kovà (ko͂vą) 'battle'.

On the basis of these data it would appear that we cannot predict what sort of accent (rising or falling) a syllable will have and hence would be forced to mark these forms for accent in the underlying representation. But in order for the explanation of mobility of these forms in terms of accentless stems to go through, it would appear that we must consider their accent to be inserted and hence predictable by a rule.

At this point I think it would be useful to say something about the historical antecedents of the present Lithuanian accents. Originally, the Lithuanian acute can be seen quite clearly to be the descendent of accent on a long vowel, and the circumflex and grave to be reflexes of accent on short vowels. However, later sound changes and derivational, processes have obscured this. Thus, pìlnas originally contained a long vowel which became shortened by Osthoff's Law and hence fell together in length with vi͂lkas,

the accent being the superficial differentiating factor. Likewise, the a̲
of dáigas is the reflex of a long vowel which became shortened by Vowel
Truncation and hence assumed the same surface length as a form like vaĩkas.
Similarly, the difference between the C and D forms was and, given our
analysis, still is the fact that the C forms like tévas contain underlying
long vowels, while the D forms like lẽdas have basic short vowels which
are lengthened secondarily. Finally, in the present-day language one does
find a great number of forms with circumflex accent and reflexes of under-
lying long vowels. However, historically at least, most of these forms are
derived: for example, sèkmẽ (sẽkmę) 'consequence' from sèkti 'follow';
sėjà (sė̃ję) 'planting time' from sė́ti 'sow'; kovà (kõvę) from káuti 'beat'.

At least historically then, the contrast of rising and falling was
predictable in terms of an underlying length contrast. For purposes of the
following discussion I will assume that such a prediction is also possible
synchronically. Thus, I will assume that the underlying representation for
pìlnas is /pi:ln-/, for viĩkas is /vilk-/, for dáigas is /da:ig-/, and for
vaĩkas is /vaik-/. In addition, of course, we are assuming that tévas and
óras contain underlying long vowels contrasting with forms like lẽdas and
nãmas which contain underlying short vowels lengthened by the rule of
Secondary Lengthening. Finally, I will assume the long vowels and circum-
flex accent in forms such as those in E can be predicted from the derivational
pattern. (As the analysis develops we shall see that these assumptions do
not necessarily have to be made in order for the distinction between mobile
and immobile paradigms to be explained in a satisfactory way.)

Now having made this assumption about an underlying length contrast,
let us see how the accent insertion rule for the mobile stems is to be
formulated. It will immediately be noticed that the relevant generalization

is to place accent on the initial _syllable_ or vowel of the word and not to assign the accent directly in terms of morae. Thus, given /pi:ln/ and vilk-/ if we were to assign the accent in terms of morae, in order to get accent on the initial mora of the former and on the final of the latter we would need rules of assignment like the following: "in an unaccented word, assign accent to the initial mora of the first syllable if the first syllable contains a long vowel; but if the initial syllable contains a short vowel, assign accent to the final mora of the initial syllable." Notice first that each rule of assignment depends crucially on the notion syllable and secondly that the relevant generalization is that accent is limited to the first syllable. Hence, this strongly suggests that at this level of analysis, where the distinction between the mobile and immobile stems is to be made, the accentual unit is the syllable and not the mora.[8] In addition, it suggests that what gets inserted here and called accent is really stress and not high pitch. (As will be shown below, the assumption that the mobile - immobile distinction is defined in terms of stress enables one to give a plausable account of the accentuation in forms like _galvà_ and _langè._)

Hence, I will assume that the contrast between the mobile and immobile stem types is defined in terms of the feature stress. Immobile stems will now be analyzed as being stressed in underlying representations and mobiles will be stressless. When the latter are combined with a stressless ending, a rule of Stress Assignment will apply to insert stress on the initial syllable of stressless words. Thus I am assuming that at the deepest level of analysis we have two prosodic features in Lithuanian -- length and stress -- and that the superficial features of rising and falling tones are derived by phonological rules which operate in terms of these two basic underlying features of length and stress. It is to a discussion of these rules that we now must turn.

At this point essentially two different approaches are available for converting the features of length and stress into a system with rising and falling tones. I will sketch first an approach which I proposed in an earlier version of this thesis and which I now think to be, if not inadequate, at least questionable.

According to this approach, after the stress has been assigned by the Stress Insertion rule, it is necessary to convert into a mora representation before the rules of Vowel Truncation, Osthoff's Law, Secondary Lengthening, etc. neutralize the underlying length contrasts in terms of which the rising and falling tones are to be predicted. Given a form like /pí:ln+as/ and a form like /vílk+as/ (we use the symbol x to designate stress, retaining ±
for high pitch), what we require is a rule to place high pitch on the initial mora of the first syllable of the former and on the final mora of the initial syllable of the latter. A similar treatment is required for /ka:im+as/, /da:ig+as/, /vaik+as/, and /rat+as/. This can be done by a rule of the following form, which I will call Mora Assignment.

(Mora Assignment) Place high pitch on the first mora of a stressed syllable containing a long vowel, and on the last mora of a syllable containing a short vowel.

Thus, at this point the grammar converts from a syllable to a mora representation.

(47) $\overset{x}{pi}$:ln+as   ---> $\overset{+}{pi}$jln+as

$\overset{x}{vi}$lk+as   ---> $vi\overset{+}{l}k+as$

$\overset{x}{ka}$:im+as   ---> $ka\overset{+}{a}im+as$

$\overset{x}{da}$:ig+as   ---> $da\overset{+}{a}ig+as$

$\overset{x}{va}$ik+as   ---> $va\overset{+}{i}k+as$

$\overset{x}{ra}$t+as   ---> $ra\overset{+}{t}+as$

But now a problem arises with the interaction of this treatment of accent

with the rules of Vowel Truncation, and Osthoff's Law. For given /káaim+as/,
Vowel Truncation, which was formulated to delete the first of three con-
secutive vowels, would apply to delete the initial vowel giving /kaim+as/
with loss of all accentual information. Similarly, Osthoff's Law was
originally formulated to delete the second component of a long vowel in the
environment ___ R C; but it could just as easily have been formulated to
truncate the initial mora. But such a formulation would have taken /píiln+as/
to /piln+as/, again with loss of accent. However notice that in both cases
when the length of the syllable is changed, the underlying opposition between
acute and circumflex is still maintained. This retention of the accent is
reminiscent of the problem of /bréns+ti/ ---> /breés+ti/, touched upon, but
never solved, in the first chapter.

In order to handle this problem I introduced a convention which I
called Accent Copy. This convention applied after each phonological rule
affecting the length of a syllable. According to this convention, if the
accent fell on the initial mora of a syllable prior to a rule having an
effect on the length of a syllable, then this convention copied the accent
onto the initial mora of the same syllable after the rule affecting the
length. And similarly if the accent fell on the final mora of a syllable
whose length was altered by some phonological rule, then the convention copied
the accent onto the final mora. Hence, the opposition between accent on the
initial and final mora of a syllable was retained. Thus we would have deriva-
tions like the following.

	/káaim+as/	/píiln+as/	/bréns+ti/
Vowel Truncation	kaim+as	--------	--------
Accent Copy	káim+as	--------	--------
Osthoff's Law	-------	piln+as	--------

Accent Copy	-------	pı́ln+as	--------
Nasal Elision	-------	-------	bres+ti
Compen. Length.	-------	-------	brees+ti
Accent Copy	-------	-------	breés+ti

In addition this convention will have no effect on syllables undergoing

Leskien's Law shortening, since both before and after the shortening the accent

remains on the initial mora of the syllable. Finally, if we adopt a suggestion

of McCawley's,[9] and assume that accent is placed on morae boundaries, rather

than directly on the morae themselves, it is possible to explain why forms

like rãtas with a short underlying vowel get a circumflex rather than, say,

an acute accent when they are lengthened. This would be because the rule

of mora assignment would have put the accent on the rightmost mora boundary

in the initial syllable of ratas. Thus, using an asterisk to represent mora

boundaries, this form would receive the following representation as a result

of mora assignment: $/r_*a\overset{+}{*}t_*a_*s/$. When such a form undergoes Secondary

Lengthening, Accent Copy will preserve the accent on the final mora of the

syllable, thus guaranteeing a rising accent.

These then were the basic features of my original proposal for handling

the problem of the preservation of the accent in Lithuanian. However, recent

work by Morris Halle on Slovene accent suggests an alternative solution

to our problem.[10] Like Lithuanian, Slovene also has a contrast between rising

and falling accents on long syllables. Halle proposes to treat the falling

tone of Slovene as the phonetic reflex of stress on a high-pitched vowel and

rising tone as the reflex of stress on a low pitched vowel. Now if we adopt

the same interpretation for the rising and falling accents of Lithuanian,

another solution to the problem of the preservation of the accent presents

itself.

After the Stress Insertion rule and before the rules which neutralize

the underlying length contrasts, we will insert the following rule of Tone

Assignment into the grammar, which will associate high pitch with a stressed

long vowel and low pitch with a stressed short vowel.

(Tone Assignment)   + syll.
                       + stress ---→ α high pitch
                       α long $-\alpha$ low pitch

Such a rule then gives derivations like the following (where $\underline{H}$ = high pitch,

$\underline{L}$ = low pitch, and $\underline{x}$ = stress).

(48)   pí:ln+as   ---→   pí:ln+as

                       vilk+as   ---→   vílk+as

                       ká:im+as   ---→   ká:im+as

                       vaik+as   ---→   vaik+as

                       rát+as   ---→   rát+as

Now when such forms undergo the various shortening rules, they will still

retain the specification for high pitch, and hence, when combined with stress,

will come out falling under our new interpretation. Thus, after Vowel

Truncation and Osthoff's Law káimas and pìlnas will be represented as

/káim+as and /pìln+as/, while vaĩkas and vilkas will be /vaik+as/ /vilk+as/.

Similarly, this treatment allows a straightforward explanation for the

preservation of accent in Nasal Elision: /bréns+ti/ ---→ /brées+ti/.

Superficially it may appear that there is not much to choose between

these two possible solutions to the problem. However, I think deeper con-

siderations show the second to be preferred. First, it permits the solution

of the problem of accent retention in a fairly straightforward way without

appeal to an essentially new and powerful device like Accent Copy. Hence the

second solution limits the number of possible analyses that might be given. The

first solution would be preferred here only if it turns out to be the case

that such a convention as Accent Copy is needed for other languages, which could not be treated under the second proposal.

Secondly, the second proposal permits a much more natural explanation for why secondarily lengthened vowels in forms like lĕdas and rãtas show up with a circumflex or rising tone rather than a falling tone. Rather than having to appeal to the questionable notion of accent on mora boundaries, the reason that the root vowels in these forms receive a rising tone is that they are underlyingly short vowels and hence are assigned a low tone by the Tone Assignment rule. When these vowels are lengthened by Secondary Lengthening, the rising contour then shows up, since, by hypothesis, under the second proposal rising tone is interpreted as stress on a low toned vowel.

However, despite its appeal, there are certain, perhaps minor, problems of phonetic detail with this proposal. Note that we will have assigned a shortened acute such as the nom. dual form rankì from /rank+ʲe/ a high tone, while the grave accent of stìklas originates from a low tone. However, to my ears both of these accented syllables seem to have the same pitch value, which sounds like a simple high pitch accompanied by stress. Presumably this problem can be solved by claiming that the tone distinctions are neutralized not only in unstressed syllables, but also in short syllables. This then would involve saying that the accented syllables in forms like stìklas, rankì, rankà, etc. are merely stressed with no accompaning pitch assignments. This interpretation of the grave accent, i.e. as merely designating stress, accords with the traditional description, but clearly more precise phonetic investigations would be required in order to corroborate it. Provisionally, then, I will assume a rule of Neutralization, which levels out tone distinctions in unstressed and in short syllables.

(Neutralization)
$$\begin{matrix} V \\ - \text{ stress} \\ \\ V \\ - \text{ long} \end{matrix} \quad \text{---}> \quad \begin{matrix} - \text{ high tone} \\ - \text{ low tone} \end{matrix}$$

Finally, if we are to maintain the second proposal we will require a different formulation of de Saussure's Law, which previously was treated in terms of morae. In order to account for the movement of stress from a circumflex or grave to a following acute, we require a rule of the following form.

(de Saussure's Law)
$$\begin{matrix} + \text{ syllabic} \\ + \text{ stress} \\ + \text{ low tone} \end{matrix} \quad C_1 \quad \begin{matrix} + \text{ syllabic} \\ + \text{ high tone} \end{matrix}$$

$$\begin{matrix} 1 & 2 & 3 & \text{----}> \\ \\ 1 & 2 & 3 \\ - \text{ stress} & & + \text{ stress} \end{matrix}$$

Although perhaps not as elegant as the "dissimilation" treatment in terms of morae, this formulation still does have a certain intuitive phonetic appeal, since it involves the transfer of stress from a rising syllable to a following falling one. That is, the stress slides over the crest created by the abutting rising and falling tones.

To sum up this section then, we have formulated the following set of ordered accentual rules for Lithuanian.

(49)   Stress Insertion: $V \text{---}> \acute{V} / \# C_0 \underline{\quad} [- \text{ stress}]_0 \#$

Tone Assignment: $\begin{matrix} \acute{V} \\ \alpha \text{ long} \end{matrix} \text{---}> \begin{matrix} \alpha H \\ -\alpha L \end{matrix}$ (H = high tone, L = low tone)

de Saussure's Law: $\begin{matrix} \acute{V} \\ + L \end{matrix} \ C_1 \ \begin{matrix} V \\ + H \end{matrix} \text{---}> \begin{matrix} V \\ + L \end{matrix} \ C_1 \ \begin{matrix} \overset{x}{V} \\ + H \end{matrix}$

Stress Adjustment: $[+ \text{ segment}]_1 \text{----} - \text{ stress} / \# X [\pm \text{ stress}] \underline{\quad} \#$

(where X contains no [+ stress])

Neutralization:
$$\begin{matrix} V \\ - \text{ stress} \\ \\ V \\ - \text{ long} \end{matrix} \text{----}> \begin{matrix} -H \\ \\ -L \end{matrix}$$

Before demonstrating how these rules work in derivations we must consider the treatment of accent in the desinences.

3.7 Accentuation in the Desinences

In the previous section we saw that in general it was possible to predict the three different kinds of surface accent in Lithuanian stems in terms of the underlying length of the syllable. In this section we will see that, although the distribution of tone and stress in the nominal desinences is by no means random, the assignment of these features is essentially independent of length.

As far as their accentual properties are concerned, the nominal endings fall into three major groups. First, there are desinences which are basically stressless and toneless. In the masculine o-stem declension these are the nom., gen., dat., acc., and voc. singular. In the feminine a-stems they are the dat., acc., and voc. singular and the nom. and voc. plural.

Second, there are endings which have an underlying acute or high tone, but are basically stressless, i.e. they do not take the stress in the mobile paradigms, and hence permit the rule of Stress Insertion to apply. (Of course superficially they may end up with the word stress via de Saussure's Law if the preceding stem has a low tone on its final syllable.) In the masc. o-stem declension these endings are the instr. sg. (ratù, cf. gerúoju), nom. dual (ratù, cf. gerúoju), and the acc. pl. (ratùs, cf. gerúosius). For the fem. a-stems the cases are the same: instr. sg. (rankà, cf. gerája), nom. dual (rankì, cf. geríeji), and acc. pl. (rankàs, cf. gerásias). Since the case endings of this second group are exactly the same for both declensions, we can consider the high tone on these desinences to be assigned by a rule.

Finally, there are the stressed desinences, i.e. those that take
the stress in the mobile paradigms and hence block the rule of Stress
Insertion. As far as the tonal properties of these desinences are concerned,
let us first observe that the distribution of the tones in this class of
desinences is not arbitrary. Most of the endings in this group have an
underlying low tone (which shows up as surface circumflex or grave) on the
last vowel of the desinence: e.g. in the masc. pl. we have nom. tèvaĩ,
gen. tèvũ, instr. tèvaĩs, loc. tèvuosè; and in the fem. gen. sg. galvõs,
loc. sg. galvojè, gen. pl. galvũ, instr. pl. galvomìs, and loc. pl. galvosè.
This leads one to believe that there is a principle of tone assignment which
says: "place low tone on the last vowel of the stressed desinences." One's
belief in the existence of such a principle is further strengthened by
facts like the following. Many of the desinences are not atomic wholes,
but rather seem to be composed of subparts, where the constituent structure
is something like theme vowel plus other material, which itself may be com-
plex. When these desinences occur in the long form adjectives, the pronominal
element which is characteristic of the latter is sometimes inserted between
the theme vowel and part of the remaining material composing the desinence.
Thus we find pairs like the following in the instr. pl. feminine short and
long form adjectives: geromìs and gerosiõmis. The short form adjective
has the structure /root + theme + -mis- s/, where the mi appears to be some
sort of infix. Similarly in the long form adjective we have a constituent
structure of the following form /root + theme + s/ + / root + theme + -mi- s/.
Now what is important in the present instance is that when the element mi
is absent from the desinence of the short form constituent of the long form
adjective, the long theme vowel (from underlying a:) shows up as circumflex
rather than acute as might be expected if the underlying length of a vowel
were the determinant of the tone, as it seems to be in the non-derived

nominal stems. However, the rising accent on this vowel does agree with the principle of low tone on the last vowel of a stressed desinence.

There are only a few cases which are exceptions to this principle of low tone on the last vowel of a stressed desinence. One systematic exception is the dative case: e.g. feminine dual galvóm and plural galvóms (cf. geróm, gerójom and geróms, gerósioms), and masculine dual and plural langám, langáms (cf. geríem, geríejiem and geríems, geríesiems). Thus in the dative we systematically find an acute accent, which it will be recalled was exceptional in not attracting the accent via de Saussure's Law (rañkom, rañkoms, rãtam, rãtams). Given the regularity of the association of acute accent and the dative case, this suggests that there is another special rule which assigns high tone to the stressed dative desinences. Furthermore, if this rule is ordered after de Saussure's Law we no longer have to mark these desinences as exceptions to the rule.

The other exception to the generalization that stressed desinences take a low pitch is the nom. sg. fem.: e.g. galvà (cf. geróji). Here the accent must be acute or high tone. I consider this a true exception and hence will enter this desinence in the lexicon as idiosyncratically specified for high tone.

Finally it must be mentioned that the distribution of the feature stress in the desinences is not random, but rather seems to be principled in nature. First, we observe that in the masculine o-stems all of the desinences in the singular are unstressed except for the locative: langè, vaikè, etc. However, as was mentioned earlier this è derives from an under-lying particle en, which shows up in the so-called adessive case, which is formed from the locative by the addition of the postposition pi: cf. dienosempi via Nasal Assimilation. Hence this particle may be considered as

being outside the case ending system and given a separate lexical representation in which it is stressed.[11] This permits the generalization that all masculine singular desinences are stressless, which of course corresponds to the situation in Slavic. The basic pattern for all declensions in the plural is stressed desinences in the oblique cases and stressless desinences in the nominative and accusative. The masculine o-stem desinence -aĩ is an exception here: langaĩ, vaikaĩ, etc. However, it is worthwhile to note that this ending is not original but seems to have been remade. The original ending was -oi which shows up as ie in present-day Lithuanian in the masculine adjectives: gerì - geríeji. Hence ignoring the masculine nom. pl., we can make the generalization that the oblique plural is associated with stressed desinences, while the nom. and acc. are basically stem stressed. This also corresponds to the situation in Slavic. Finally, in the singular of the feminine a-stems the nom., gen., and loc. are end stressed, while the dat., acc., and instr., have basically stressless desinences. In Slavic the basic pattern seems to have been end stressed except for the accusative. In the plural the feminines follow the basic pattern of stem stress in the nominative and accusative and end stress in the oblique.

Hence it would appear that the basic underlying pattern in the distribution of stress in the desinences is one of an opposition between the masculine (stem stressed) and feminine (end stressed) in the singular and a neutralization of this opposition in the plural where the basic pattern is end stressed in the oblique and stem stressed in the nominative and accusative. Since I feel that these are true and interesting generalizations, they must be expressed somehow in the description. Towards this end I will say that there is a general rule of stress assignment which stresses the desinences of the feminine singular and the oblique plural. After this rule has applied

there will be special rules which destress the dative, accusative, and instrumental feminine singular and stress the desinence of the nominative plural masculine o-stems.

Hence, to summarize this section, we have seen that although the distribution of accent in the desinences is not predictable from underlying length contrasts, it is still not random, but rather exhibits certain regularities, which not too surprisingly seem to be governed by the syntactic catagory of case. These regularities are expressed by a series of Stress Assignment rules followed by a series of Tone Assignment rules, which are repeated below.

(50)   Stress Assignment Rules

1. stress the desinence of the feminine singular and the oblique plural.

2. destress the desinences in the dative, accusative, and instrumental singular feminine.

3. stress the nominative plural o-stem masculine desinence.

Tone Assignment Rules

1. assign high tone (acute) to the instrumental singular, nominative dual, and accusative plural masculine o-stem and feminine a-stem desinences.

2. assign low tone to the last vowel of the stressed desinences except for the nominative singular feminine.

3. assign high tone to the stressed dative case desinences.

3.8   Sample Derivations and Concluding Remarks on Accent

I shall begin this section with sample derivations from each of the three kinds of cases discussed in the previous section (stressless and toneless, stressless and high toned, and stressed desinences) in order to illustrate how the rules of accent which I have developed apply. To save space it will be assumed that the rules of Stress and Tone Assignment for the

desinences have already applied.

(51)   Nominative Masculine Singular

	/kă:im+as/	/răt+as/	/la:ng+as/	/vaik+as/
Stress Insertion	--------	------	lá:ng+as	vaik+as
Tone Assignment	kă:im+as — H	răt+as — L	lă:ng+as — H	vaik+as — L
Vowel Truncation	kăim+as — H	------	--------	-------
Osthoff's Law	-------	------	lăng+as — H	-------
Secondary Length.	kă:im+as — H	ră:t+as — L	lă:ng+as — H	-------12

(52)   Instrumental Singular Feminine

	/vă:rn+a:#/ H	/rănk+a:#/ H	/ga:lv+a:#/ H	/kalb+a:#/ H
Stress Insertion	----------	--------	gă:lv+a:# — H	kălb+a:# — H
Tone Assignment	vă:rn+a:# — H H	rănk+a:# — L H	gă:lv+a:# — H H	kălb+a:# — L H
Osthoff's Law	vărn+a:# — H H	------	gălv+a:# — H H	------
de Saussure's Law	------	rank+ă:# — L H	------	kalb+ă:# — L H
Leskien's Law	vărn+a# — H H	rank+ă# — L H	gălv+a# — H H	kalb+ă# — L H
Secondary Length.	vă:rn+a# — H H	------	gă:lv+a# — H H	------
Neutralization	vă:rn+a# — H	rank+ă#	gă:lv+a# — H	kalb+ă#

(53)   Genitive Singular Feminine

	/vă:rn+ă:s/ L	/rănk+ă:s/ L	/ga:lv+ă:s/ L	/kalb+ă:s/ L
Stress Insertion	----------	--------	---------	--------

	/ṽa:rn+ǎ:s/	/r̃ank+ǎ:s/	/ga:lv+ǎ:s/	/kalb+ǎ:s/
Tone Assignment	va:rn+a:s H L	rank+a:s L L	--------	--------
Osthoff's Law	varn+a:s H L	--------	galv+a:s L	--------
de Saussure's Law	--------	--------	--------	--------
Leskien's Law	--------	--------	--------	--------
Tensing	varn+o:s H L	rank+o:s H L	galv+o:s L	kalb+o:s L
Stress Adjust.	varn+o:s H L	rank+o:s L L	--------	--------
Secondary Length.	va:rn+o:s H L	--------	--------	--------
Neutralization	va:rn+o:s H	rank+o:s L	--------	--------

(54)   Nominative Singular Feminine

	/va:rn+a:#/ H	/rank+a:#/ H	/ga:lv+a:#/ H	/kalb+a:#/ H
Stress Insertion	--------	--------	--------	--------
Tone Assignment	va:rn+a:# H H	rank+a:# L H	--------	--------
Osthoff's Law	varn+a:# H H	--------	galv+a:# H	--------
de Saussure's Law	--------	rank+a:# L H	--------	--------
Leskien's Law	varn+a# H H	rank+a# L H	galv+a# H	kalb+a# H
Stress Adjust.	varn+a# H H	--------	--------	--------
Secondary Length.	va:rn+a# H H	--------	--------	--------
Neutralization	va:rn+a# H	rank+a#	galv+a#	kalb+a#

To sum up then we see that it is indeed possible to reduce the number

of accent classes in the traditional taxonomy to null and to define the

accentual behavior of the various classes of nominals in terms of the
underlying accentual properties of their constituent stems and desinences.
The distinction between the mobiles and immobiles is based on the rules of
Stress Insertion and Stress Adjustment and the contrast between underlying
stressed and stressless stems and desinences. The distinction between the
odd and even numbered classes in the traditional taxonomy is defined in
terms of the rule of de Saussure's Law and the underlying contrast between
high and low pitch stem final syllables and high and low pitched desinences.

Finally, it must be pointed out that the distinction between the
mobile and immobile classes, since it is defined in terms of stress, is
essentially independent of the assumption that the tones are predictable
in terms of an underlying length contrast. Thus, we can easily dispense
with the underlying length contrast in diphthongs (pi:ln- versus vilk-)
and distinguish these stems in terms of an underlying tonal contrast as
p$_H$iln- and v$_L$ilk-. Since these latter stems have no underlying stress, we
are still able to characterize the difference between the mobile and
immobile classes in terms of stressed and stressless stems. Note that such
an option is not available in a description which operates in terms of a
single underlying feature of "accent" which comes out as stress plus
high pitch phonetically. It is this latter drawback which, it seems to me,
argues strongly in favor of the second interpretation of the Lithuanian
accents in terms of high and low pitch plus stress, over the initial inter-
pretation in terms of high pitched morae. Obviously the validity of this
second interpretation depends crucially on the phonetic plausability of
considering a falling contour as stress on a high pitched vowel and rising
as stress on a low pitched vowel. At the moment I am unable to make a
judgment on this matter.

Footnotes

[1] For a discussion of the concept "mora" from the standpoint of generative phonology, see McCawley (1968).

[2] For an interesting discussion of the accentual development of Lithuanian, see Darden (1968).

[3] See, for example, Senn (1966).

[4] This rule is a synchronic reflex of a sound change known as Leskien's Law. See Leskien (1881).

[5] This rule is a synchronic reflex of another sound change known as de Saussure's Law. See de Saussure (1896).

[6] See Coats (1970) and Stang (1965).

[7] See McCawley (1968) and Hill (1968).

[8] Of course one can make a distinction between an accentual unit as a bearer of accent and a measure of accentual distance. Thus it might be said that at this point in the grammar Lithuanian is a "syllable counting mora language," where the measure of distance is the syllable and the accentual bearer is the mora. However, as will be demonstrated momentarily there are other problems encountered in operating with morae here, which indicate that at this point in the grammar at least the mora is not the accentual unit. For a discussion of the distinction between the mora and the syllable as bearers of accent and measures of distance, see McCawley (1968).

[9] See McCawley (1968).

[10] See Halle (1970).

[11] Furthermore, since it is being considered as a morpheme outside of the case system, we can assign this particle a representation with a long stressed vowel /é:n/ which will get a high tone by the Tone Assignment rule. Of course we now need to make use of the minor rule eliding the word final nasal and compensatorily lengthening the preceding vowel. If this rule is ordered before Leskien's Law, then the derived long acute vowel can be shortened by the latter rule.

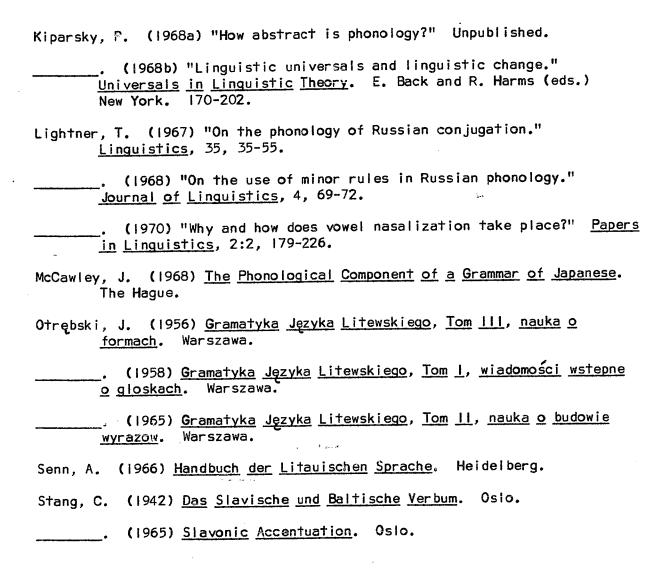[12] We must block Secondary Lengthening here. This rule was originally formulated to lengthen accented non-high vowels, where accent was conceived of as high pitch on morae. We now want the conditioning factor to be stress and must furthermore prevent the rule from applying to the low vowel component of rising (low toned) diphthongs such as vaikas or antis, but permit the rule to apply to the low vowel components of the falling diphthongs: kaimas, langas, etc. This can be accomplished by reformulating Secondary Lengthening as follows.

$$
\begin{bmatrix} + \text{ syllabic} \\ + \text{ stress} \\ - \text{ high} \\ \langle + H \rangle \end{bmatrix} \longrightarrow + \text{ long} \ / \ \underline{\hspace{1cm}} \begin{bmatrix} - \text{ sonorant} \\ \langle + \text{ sonorant} \rangle \end{bmatrix}_1 \ V
$$

REFERENCES

Anderson, S. (1969) West Scandinavian Vowel Systems and the Ordering of Phonological Rules. Unpublished MIT Ph.D. thesis.

Bach, E. (1968) "Two proposals concerning the simplicity metric in phonology." Glossa, 2:2, 128-149.

Bailey, C. J. (1968) "The major class features 'sonorant' and 'vocalic' and the problem of syllabicity in generative grammar." PEGS.

Balčikonis, J. (1954) Dabartinės Lietuviu Kalbos Žodynas. Vilnius.

Chomsky, N. and M. Halle (1968) The Sound Pattern of English. New York.

Coats, H. (1970) Word Stress Assignment in a Generative Grammar of Russian. Unpublished University of Illinois Ph.D. thesis.

Darden, B. (1968) "Rule orderings in Baltic and Slavic nominal accentuation." Unpublished.

de Saussure, F. (1896) "Accentuation lituanienne." Anzeiger fur Indogermanische Sprache und Altertumkunde, 6, 157-166.

Halle, M. (1963) "O pravilax russkogo sprjazenija." American Contributions to the Fifth International Congress of Slavists, 113-132.

_____. (1965) "A survey of Latvian morphophonemics." QPR, 83, 105-113.

_____. (1970) "Remarks on Slavic accentology." Unpublished.

Heeschen, C. (1967) "Lithuanian morphophonemics." QPR, 85, 284-296.

Hill, J. and K. Hill (1968) "Stress in the Cupan (Uto-Aztecan) languages." IJAL, 34, 233-241.

Jakobson, R. (1948) "Russian conjugation." Word, 4, 155-167.

Kenstowicz, M. (1970a) "The Lithuanian third person future." Studies Presented to Robert B. Lees by his Students. J. Sadock and A. Vanek, (eds.). (Linguistic Research Inc.). Edmonton, Champaign. 95-108.

_____. (1970b) "On the notation of vowel length in Lithuanian." To appear in Papers in Linguistics, 3:1.

Kiparsky, P. (1968a) "How abstract is phonology?" Unpublished.

_____. (1968b) "Linguistic universals and linguistic change." Universals in Linguistic Theory. E. Back and R. Harms (eds.) New York. 170-202.

Lightner, T. (1967) "On the phonology of Russian conjugation." Linguistics, 35, 35-55.

_____. (1968) "On the use of minor rules in Russian phonology." Journal of Linguistics, 4, 69-72.

_____. (1970) "Why and how does vowel nasalization take place?" Papers in Linguistics, 2:2, 179-226.

McCawley, J. (1968) The Phonological Component of a Grammar of Japanese. The Hague.

Otrębski, J. (1956) Gramatyka Języka Litewskiego, Tom III, nauka o formach. Warszawa.

_____. (1958) Gramatyka Języka Litewskiego, Tom I, wiadomości wstepne o gloskach. Warszawa.

_____. (1965) Gramatyka Języka Litewskiego, Tom II, nauka o budowie wyrazow. Warszawa.

Senn, A. (1966) Handbuch der Litauischen Sprache. Heidelberg.

Stang, C. (1942) Das Slavische und Baltische Verbum. Oslo.

_____. (1965) Slavonic Accentuation. Oslo.

VITA

The author was born in Chicago, Illinois on August 18, 1945. He received his elementary school education in the Chicago area and attended Saint Procopius Academy until the fall of 1962 when he and his family moved to Sunnyvale, California. He graduated from Fremont High School, Sunnyvale, in 1963 and, after a year's attendance at Foothill College, Los Altos, California, he enrolled at San Jose State College, where he majored in psychology and philosophy, graduating magna cum laude in June, 1966. He then enrolled as a Ph.D. candidate in linguistics at the University of Illinois where he was supported by an NDEA Title IV Fellowship from September, 1966 to the summer of 1969. In the fall of 1969 he was awarded a University of Illinois Dissertation Fellowship and was appointed an Instructor in the Linguistics and Slavic Departments of the same institution the following year.