1

Aspects of the Morpho-phonology of the Latin Verb

<This paper is a revision of Embick and Halle 2003 'On the Status Stems in Morphological Theory'< in Twan Geerts et al. Romance Languages and Linguistic Theory, which was printed without having been proof-red by the authors.>

1. The Latin phoneme /I/

It is generally assumed in phonological studies like the present one that the knowledge that speakers have of the words of their language includes knowledge of the nested constituents of the kind illustrated in (1).

(1)  
N  
/ \  
Adj \  
/ \ / \  
/ Adj \  
/ \ / \ / \  
Pf Vb Sf Sf
| | | |  
in alter abi l ity

The terminal nodes or morphemes that compose the word in-alter-abil-ity are shown in the bottom line below the tree in (1). The labels of the constituent morphemes of the word are self-explanatory, except perhaps for Pf, Sf, and VSt, which stand for Prefix, Suffix and Verb Stem respectively.

Each letter in the bottom line of (1) stands for a complex of phonetic features of the kind illustrated in (2). In (2) we have shown the six vowels that appear in underlying representations of Latin morphemes. (The existence of the sixth vowel /I/ as a Latin phoneme is discussed below.)
Typical examples of inflected forms of the Latin verb are those in (3).

(3)

<table>
<thead>
<tr>
<th>Verb</th>
<th>1Pl</th>
<th>1Sg</th>
</tr>
</thead>
<tbody>
<tr>
<td>'carry'</td>
<td>port-a:-mus</td>
<td>port-o:</td>
</tr>
<tr>
<td>'teach'</td>
<td>doc-e:-mus</td>
<td>doc-e-o:</td>
</tr>
<tr>
<td>'hear'</td>
<td>aud-i:-mus</td>
<td>aud-i-o:</td>
</tr>
<tr>
<td>'take'</td>
<td>cap-i-mus</td>
<td>cap-i-o:</td>
</tr>
<tr>
<td>'read'</td>
<td>leg-i-mus</td>
<td>leg-o:</td>
</tr>
</tbody>
</table>

Each of the 1Pl Present tense forms in (3) is composed of three pieces: a Verb Stem, a Theme, and the 1Pl Person Agr ending /mus/. The forms also illustrate the fact that different Verb stems take different Theme vowel, which are shown directly after the Verb Stem. At first sight the forms /cap-i-mus leg-i-mus/ may appear to share the Theme vowel /i/, but as shown by the 1Sg forms /cap-i-o:/ vs. /leg-o:/ the Theme vowels cannot be the same in the two verbs, for the Theme vowel is deleted in /port-o:, leg-o:/, but not in /doc-e-o:, cap-i-o:, aud-i-o:/.

<<Fn: Vowel length effects are disregarded at this point.>>

The question raised by the examples in (3) is how to account for the fact that /i/ is deleted in /leg-o:/ (cf. /leg-i-mus/), but not in /cap-i-o:/ or /aud-i-o:/ (cf. /cap-i-mus, aud-i:-mus/). The answer is that the Theme vowel in /leg-i-mus ~ leg-o:/ is underlingly not /i/, but /I/, i.e., [+Back,-Round,+High], an abstract vowel, which differs minimally from /i/, i.e., from [-Back,-Round,+High].

By positing the underlying abstract vowel /I/ we can account for the deletion of the Theme vowels /a/ and /I/ in pre-vocalic position as, e.g., in /port-o: <<<< port-a:-o:/ and /leg-o: <<<< leg-I-o:/ with the (remarkably) simple rule (4).

(4) Delete [+Back,-Round] in env. ___ + V (before Vowel)
Rule (4) implies that an underlying /I/, which has the features [+Back,-Round,+High], will surface with these features. In fact, undeleted /I/ in Latin always surfaces as /i/, as shown by the 1Pl form /leg-i-mus/. To account for the fact that undeleted /I/ surfaces as /i/, we add rule (5).


The two rules (4) and (5) generate correct outputs only if rule (4) is applied before rule (5). If rule (5) is applied before rule (4), it turns every underlying /I/ into /i/, and there remains no /I/ to be deleted by rule (4). This incorrect consequence is straightforwardly avoided if rule (4) is applied before rule (5), and this fact, in turn, constitutes (crucial) evidence for the proposition that phonological rules must always be applied in a specific order.

In sum, the few facts discussed above show that the (underlying) form in which a word or morpheme is stored in a speaker’s memories may differ from the surface form in which it appears in an actual utterance. The reason for the difference is that sequences of morphemes are subject to phonological rules such as (4) and (5), which apply, not all at once, but in a specific order; in Latin, in particular, rule (4) is ordered before rule (5).

2. The Composition of the Forms of the Latin Verb (Conjugation)

An aspect of its morphology that Latin shares with many languages (though not with all languages) is that unmarked morphological categories are often signaled by the absence of any phonetic marker. This is illustrated by the finite forms of the Latin verb in (6). The examples in the shorter even-numbered lines of (6) are 1Sg forms, those in the longer, odd-numbered examples are 1Pl forms.
<table>
<thead>
<tr>
<th>(6)</th>
<th>Unmarked</th>
<th>[-Fut]</th>
<th>[+Fut]</th>
</tr>
</thead>
<tbody>
<tr>
<td>NonPf</td>
<td>port-a:-mus</td>
<td>port-a:-b-a:-mus</td>
<td>port-a:-b-i-mus</td>
</tr>
<tr>
<td></td>
<td>port-o: (1Sg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perf</td>
<td>port-a:-v-i-mus</td>
<td>port-a:-v-e-r-a:-mus</td>
<td>port-a:-v-e-r-i-mus</td>
</tr>
<tr>
<td></td>
<td>port-a:-v-i:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NonPf</td>
<td>de:l-e:-mus</td>
<td>de:l-e:-b-a:-mus</td>
<td>de:l-e:-b-i-mus</td>
</tr>
<tr>
<td></td>
<td>de:l-e-o:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perf</td>
<td>de:l-e:-v-i-mus</td>
<td>de:l-e:-v-e-r-a:-mus</td>
<td>de:l-e:-v-e-r-i-mus</td>
</tr>
<tr>
<td></td>
<td>de:l-e:-v-i:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NonPf</td>
<td>aud-i:-mus</td>
<td>aud-i-e:-b-a:-mus</td>
<td>aud-i-e:-mus</td>
</tr>
<tr>
<td></td>
<td>aud-i-o:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perf</td>
<td>aud-i:-v-i-mus</td>
<td>aud-i:-v-e-r-a:-mus</td>
<td>aud-i:-v-e-r-i-mus</td>
</tr>
<tr>
<td></td>
<td>aud-i:-v-i:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NonPf</td>
<td>cup-i-mus</td>
<td>cup-i-e:-b-a:-mus</td>
<td>cup-i-e:-mus</td>
</tr>
<tr>
<td></td>
<td>cup-i-o:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perf</td>
<td>cup-i:-v-i-mus</td>
<td>cup-i:-v-e-r-a:-mus</td>
<td>cup-i:-v-e-r-i-mus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NonPf</td>
<td>vert-i-mus</td>
<td>vert-e:-b-a:-mus</td>
<td>vert-e:-mus</td>
</tr>
<tr>
<td></td>
<td>vert-o:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perf</td>
<td>vert-i-mus</td>
<td>vert-e-r-a:-mus</td>
<td>vert-e-r-i-mus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NonPf</td>
<td>leg-i-mus</td>
<td>leg-e:-b-a:</td>
<td>leg-e:-mus</td>
</tr>
<tr>
<td></td>
<td>leg-o:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perf</td>
<td>le:g-i-mus</td>
<td>le:g-e-r-a:-mus</td>
<td>le:g-e-r-i-mus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NonPf</td>
<td>cup-i-mus</td>
<td>cup-i-e:-b-a:-mus</td>
<td>cup-i-e:-mus</td>
</tr>
<tr>
<td></td>
<td>cup-i-o:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perf</td>
<td>cup-i:-v-i-mus</td>
<td>cup-i:-v-e-r-a:-mus</td>
<td>cup-i:-v-e-r-i-mus</td>
</tr>
</tbody>
</table>

The unmarked NonPerf forms in the odd-numbered line of (6) differ systematically from the marked Perf forms in the even-numbered lines by the absence vs. the presence of the sequence /v-i/ (/v-e/ before /r/). A parallel difference in word length obtains between the shorter forms in the first column of (6), which are unmarked (lack a phonetic exponent) for [αFut], and the longer, marked [αFut] forms in the second and third columns. Here, the difference is due to the presence in the second and third columns of (6) of the [αFut] morpheme contrasting with its absence in the forms in the first column.

It assumed here that each of the six forms in (6) is an instance of the sequence of five abstract morphemes in (7), which make up the finite forms of the Latin active verb. The morphemes enclosed in parentheses in (7) are ‘optional’ in the sense that
the well-formedness of a word is preserved when optional morphemes are omitted. (As explained below (see rule (11)), the letters X and Y stand for consonants that are inserted here by phonological rules.)

(7) VbStem Theme (X - Perf) (Y - [αFut]) Agr

The Rules of Vocabulary Insertion in (8) supply the phonetic exponents for the abstract morphemes in representations such as those in (7). Thus the rules (8a) “spell out” the different Agr (Person-Number) endings of the Latin verb.

(8)  a. 1Sg >>> /o:/  2Sg >>> /s/  3Sg >>> /t/
     1Pl >>> /mus/  2Pl >>> /tis/  3Pl >>> /nt/

b. Examples:
   (Present Tense forms of the verb /port-a:/ ‘carry’.)

   1Sg /port-o:/  2Sg /port-a:-s/  3Sg /port-a-t/
   1Pl /port-a:-mus/  2Pl /port-a:-tis/  3Pl /port-a-nt/

As shown in (8b) above, some Person Agr endings trigger changes in the preceding morpheme. For example, the Theme vowel /a:/ is deleted (by rule (4)) in the 1Sg, /port-o:/ <<< /port-a:-o:; and a rule, not further discussed in this paper, shortens the Theme vowel /a:/ in /port-a-t/ and /port-a-nt/.

As shown in (9b), before the [αFut] morpheme /e:/ is inserted after (the three) [+high] Theme vowels. As shown in (9b) below, when /e:/ is inserted after a [+Back, -Round] Theme vowel, it triggers rule (4), which deletes the (preceding) Theme vowel; e.g., 1Pl /leg-I-e:-mus >>> leg-e::-mus/.

(9)  a. Insert /e:/ in env.    [+High] + _____ + [αFut]
          |     Theme
   b.  [-Fut]      [+Fut]
      aud-i-e:-b-a:-mus  aud-i-e:-mus
      cap-i-e:-b-a:-mus  cap-i-e:-mus

[Type text]
The Vocabulary Insertion rule \((10)\) accounts for the phonetic exponents of the \([\alpha\text{Fut}]\) morpheme in (7). According to \((10)\), the exponent of the \([-\text{Fut}]\) morpheme is /a:/, whereas \([+\text{Fut}]\) has the exponent /I/ after \([-\text{High}]\) stem vowels, but is deleted elsewhere by rule \((10\text{bii})\); i.e., after \([+\text{High}]\) stem vowels. A consonant (/b/ or /s/ (>> /r/)) is inserted before the \([\alpha\text{Fut}]\) morpheme by rule \((11)\) below. Since rule \((11)\) applies after \((10)\), there is no insertion where \([+\text{Fut}]\) has been deleted by rule \((10\text{bii})\).

\((10)\)

a. \([-\text{Fut}] \implies /a:/\)

b. i. \([+\text{Fut}] \implies /I/ \text{ in env. } [-\text{High}] + ___\)

ii. \([+\text{Fut}]\) is deleted elsewhere

c. Examples

<table>
<thead>
<tr>
<th>Form</th>
<th>Exponent</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{port-a:-b-a:-mus})</td>
<td>/e:/</td>
</tr>
<tr>
<td>(\text{de:l-e:-b-a:-mus})</td>
<td>/e:/</td>
</tr>
<tr>
<td>(\text{leg-I-e:-b-a:-mus} \implies \text{leg-e:-b-a:-mus})</td>
<td>/e:/</td>
</tr>
</tbody>
</table>

The forms in the bottom line of \((10c)\) merit additional comment. All three include \([+\text{Fut}]\) in their underlying representation, but this morpheme is deleted by rule \((10\text{bii})\) in the course of the derivation of the surface form. In spite of the deletion of the \([+\text{Fut}]\) morpheme, the \([+\text{Fut}]\) forms in the bottom line of \((10c)\) are distinct from their Present tense cognates in \((10d)\). The reason for this is that the /e:/-insertion rule \((9b)\) is ordered before the deletion rule \((10\text{bii})\) and that the Vocabulary [Type text]
Insertion rules (9a,b) and (10a,b) are ordered before the phonological rules (4) and (5).

Before the [αFut] morpheme, the consonant /s/ (which surfaces as /r/ intervocalically) is inserted in Perfect forms, and the consonant /b/ is inserted in nonPerfect forms; e.g., /port-a:-b-a:-mus, port-a:-b-i-mus/ and /port-a:-v-e-r-a:-mus, port-a:-v-e-r-i-mus/. There is, of course, no consonant insertion where [+Fut] is deleted by rule (10bii).

Insertion of the consonants before the [αFut] morpheme is accounted for by the rules in (11a). Illustrations of their application are shown in (11b).

(11) a. Insert /s/ in env. Perf + ____ [αFut]
    /b/ in env. + ____ [αFut]

b. Examples

    Present
    port-a:-mus    port-a:-v-e-r-a:-mus    port-a:-v-e-r-i-mus
    port-a:-b-a:-mus    port-a:-b-i-mus
    aud-i:-mus    aud-i:-v-e-r-a:-mus    aud-i:-v-e-r-i-mus
    aud-i:-e:-b-a:-mus    aud-i:-e:-mus
    cap-i-mus    cap-i-e:-b-a:-mus    cap-i-e:-mus
    leg-i-mus <<< leg-e:-b-a:-mus <<< leg-e:-mus <<<
    I-mus    I-e:-b-a:-mus    I-e:-mus

An alternative analysis of the above facts is that in (12).

(12) a. [+Fut] >>> /rI/ in env. Perf ___
    >>> /bI/ elsewhere

b. [-Fut] >>> /ra:/ in env. Perf ___
    >>> /ba:/ elsewhere

On the alternative analysis (12), both the [+Fut] and [-Fut] morpheme has two exponents, and each of these four exponents consists of a sequence of two phonemes. This alternative analysis is (technically) inferior to the analysis using rules (9) and (10), because rules (9)/(10) mention a total of only four phonemes, while rule (12) mentions eight phonemes. Moreover, the four phonemes of (9)/(10) are mentioned twice.
each in (12) without formal note being taken of this (obvious) repetition (redundancy).

Consider next the different inflected forms of the Latin verb in (13). Four distinct cases need to be considered here, as shown in (13a–d).

(13)

<table>
<thead>
<tr>
<th>Perf 1Pl</th>
<th>Pres 1Pl</th>
<th>Pres 1Sg</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. vert-i-mus</td>
<td>vert-i-mus</td>
<td>vert-o: ‘turn’</td>
<td>I</td>
</tr>
<tr>
<td>leg-i-mus</td>
<td>leg-i-mus</td>
<td>leg-o: ‘read’</td>
<td>I</td>
</tr>
<tr>
<td>ce:p-i-mus</td>
<td>cap-i-mus</td>
<td>cap-i-o: ‘take’</td>
<td>i</td>
</tr>
<tr>
<td>aug-s-i-mus</td>
<td>aug-e:-mus</td>
<td>aug-e-o: ‘increase’</td>
<td>e:</td>
</tr>
<tr>
<td>vinc-s-i-mus</td>
<td>vinc-i:-mus</td>
<td>vinc-i-o: ‘fetter’</td>
<td>i:</td>
</tr>
<tr>
<td>scri:b-s-i-mus</td>
<td>scri:b-i-mus</td>
<td>scri:b-o: ‘write’</td>
<td>I</td>
</tr>
<tr>
<td>sec-u-i-mus</td>
<td>sec-a:-mus</td>
<td>sec-o: ‘cut’</td>
<td>a:</td>
</tr>
<tr>
<td>mon-u-i-mus</td>
<td>mon-e:-mus</td>
<td>mon-e-o: ‘urge’</td>
<td>e:</td>
</tr>
<tr>
<td>aper-u-i-mus</td>
<td>aper-i:-mus</td>
<td>aper-i-o: ‘open’</td>
<td>i:</td>
</tr>
<tr>
<td>port-a:-v-i-mus</td>
<td>port-a:-mus</td>
<td>port-o: ‘carry’</td>
<td>a:</td>
</tr>
<tr>
<td>de:l-e:-v-i-mus</td>
<td>de:l-e:-mus</td>
<td>de:l-e-o: ‘destroy’</td>
<td>e:</td>
</tr>
<tr>
<td>aud-i:-v-i-mus</td>
<td>aud-i:-mus</td>
<td>aud-i-o: ‘hear’</td>
<td>i:</td>
</tr>
<tr>
<td>pet-i:-v-i-mus</td>
<td>pet-i-mus</td>
<td>pet-o: ‘ask’</td>
<td>I</td>
</tr>
<tr>
<td>cup-i:-v-i-mus</td>
<td>cup-i-mus</td>
<td>cup-i-o: ‘desire’</td>
<td>i</td>
</tr>
</tbody>
</table>

As shown in the right-most column in (13d), verb stems in Latin are formed with one of five Theme vowels: long /a: e: i:/ and short /I i/ (from which we conclude that only [-Round] vowels can serve as Verb Themes in Latin).

As shown in the first column of (13), the exponent of the Perf is /i/, before which may be inserted either the obstruent /s/ or the vowel /u/~ (alternating with) /v/. A fact, insufficiently emphasized in Latin grammars, is the treatment of the verb Theme vowel in Perfect forms; in particular, grammars fail to emphasize the fact that the Theme vowel of the verb is systematically deleted, where the Perf is bare /i/ (see example in (13a)), and where /s/ precedes the Perfect /i/ (example
(13b)); but elsewhere – i.e., where /u/~v/ precedes the Perf (13c,d) – the Theme may or may not be deleted,. The suggested treatment in these four cases is illustrated in (14a-d).

(14)
a. VbStem Theme Perf Agr
   | | | |
   vert I i mus >>> vert-i-mus ‘turn’

b. VbStem Theme Perf Agr
   | | \ | |
   aug e: s i mus >>> aug-s-i-mus ‘increase’

c. VbStem Theme Perf Agr
   | | \ | |
   sec a: u i mus >>> sec-u-i-mus ‘cut’

d. VbStem Theme Perf Agr
   | | | |
   port a: u i mus >>> port-a:-v-i-mus ‘carry’

Theme deletion is implemented here graphically by linking the Perf exponent /i/ or the phoneme preceding it to the Theme position, as shown in (14).  <Footnote: In the Perf forms /pet-i:-v-i-mus cup-i:-v-i-mus/ and in a few other, the Theme vowels, which underlyingly are short /i i/, are lengthened in the Present tense by a special rule not further discussed here.>

In (13), there are three distinct Perf suffixes: /i/, /s-i/, and /v-i/ ~ /u-i/. I account for these facts with the Vocabulary Insertion Rule (14a) and the two morphophonological rules (14b,c).

(14)
a. Perf >>> /i/

b. Insert /s/ in env. VerbSt (List L) Theme ___ Perf
   /u/ in env. VerbSt (List LL) Theme ___ Perf
   }
   /i/
c. Examples
i.
VbStem Theme Perf [-Fut] Agr
| | \ | | | |
scri:b I s I s a: mus >> scri:b-s-e-r-a:-mus

ii.
VbStem Theme Perf [-Fut] Agr
| | | | |
le:g I I s a: mus >> le:g-e-r-a:-mus

iii.
VbStem Theme Perf [-Fut] Agr
| | | | |
vert I s I a: mus vert-e-r-a:-mus

iv.
VbStem Theme Perf [-Fut] Agr
| | | | |
aud i: u I s a: mus aud-i:-v-e-r-a:-mus

v.
VbStem Theme Perf [-Fut] Agr
| | | |
sec a: u I s a: mus sec-u-e-r-a:-mus

vi.
VbStem Theme Perf [-Fut] Agr
| | | |
port a: u I s a: mus port-a:-v-e-r-a:-mus

vii.
VbStem Theme [+Fut] Agr
| | |
aud i: e: mus aud-i-e:-mus

Additional examples in (9b,c) above.
In the account of the surface forms shown in (14c) it is assumed that a link between a grammatical category and a phoneme established by a slanting line takes precedence over (and eliminates) a link established by a vertical line, as in (14ci, 14ciii, 14cv) above.

The order of application of the rules is that in (15).

(15) (8) (9) (11) (10) (4a,b) (5)
Additional material/hold/do not discard

[-Fut] >>> /a:/

(10) a. reg-I-e:-mus >>> reg-e:-mus reg-I-o: >>> reg-o: 
ad-i-e:-mus aud-i:-o: >>> aud-i-o: 
cap-i-e:-mus cap-i-o:

b. Insert /e:/ after [+High] Theme vowels

The /e:/ appearing after the Theme vowel in the verbs in (10a) is due to rule (10b). The exponents of [αFut] morpheme -- /i/ or /a:/ -- are preceded in Perfect forms by /r/ (<<< /s/) or by /b/, as shown in (10).

(12)

port-a:-mus port-a:-b-a:-mus port-a:-b-i-mus 'carry'
doc-e:-mus doc-e:-b-a:-mus doc-e:-b-i-mus 'teach'
aud-i:-mus aud-i:-e:-b-a:-mus aud-i-e:-mus 'hear'
cap-i-mus cap-i-e:-b-a:-mus cap-i-e:-mus 'take'
leg-i-mus leg-e:-b-a:-mus leg-e:-mus 'read'

<<< leg-I-e:-mus

The stems of the verbs in (10) are followed by one of the five vowels that appear as Themes of Latin verbs. The long vowel /e:/ is inserted after the [+High] Theme vowels -- /i: i I/ -- and before the [αFut] morpheme. Moreover, the [+Fut] Indicative form /aud-i-e:-mus/ is distinct from both the Present Indicative /aud-i:-mus/ and the Present Subjunctive /au-d-i-a:-mus/. (The Latin verb has no Fut Subjunctive forms.)
The /e:/ is due to rule (10a)

This does not mean, however, that verbs with [+High] Themes have no [-Fut] forms; they do, only these forms do not include a phoneme sequence representing the [-Fut] morpheme. It must be noted that after verbs with a [+High] Theme vowel, the Agr Person ending is attached to the Verb Stem directly without the intervening [-Fut], because at this point in the derivation [-Fut] will have been deleted by rule (9bii).

CONTINUE REVISIONS

The effect of (9) is to supply the exponent /I/ to the morpheme [-Fut], and the exponent /a:/ to the morpheme [-Fut], but only where the latter is preceded by a [+high] vowel; elsewhere the [-Fut] morpheme is deleted (cf. (9bii)); i.e., the [αFut] has no phonetic exponent after verb stems with the [+high] Themes /i:, i/ or /I/. That does not mean, of course,

This is an important discovery of this study and accounts for a body of data that are rarely dealt with in grammars of Latin.

In addition to the Vocabulary Insertion rules (9), Latin also has the two phonological rules in (10a,b), which insert phonemes into the sequence. Rule (10a) inserts the vowel /e:/ after [+High] Theme vowels -- /I/ /i/ and /i:/ --and this triggers, in

[Type text]
turn, deletion of the Theme vowels /a:/ and /I/ by rule (4). Examples in (10c).

The rules just reviewed make a distinction

Rule (10b) inserts the consonants /s/ (which surfaces as /r/) and /b/ before the [αFut] morpheme. To my knowledge, this fact has never been properly dealt with in Latin grammars. The significance of these data becomes evident only when examined in the light of the theory underlying this study.

Rule (10a) inserts the vowel /e:/ after [+High] Verb Themes; e.g., /audi-i-e:-b-a:-mus, cap-i-e:-b-a:-mus, leg-I-e:-b a:-mus >>> leg-e:-b-a:-mus/. On this analysis, therefore, the [αFut] morpheme has a single vowel exponent (/I/ (cf. rule (9)), before which a consonant -- either /r/ or /b/ -- is inserted by (rule 10). The crucial effects of the deletion rule (9bii) must also be taken into account here.

(13)
a. Perf >>>> /i/
b. Insert /s/ in env. VbSt + Theme ___ Perf where VbSt = ListB
c. Insert /u/ in env. VbSt + Theme ___ Perf where VbSt = ListC

Implicit in (13) are the propositions a) that the Perf exponent is /i/, and that after certain VbStems either /s/ or /u/ ~ /v/ are preposed before the Perf /i/. Moreover, the Theme vowel of the verb is treated differently before different exponents of
Specifically, the Theme vowel is always deleted when followed by /s-i/ or by /i/, but only after some Verb stems, when followed by /u-i/. This is shown in (14).

(14) a. VbSt Theme Perf Agr(1Pl)
| | / \ | | |
| | / \ | | |
XYZ V s i mus

b. before /u-i/
VbSt Theme Perf Agr(1Pl)
| | | / |
scri:b I u i mus

Examples of verbs with Theme deletion before /u-i/ in the Perfect are given in (15a), examples of verbs without Theme deletion before /u-i/ are in (15b).

(15)
a. sec-a: -u-i-mus >>> sec-u-i-mus 'cut'
  mon-e:-u-i-mus >>> mon-u-i-mus 'warn'
  aper-i:-u-i-mus >>> aper-u-i-mus 'open'

b. port-a:-v-i-mus 'carry'
  de:l-e:-v-i-mus 'delete'
  aud-i:-v-i-mus 'hear'

3. Comparison of the order of the morphemes in verbs of Latin and Germanic

As shown in (16) in many Latin verbs, the Passive voice is formed by suffixing /r/ (sometimes /jur/) to the end of the word.

(16)
'carry' Fut Pass   'carry' Perf Past Pass
port a: b I mus r   port a: v e r a: mus r
| | | | | | | | |
VbSt Theme [+Fut] Agr Pass   VbSt Theme Perf  [-Fut] Agr Pass

Phonological rules, that are not otherwise discussed here, delete word final /s/ before /r/ and replace the Perfect exponent /i/ with /e/ in position before before /r/.

Compare the Latin morpheme order in (16) with that in German subordinate clause in (17).

(17) ‘... that you could have been exiled to Sibiria’
    . . . dass du nach Sibirien

    verschick-t  word-en  sei-n  konn-te-st
    MVb          t-Prt   Aux’ n-Prt   Aux’ Inf Mod   Ipf 2Sg
MVb   Passive   Perf   Modal   T?Agr

As shown in the bottom line of (17) in German subordinate clauses, the main verb appears at the end of the clause and its auxiliaries follow the Main verb. Interestingly the German auxiliaries are identical with those of English, but appear in an order that is the opposite to that of German, as shown in (18).

(18)
T/Agr   Modal   Perf   Passive   MVb
|       | \   |   |   |
Past   can   have EnPrt   be EnPrt   exile

    Part have   be    enPrt-

all three of which include /i/, that may be preceded by /s/ or by /v~/u/. The simplest formal account of these facts is to assume the exponent of Perf is /i/ and that /s/ and /u/ are inserted before /i/ in special cases.
An aspect of the Latin conjugation that is often not fully treated in Latin grammars is the behavior of Perfect conjugation. Although grammars do not fail to note that there are three distinct Perfect suffixes, not all of them deal fully with the important topic of the manner in which the Perf attaches to the VerbStem. As readily seen in the examples in the first column of (12) many Verbs are athematic in the Perfect.

The contrast between [-Fut] /port-a:-b-a:-mus/ and [+Fut] which in turn is prefixed by /r/ (<<< /s/) where preceded by the Perf morpheme, and by /b/ elsewhere

The verbs in (6a) differ from those in (6b) in their way of forming the Perfect. Both sets insert /u-i/ in the Perfect, but they differ in the effect this has on the insertion on the Theme vowel. In (6a) the Theme vowel is preserved, in (6b) the Theme vowel disappears in the Perfect. We propose that this is due to a special rule that links the /u/ infix of the Perfect to the Theme and simultaneously delinks (deletes) the Theme vowel. We illustrate the effects of this process in (7b).

While the majority of verbs form the Perfect by inserting /u-i/, a substantial number of verbs form the Perfect by infixing /s-i/. As in the case of the /u-i/ Perfects, we assume in the case of the /s-i/ Perfects that the phonetic exponent of the Perfect is /i/ and that the /s/ is a prefix. The /s/ prefix is systematically linked to the Theme; it is this systematic linking to the Theme that distinguishes the /s/ prefix, from the /u/ prefix. The effect of this linking to the Theme, is that all /s/ Perfect lack Themes.

The third and final class of verbs - e.g./ cap-i-mus ce:p-i-mus ‘take’ take no prefix in the Perfect, but with these verbs the Perfect exponent /i/ is linked directly to the verb Theme, and as a result, no Theme ever surfaces before the /i/.

[Type text]
Verbs with /s/ Perfect: <references to Maidhoff’s text)
e: stems aug-e:, 105-117, i:-stems vinc-i: ‘fetter’ 153-160
I-stems (Cons) 236-314 di:k-s-i-mus di:c-o: di:c-i-mus
i-ste ms 482-490 a:=spic-i-mus ‘observe’ a:-spex-i-mus
    a:-spic-i-o:

It is therefore assumed here that the exponent of the Perfect is /i/, which may be prefixed with /u/ or with /s/. /s/ prefix is always linked to the Theme constituent and as a result the verb Theme is systematically in the /s/ prefect. The u-Perfect is usually also linked to the Theme accompanied by Theme deletion, As noted, however, in the case of a fair number of verbs e.g., /de:l-e::v-i-mus aud-i:-v-i-mus/, the Verb Theme survives before the Perfect5 /i/ exponent.

In sum, the Perfect exponent is /i/, which with some verbs takes the prefix /u/ or /s/. As noted, with many verbs the /u/ Prefix is linked to the Verb Theme; the /s/ Prefix is invariably linked to the Verb Theme. Verbs that take the Perfect morpheme /i/ link it to the Theme.

The Latin facts suggest that historically the underlying structure of the Latin verb was

(10) Verb (Passive) ([Perf]) ([αFut]) Agr

Each Person form of the active Latin verb has therefore the six variants below:

port-a: -mus  port-a:-  b-a:-mus  port-a:-  b-i-mus
port-a:-v-i-mus  port-a:-v-e-r-a:-mus  port-a:-v-e-r-i-mus

The /r/ is underlying /s/ as shown by PluPerfSubj
Port-a:-v-i-s-s-e:-mus

We encounter the morpheme order in (10) in the German auxiliary verb as shown in (11a)
a. Morpheme sequence in German subordinate clauses (verb last)

dass du nach Sibirien

verschick-t word-en sei-n konn-te-st
Vb (PassPart-werd)-(Perf-sei) (Inf-Modal) Tense Agr >
verschick Passive Perfect Modal

b. Morpheme sequence in English

Tense Modal Inf be Perf have PassPart Vb

Clearly the two sequences in (11) are mirror images of each other. The Affix Hopping transformation of Chomsky 1957 is required to generate the correct output in English, but not in German. Both languages require the Pairing transformation, which generates the words in both languages. In German nothing further is required; English, as noted, requires in addition the Affix Hopping transformation of Chomsky 1957 to generate the correct morpheme sequences in the words.

It is worth notice that the morpheme sequence encountered in German corresponds almost completely to that found in Latin Perfect active forms

(12) port-a:-v-e-r-a:-mus << port-a:-u-i-r-a:-mus

where (from left to right) /mus/ = Agr; /a:/ = [-Fut]; /i/ = [Perf]; (/u/ preceding /i/ has no semantic content) and /a:/ is the Thematic vowel of the verb.