# SOME NOTES ON ENGLISH VOWEL MORPHOPHONEMICS*

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Morphophonemically related differences in vowel quality, as illustrated by pairs of English words like *fīvə* : *fifth*, *sleep* : *slept*, *bathe* : *bath*, *punitive* : *punish*, *know* : *knowledge*, *hooves* : *hoof*, *south* : *southern*, can be accounted for by reference to an underlying system of seven Tense and seven Lax vowels, *ī, ĭ, ē, ĕ, ǣ, ǽ, ǿ, ø̆, ɔ̄, ɔ̆, ō, ŏ, ū, ŭ,* Tenseness being assigned by rules not discussed. From this sytem the actually occurring forms are derived as follows. A first rule analyzes *ǿ* into *yō*. The second makes Tense vowels into central vowels plus off-glides and changes Tense high vowels to low, mid to high, and low to mid. Next, non-low Tense vowels assimilate to their off-glides. Thus: *fīv → fāyv (five)*, *slēp → slīyp → slĭyp (sleep)*, *bǣð → bəyð → bēyð (bathe)*, *pø̄nĭtĭv → pyōnĭtĭv → pyūwnĭtĭv → pyūwnitiv (punitive)*. *nɔ̄ → nəw → nōw → (know)*, *hōvz → hūwvz → hūwvz (hooves)*, *sūθ → sāwθ (south)*. A last rule accounts for the quality of the Lax vowels, changing *ð* to *ŭ*, *ø̆* and *ŭ* to *ə*, and *ɔ̆* to *ă*, with *ĭ*, *ĕ*, and *ǽ* remaining as in the underlying system: *fifθ (fifth)*, *slept (slept)*, *bǽθ (bath)*, *pø̆nĭš → pənĭš (punish)*, *nɔ̆lĕj → nălĕj (knowledge)*, *hōf → hŭf (hoof)*, *sŭðrn → səðrn (southern)*.

English vowel phonology has fascinated linguists for some time. Especially fascinating has been the question of the relation between the simple vowel sounds of English and those vowels associated with glides, or semivowels. The vowel and semivowel combinations have been recognized as having some special status that other combinations of English phonemes do not. Bloomfield refers to these combinations as "compound phonemes."

> *Compound phonemes* are combinations of simple phonemes which act as units so far as meaning and word structure are concerned. Thus, the diphthong in a word like *buy* can be viewed as a combination of the vowel in *far* with the phoneme that is initial in *yes*. Standard English has eight such combinations.[1]

These combinations, for Bloomfield, are:

*This is an expanded version of a paper presented to the Linguistic Society of America, December, 1966, under the title, "Some notes on English morphophonemics."

[1]Leonard Bloomfield, *Language* (New York, 1933), p. 90.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| [aj] | *buy* | [baj] | [ij] | *bee* | [bij] | [ɔj] | *boy* | [bɔj] |
| [aw] | *bough* | [baw] | [juw] | *few* | [fjuw] | [uw] | *do* | [duw][2] |
| [ej] | *bay* | [bej] | [ow] | *go* | [gow] | | | |

I have been unable to find where Bloomfield justifies his taking these particular combinations, and no others from his list of English phonemes, as having the special status of "compound phonemes." Yet, we know that Bloomfield, and others who have concerned themselves with the problem of English vowel nuclei, are not wrong, inasmuch as these vowel nuclei—and not other sequences, as, for example, [wɪy], as in *queen*, or [ɨw] as in *away*—are units in some sense. This paper explores the question of how these vowel nuclei can properly be taken as units, or single segments.

These complex vowel nuclei, or "compound phonemes," just mentioned, participate in morphophonemic alternations with simple vowel nuclei, but in a quite unobvious way, from a phonetic point of view, such that [ɪy] alternates with [ɛ̆], as in the pairs

| | | | |
|---|---|---|---|
| *sleep* | *: slept* | *deceive* | *: deception* |
| *deep* | *: depth* | *severe* | *: severity* |
| *leave* | *: left* | *sphere* | *: spherical* |

[āy] alternates with [ɪ̆], as in the pairs

| | | | |
|---|---|---|---|
| *bite* | *: bit* | *sign* | *: signal* |
| *alive* | *: live* | *wide* | *: width* |
| *five* | *: fifth* | *type* | *: typical* |

[ēy] alternates with [æ̆], as in the pairs

| | | | |
|---|---|---|---|
| *bathe* | *: bath* | *nature* | *: natural* |
| *sane* | *: sanity* | *nation* | *: national* |
| *grade* | *: gradual* | *Spain* | *: Spanish* |

[ōw] alternates with [ă] (or [ɔ̆], depending on the dialect of English in question), as in the pairs

| | | | |
|---|---|---|---|
| *phone* | *: phonic* | *novice* | *: novitiate* |
| *mode* | *: modify* | *know* | *: knowledge* |
| *node* | *: nodular* | *pose* | *: posit* |

[2] *Ibid.*, p. 91.

[āw] alternates with [ə̆], as in the pairs

*foundation : fundamental* *profound : profundity*

*south : southern* *abound : abundant*

*pronounce : pronunciation*

[yūw] (with or without the [y] after alveolar consonants) also alternates with [ə̆], as in the pairs

*studious : study* *produce : production*

*assume : assumption* *numeral : number*

*punitive : punish* *humility : humble*

and [ūw] also alternates with [ə̆], as in the pairs

*do : does* *moon : month* *youth : young*

or with [ū], as in the pair *hooves : hoof* (the conditioning factor apparently being the following consonant). [ōy] (or [o͞y]) seems to be a leftover. There are some morphophonemic alternations involving [ōy], such as in the pairs *destroy : destruction, conjoin : conjunction, point : punctual,* but the details are not worked out here. Neither have the details of the status of [ɔ̄ə], as in *law* or *caught,* been worked out. Neither [ōy] nor [ɔ̄ə] figure in the following discussion.

There are other vowel alternations in English that are not dealt with here either. The most obvious of these are those alternations which are relics of Indo-European ablaut, such as in *drive : drove : driven, sing : sang : sung,* or of Germanic umlaut, such as in the pairs *man : men, goose : geese, mouse : mice, strong : strength.* Such alternations have to be accounted for in some way in a general grammar of English, but they are not treated here.

The concern here is with the vowel system which underlies the "regular" alternations cited above and the set of rules which accounts for the actually occurring phonetic shapes.

It seems that the English complex vowel nuclei can be divided into two (overlapping) groups: those with a glide (or modification) in the high front area—[ɪy, āy, yūw]—and those with a glide (or modification) in the high back area—[ūw, yūw, āw, ōw].

If the common possession of the high back modification of this last set is taken as indicative of one of the features of the underlying system — and the obvious choice (in the distinctive feature framework of Roman Jakobson) is Flatness, that is, rounding—then

we can say that the underlying forms of [ūw, yūw, āw, ōw] differ from those underlying [īy, āy, ēy] as being Flat, or rounded, as opposed to non-Flat, or unrounded.

On the other hand, a modification in the high front area can be taken as evidence of Acuteness, that is, for vowels, frontness. Thus, the underlying forms of [īy, āy, ēy, yūw] are Acute, or front, as opposed to those underlying [ūw, āw, ōw], which are non-Acute, or non-front.[3]

This much can be determined on the basis of the complex nuclei alone.

Now, looking at the simple nuclei, we find that these vowels are distributed in three heights: the high vowels [ĭ, ŭ], the mid vowels [ĕ, ə̆], and the low vowels [æ̆, ă]. Further, they are distributed as front [ĭ, ĕ, æ̆] versus non-front [ŭ, ə̆, ă].

The non-front vowels present somewhat of a problem because [ə̆] participates in three different morphophonemic alternations: one where it alternates with [āw], as in *pronunciation : pronounce*, another where it alternates with [yūw] (or at times simply [ūw]), as in *consumption : consume*, and a third where it alternates with [ūw], as in *month : moon*. Thus, we look to the front vowels first in the attempt to characterize the underlying system.

If the vowel underlying [ĭ] is characterized as Diffuse, or high, the vowel underlying [æ̆] as Compact, or low, and that underlying [ĕ] as non-Diffuse and non-Compact, that is, neither high nor low, then by noting the nature of the alternations that these vowels participate in, we can account for the non-front vowels. That is, if the vowel underlying [ĭ ∿ āy] is Diffuse, then so must be that underlying [ə̆ ∿ āw]; if the vowel underlying [æ̆ ∿ ēy] is Compact, then so must be that underlying [ă ∿ ōw]; and if the vowel underlying the alternation of [ĕ] with a complex Diffuse nucleus [īy] is non-Diffuse and non-Compact, then because the alternations [ə̆/ŭ ∿ ūw] and [ə̆ ∿ yūw] both involve complex nuclei which are likewise Diffuse, the vowels underlying these alternations must also be non-Diffuse and non-Compact.

Now we have an underlying vowel system except for that feature which distinguishes the vowels underlying the complex nuclei

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[3]Except for the specification of the vowel underlying [yūw]--which is Acute as opposed to the non-Acute vowel underlying [ūw] (or Flat as opposed to the non-Flat vowel underlying [īy]), Acuteness (or Flatness) turns out to be redundant, that is, Acuteness (or Flatness) is predictable for all the other vowels from the Flatness (or Acuteness) feature: vowels that are Flat (or Acute) are not-Acute (or non-Flat), and vice versa. Consequently, granted the marking for Flatness (or Acuteness), the only vowel that would have to be positively specified as Acute (or Flat) in the lexicon is that underlying [yūw].

from those underlying the simple nuclei. I have chosen the feature Tense to make this difference, as in Figure I. This particular feature is chosen because all the vowel nuclei under consideration here involve segments which are usually treated as allophonically Tense before a following semivowel and lax, or non-Tense, when not so followed.

| y | w | ĕ | ē | ĭ | ī | ăe | ā | ŏ | ō | ø̆ | ø̄ | ŭ | ū | ŭ | ō | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | Segment |
| + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | Vocalic |
| + | + | | | | | | | | | | | | | | | Consonantal |
| | + | | | | | | | + | + | + | + | + | + | + | + | Flat |
| | | | | | | + | + | | | | | | | + | + | Compact |
| | | | | + | + | | | | | | | + | + | | | Diffuse |
| + | | + | + | + | + | + | + | | | + | + | | | | | Acute |
| | | | + | | + | | + | | + | | + | | + | | + | Tense |

Figure I[4]

In the present analysis, the Tenseness of the vowels of the complex nuclei is not attributed to the influence of the following semivowel but to the underlying system (and, as will be seen below, the presence of a following semivowel is attributed to Tenseness).

Granted the marking of vowel segments from the underlying system as appropriately Tense or non-Tense (and this paper is not concerned with the problem of how the vowels get so marked[5]), then we can proceed to the rules that account for the superficial forms.

The palatal on-glide of [yūw] (< $\bar{\bar{\text{ø}}}$) can be accounted for by a rule which simply shifts the positive specification of the Acuteness feature for the vowel $\bar{\text{ø}}$ to the left, generating the semivowel *y* followed by the vowel $\bar{o}$ (>[ūw]). This is stated as Rule (1).

[4]In Figure 1 only positively specified features are stated. No. distinction is made in the figure between redundant and non-redundant features.

[5]It seems clear that in the underlying system some vowels are marked as Tense, others a Lax, and others as neither Tense nor Lax. It is the rules that specify these last-mentioned vowels as appropriately Tense or Lax that I have chosen specifically to ignore at this point.

The three-way specification of vowels in the underlying system is interestingly paralleled by the same three-way specification of the fricatives in the underlying system. Some fricatives are inherently Lax, as in *hive: hives;* some are inherently Tense, as in *fife: fifes;* and some are Tense or Lax, depending on grammatical context, as in *wife: wives.*

(1)

| | ø̄ | | y | ō |
|---|---|---|---|---|
| Segment | + | | + | + |
| Vocalic | + | | + | + |
| Consonantal | | → | + | |
| Flat | + | | | + |
| Acute | + | | + | |
| Tense | + | | | + |

The off-glides can be accounted for by a similar rule, which shifts the positive specification of the Flatness or Acuteness feature of the Tense vowel to the right, generating the appropriate semivowel, *y* or *w*, preceded by a Tense, non-Acute, non-Flat vowel, ɨ̄, ə̄, or ā, as the case may be. This is stated as Rule (2).

(2)

| | | | | |
|---|---|---|---|---|
| Segment | + | | + | + |
| Vocalic | + | | + | + |
| Consonantal | | → | | + |
| {Flat / Acute} | + | | | + |
| Tense | + | | + | |

Rule (2) changes ē to ə̄*y*, ī to ɨ̄*y*, ǣ to ā*y*, ō to ə̄*w* (and *y*ō (< ø̄) to *y*ə̄*w*), ū to ɨ̄*w*, and ɔ̄ to ā*w*, as can be seen in Figure II.

| | ē | → | ə̄ | y | ī | → | ɨ̄ | y | ǣ | → | ā | y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Segment | + | | + | + | + | | + | + | + | | + | + |
| Vocalic | + | | + | + | + | | + | + | + | | + | + |
| Consonantal | | | | + | | | | + | | | | + |
| Flat | | → | | | | → | | | | → | | |
| Compact | | | | | | | | | + | | + | |
| Diffuse | | | | | + | | + | | | | | |
| Acute | + | | | + | + | | | + | + | | | + |
| Tense | + | | + | | + | | + | | + | | + | |

Figure II (continued next page)

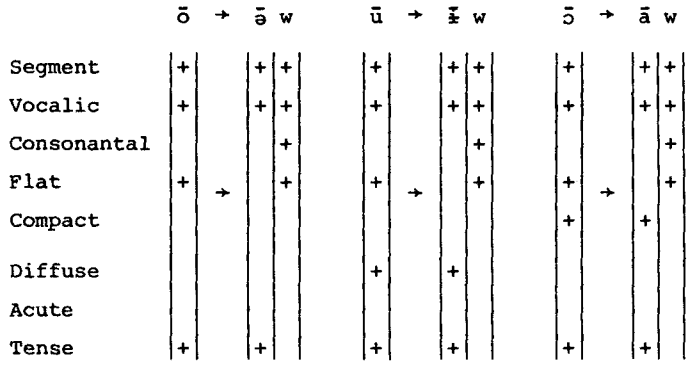


Figure II (continued)

The qualitative changes among the tense vowels are accounted for by Rule (3), which has to be qualified by the statement that if any segment is positively specified for Compactness, then it is necessarily non-Diffuse, that is, no vowel can be both high and low. Thus, if Compact is plus for any segment, Diffuse for the same segment must be minus (or null).

(3)

| | | |
|---|---|---|
| Vocalic | + | + |
| Consonantal | | |
| Compact | α | β |
| Diffuse | β | ᾱ |
| Tense | + | + |

In a rule of this sort, $\alpha$ and $\beta$ are independently plus or minus, as the case may be, and $\bar{\alpha}$ is the opposite sign from whatever $\alpha$ is. Rule (3) changes $\bar{\ə}y$ (< $\bar{e}$) to $\bar{\ɨ}y$, $\bar{\ɨ}y$ (< $\bar{\i}$) to $\bar{a}y$, $\bar{a}y$ (< $\bar{æ}$) to $\bar{\ə}y$, $\bar{\ə}w$ (< $\bar{o}$) to $\bar{\ɨ}w$ (and $y\bar{\ə}w$ (< $\bar{\phi}$) to $y\bar{\ɨ}w$), $\bar{\ɨ}w$ (< $\bar{u}$) to $\bar{a}w$, and $\bar{a}w$ (< $\bar{ɔ}$) to $\bar{\ə}w$, as can be seen in Figure III.

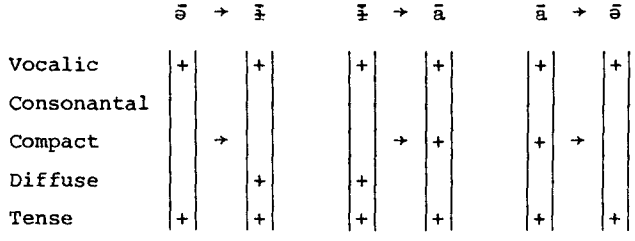


Figure III

There is a problem with Rules (2) and (3) that remains unresolved. There seems to be no good reason for deciding whether Rule (2) precedes Rule (3) or whether Rule (3) precedes Rule (2). That is, for example, *ā y* can be derived from underlying *ī* equally well through an intermediate *ɨ̄*y (if Rule (2) precedes Rule (3)) or through an intermediate *ǣ* (if Rule (3) precedes Rule (2)). If this is so, it seems reasonable to assume that the two rules are not applied sequentially in a derivation and thus should be combined into Rule (2′).

(2′)

| | | | | |
|---|---|---|---|---|
| Segment | + | → | + | + |
| Vocalic | + | | + | + |
| Consonantal | | | | + |
| {Flat / Acute} | + | | | + |
| Compact | α | | β | |
| Diffuse | β | | α | |
| Tense | + | | + | |

Rule (2′) changes *ē* directly to *ɨ̄y*, *ī* to *āy*, *ǣ* to *ə̄y*, *ō* to *ɨ̄w* (and *yō* (< *ø̄*) to *yɨ̄w*), *ū* to *āw*, and *ɔ̄* to *ə̄w*, as can be seen in Figure IV.

| | ē → ɨ̄ y | | | ī → ā y | | | ǣ → ə̄ y | | |
|---|---|---|---|---|---|---|---|---|---|
| Segment | + | | + | + | | + | + | | + | + |
| Vocalic | + | | + | + | | + | + | | + | + |
| Consonantal | | | + | | | + | | | | + |
| Flat | | → | | | → | | | → | | |
| Acute | + | | + | + | | + | + | | | + |
| Compact | | | | | | + | + | | | |
| Diffuse | | | + | + | | | | | | |
| Tense | + | | + | + | | + | + | | + | |

| | ō → ɨ̄ w | | | ū → ā w | | | ɔ̄ → ə̄ w | | |
|---|---|---|---|---|---|---|---|---|---|
| Segment | + | | + | + | | + | + | | + | + |
| Vocalic | + | | + | + | | + | + | | + | + |
| Consonantal | | | + | | | + | | | | + |
| Flat | + | → | + | + | → | + | + | → | | + |
| Acute | | | | | | | | | | |
| Compact | | | | | | + | + | | | |
| Diffuse | | | + | + | | | | | | |
| Tense | + | | | + | | | + | | | |

Figure IV

All of the vowel nuclei generated by Rule (2′) involve vowels that are non-Flat and non-Acute, that is, unrounded non-front vowels. For most dialects of English, Rule (4) applies, such that non-low vowels assimilate with respect to rounding or frontness to their following semi-vowels.

(4)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Vocalic | + | + | | | + | + | | |
| Consonantal | | + | | | | + | | |
| {Flat / Acute} | | + | → | | + | + | | |
| Compact | | | | | | | | |
| Tense | + | | | | + | | | |

Rule (4) changes *ɨ̄y* (< *ē*) to *ī̆y*, *ēy* (< *ǣ*) to *ēy*, *ɨ̄w* (< *ō*) to *ūw* (and *yɨ̄w* (< *ø̄*) to *yūw*), and *ə̄w* (< *ɔ̄*) to *ōw*, as can be seen in Figure V, but *āy* (< *ī*) and *āw* (< *ū*) remain.

| | ɨ̄ y | → | ī̆ y | ə̄ y | → | ē y | ɨ̄ w | → | ū w | ə̄ w | → | ō w |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vocalic | + + | | + + | + + | | + + | + + | | + + | + + | | + + |
| Consonantal | + | | + | + | | + | + | | + | + | | + |
| Flat | | | | | | | + | | + + | + | | + + |
| Acute | + | → | + + | + | → | + + | | → | | | → | |
| Compact | | | | | | | | | | | | |
| Diffuse | + | | + | | | | + | | + | | | |
| Tense | + | | + | + | | + | + | | + | + | | + |

Figure V

It might be noted that in some dialects, notably in certain varieties of Australian English, Rule (4) seems not to apply, so that the non-Compact complex vowel nuclei begin with unrounded central vowels. In this particular respect, such dialects would be by the present analysis closer in their phonetics to the underlying system than would be other dialects, where non-Compact vowels are made front before *y* and rounded before *w* by Rule (4).

The remaining rules to be mentioned here have to do with the specification of the features of the Flat lax vowels, that is, of the lax vowels which are specified as rounded in the underlying system.

Rule (5), which is, of course, subject to the same qualification mentioned in connection with Rule (3), namely, that Diffuse is

necessarily minus for any Compact segment, accounts for most of the changes from the underlying lax rounded vowels.

(5)

| | | | | |
|---|---|---|---|---|
| Vocalic | + | | + | |
| Consonantal | | | | |
| Flat | + | → | γ | where γ = + only if α = β |
| Acute | α | | | |
| Diffuse | β | | γ | |
| Tense | | | | |

Rule (5) changes ŏ to ŭ, ø̆ and ŭ to ə̆ to ɔ̆ to ă, as can be seen in Figure VI.[6]

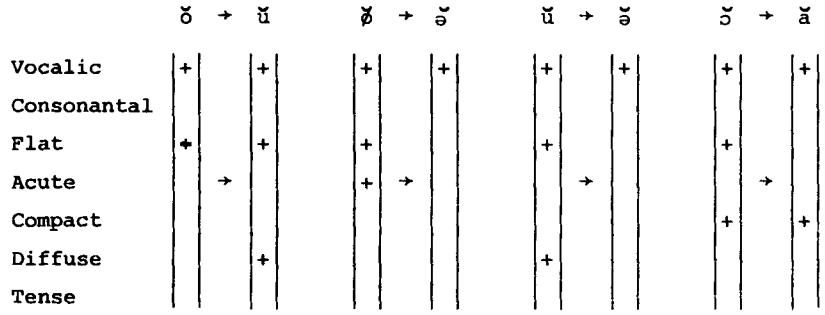


Figure VI

In standard British English, where ɔ̆ remains and ø̆, ŭ become ă, Rule (6) applies instead of Rule (5).

(6)

| | | | | |
|---|---|---|---|---|
| Vocalic | + | | + | |
| Consonantal | | | | |
| Flat | + | | γ | where γ = + only if α = β |
| Acute | α | → | | |
| Compact | | | γ̄ | |
| Diffuse | β | | γ | |
| Tense | | | | |

The application of Rule (6) is shown in Figure VII.

[6]Rule (5) does not apply before non-intervocalic *r*, in which position it seems that the non-Compact Lax vowels combine with the following *r* to form a Tense retroflex syllabic r̄, and that the Compact Lax vowels are made Tense and non-Acute: æ̆r → ār, ŏr → ɔ̄r (as in *start, sort*).

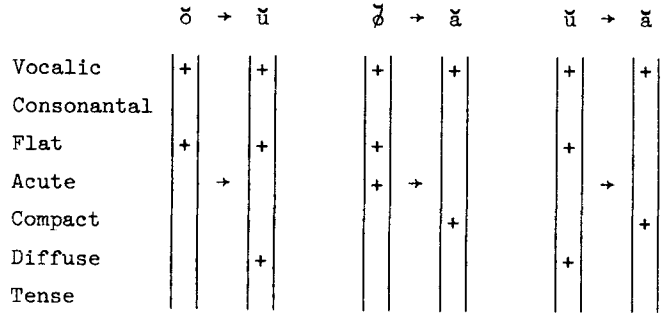


Figure VII

The following examples illustrate the application of the above rules: *fīv → fāyv (five), slēp → slīyp → slīyp (sleep), bæð → bəyð → bēyð (bathe), pø̆nĭtĭv → pyōnĭtĭv → pyīwnĭtĭv → pyūwnĭtĭv (punitive), nō → nəw → nōw (know), hōvz → hīwvz → hūwvz (hooves), sūθ → sāwθ (south); fĭfθ (fifth), slĕpt (slept), bæ̆θ (bath), pø̆nĭs → pănĭš* (or *pănĭš*) *(punish), nɔ̆lĕj → nălĕj* (or unchanged) *(knowledge), hŏf → hŭf (hoof), sŭðrn → sə̆ðrn* (or *sə̆ðrn*) *(southern).*

There are later rules, their details depending on the dialect, which account for facts such as the change of *ŭ* to *ə̆* (or British *ă*) in certain as yet not well understood environments; the deletion of the on-glide portion of *yūw* in certain positions, as after syllable-initial Acute consonants for most Americans; reductions of vowels in unstressed positions; and so on, until all the features are properly specified.

Historically, the phenomena discussed in this paper are the results of the so-called Great Vowel Shift. Synchronically, it seems that the results of the Great Vowel Shift can be accounted for by three rules (Rules (1), (2′), and (4)) for the Tense vowels and one rule (Rule (5) or (6)) for the non-Tense, or lax, vowels. This is not intended to suggest that the Great Vowel Shift took place historically in this way. I see no reason to abandon the point of view that modifications of a language usually happen one feature at a time, with subsequent simplification of the rules and the result that the phonological rules of a language may not necessarily match neatly the historical stages the language has gone through.