On the status of onglides in 
American English*

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1 Introduction
In many languages the issue arises as to whether an onglide patterns as part of the syllable onset or forms the first part of a (rising) diphthong with the immediately following vowel. If it is part of the syllable onset, the structure of a CGV syllable would be as in (1), but if it forms the first part of a diphthong the structure of a CGV syllable could either be as in (2a) with a monomoraic diphthong (where the glide is 'co-moraic' with the following vowel) or as in (2b) with a bimoraic diphthong (C = consonant, G = glide, V = vowel, μ = mora, and σ = syllable).\(^1\)

(1) *Onset analysis of onglides*

\[
\begin{array}{c}
\text{C} \\
\text{G} \\
\text{V}
\end{array}
\]

(2) *Diphthongal analysis of onglides*

\[
\begin{array}{c}
a. \begin{array}{c}
\text{C} \\
\text{G} \\
\text{V}
\end{array} \\
\text{b.} \\
\text{C} \\
\text{G} \\
\text{V}
\end{array}
\]

Several recent works address the status of onglides for a variety of languages. Fu (1990) argues on the basis of feature cooccurrence restrictions that the onglide in a CGV(C) syllable is part of the onset in Mandarin but part of the nucleus in Taiwanese. Kim & Kim (1991) argue for the nucleus analysis of onglides in Korean, based on a variety of
sequences. If there is a sonority distance relationship between the consonant and the glide in CGV sequences then we consider that as evidence for the glide being part of the onset.

Steriade (1988) further notes that constraints against homorganic tautosyllabic sequences can hold regardless of subsyllabic constituency. For example, she notes that many languages have a constraint against a labial onset followed by a round vowel, but such a constraint does not inform us about subsyllabic structure. Moreover, constraints that hold between the consonants that flank both sides of the vowel in an English CCVC sequence, as noted by such researchers as Clements & Keyser (1983) and Davis (1985, 1991), can refer to the homorganicity of the consonants but never to their sonority. Thus one does not find a constraint requiring that the postvocalic consonant be a sonorant if the prevocalic one is an obstructant in a CCVC sequence. This is consistent with the view of Steriade (1988) that constraints based on sonority distance are found exclusively within the prenuclear or postnuclear part of the syllable. With the understanding that constraints referring to sonority distance reflect subsyllabic structure, we now consider the specific phonotactics of English CGV sequences.

2.1 The phonotactics of CGV sequences

English phonotactic evidence supports the onset status of /w/ in CGV sequences. First, there are no sonority constraints that hold between the /w/ in such sequences and the following vowel. The examples in (3) show that /w/ can occur before virtually any English vowel:

(3) The cooccurrence of /w/ with vowels in CGV sequences

- before /i/: queen, dweeb, sweep, tweezers, squeeze
- before /i/: quit, twin, dwindled, shine, squint
- before /e/: quake, Dwayne, sway, quaint
- before /e/: quest, twelve, dwell, Gwen, swept
- before /æ/: quack, quagmire, twang, swagger, twinkle
- before /u/: swoon, swoop, squish
- before /o/: —
- before /o/: quote, quotient, quota
- before /a/: dwarf, thwart
- before /æ/: twas, sworn, swung
- before /æ/: quality, schwa, stark
- before /æ/: quiet, quire, shine, twilight, swipe
- before /æ/: —

The gaps in (3) are readily explained in terms of homorganicity rather than sonority. English has a very limited number of words in which /w/ occurs before a back rounded vowel. If there is a constraint that disfavours such sequences it would be one on homorganicity since /w/ is a back rounded glide, and thus would not reflect upon syllable-internal structure.
(For a possible acoustic explanation for such a constraint see Ohala & Kawasaki 1984.) Relatedly, English seems to have no CwV sequences in which the vowel is a diphthong containing a back round component: [Cwaw] and [Cwaw] are disallowed. However, there is also the possibility that the lack of a Cw sequence before /u/, /aw/ and /oy/ is accidental. (In a search conducted by the second author using a 20,000 word database the vowels /u/, /aw/ and /oy/ were the three least frequent vowels.)

Second, as noted by Clements & Keyser (1983), there are constraints that hold between /w/ and the preceding consonant in CwV sequences. These constraints fall into two types. The first type involves the restriction that prevents labial consonants from occurring before /w/ in CwV sequences. That is, there are virtually no English words in which a labial consonant precedes the labial /w/. This constraint is on homorganicity and does not therefore reflect on syllable structure.

The second constraint is really one of sonority and argues for /w/ in the onset. Specifically, in a CwV sequence the initial consonant cannot be a sonorant. That is, while one finds a variety of (non-labial) obstruents which can precede /w/, as shown in (4a), there are no sequences like those in (4b) where the initial consonant is a sonorant:

(4a) Examples of obstruents occurring before /w/ in CwV sequences
interdentals: thwart, thwack
alveolars: twin, dwarf, swine, (zweieck)
palatals: schwa, Schw
velars: quote, quite, Gwendolynne, (guano)

(4b) The absence of sonorants before /w/ in CwV sequences
*nwV, *nwV, *nwV

The constraint responsible for the absence of initial sonorants in CwV sequences can be understood as an instance of a more general constraint on English syllables, namely, that they do not permit two sonorant consonants in the onset. Thus, there are no syllable-initial sonorants in English like those in (5):

(5) Constraint on two sonorants in the onset of English syllables

Consequently, the /w/ in CwV sequences functions like other sonorant consonants in requiring that a preceding tautosyllabic consonant be an obstruct. This shows that there is a relationship in terms of sonority distance between /w/ and the preceding consonant in CwV sequences. We take this evidence that the /w/ in such sequences is part of the syllable onset and thus the /w/ in syllable-initial CwV sequences has the structure reflected in (1)."n

Moreover, it is worth emphasizing that the relevant stress facts of English (cf. Hayes 1981; Halle & Vergnaud 1987) are consistent with the onset analysis of /w/ in CwV sequences. Words like equity, requisite and Aquila have antepenultimate stress since the penultimate nucleus contains a short vowel; the /w/ onglide does not add weight to the syllable (i.e. it is non-moraic). While the stress facts alone are not conclusive evidence for the onset analysis (since it is also compatible with the co-moraic analysis of (2a)), when taken together with the phonotactic evidence discussed above they provide support for the onset analysis of /w/ in CwV sequences.

2.2 The phonotactics of CyV sequences

We show in this section that the English phonotactic evidence supports the co-moraic analysis of the [y] onglide in CyV sequences, as in (2a). We maintain with Borowsky (1986) and Anderson (1986, 1988) that the [y] is present underlyingly and not inserted by a lexical rule as in Halle & Mohanan (1983) or McMahon (1990). This is an issue that we will return to in §5.

The phonotactics of American English do not treat the /y/ in a syllable-initial CyV sequence as part of the onset. Recall from the discussion in the preceding section that English disallows syllables beginning with two sonorant consonants. This is evidenced by the non-occurrence of the clusters in (5) in syllable-initial position. The fact that a sonorant consonant cannot occur before /w/ in a tautosyllabic CyV sequence supports the onset analysis of /w/ in such sequences. On the other hand, /y/ can occur after a syllable-initial sonorant consonant. This is seen by words like those in (6), in which the sonorant /m/ precedes the [y] onglide:

(6) music, mute, mucus, mule, mural, muse

If [y] were part of the onset, the [my] cluster would constitute the only violation of the constraint preventing two sonorant consonants from occurring at the beginning of the syllable. By viewing the [y] in CyV-clusters as being co-moraic with the following vowel and not part of an onset, the constraint would be exceptionless. Thus, we view the forms in (6) as providing evidence for the diphthongal analysis of [y] in CyV sequences, as in (2a).

Given our view that [y] in CyV sequences has the structure like that in (2a), one might expect that the other sonorant consonants, /n/ and /l/, could precede /w/ in syllable-initial position. However, there are no syllable-initial sequences of [nyV], [lyV] or [yV]. The absence of these particular sequences is not a reflection of the constraint in (5). Rather, it reflects a constraint that disallows a coronal consonant from occurring before [y] in syllable-initial CyV sequences. The constraint disallows the coronal sonorants /n/ and /l/ as well as the coronal obstruents from occurring syllable-initially before [y]. The specific syllable-initial sequences disallowed by the constraint are given in (7):

(7) Constraint disallowing coronals before [y] in syllable-initial CyV sequences
Because [y] is a coronal sound, the constraint in (7) can be viewed as a constraint on homorganicity and not one on sonority distance. Consequently, the constraint does not say anything about subsyllabic structure. The fact that the non-coronal sonorant /m/ can occur in syllable-initial position before the [y] onglide in CyV sequences, as seen in (6), argues that the [y] in such sequences cannot be part of the onset; if it were, then the constraint noted in (5) would be violated.

The other phonotactic observation that is suggestive of the co-moramic analysis of [y] in CyV sequences is the well-known fact that the vowel in such sequences is highly restricted, that is, it can only be an [u]. Thus, forms like those in (8a) in which there is a syllable-initial Cyu sequence are common, while the syllable-initial sequences in (8b) do not occur:

(8) a. Examples of syllable-initial Cyu sequences
   puny, beauty, mute, fume, view, cute, argue, huge

b. The non-occurrence of other vowels in syllable-initial CyV sequences

Thus, [y] in CyV sequence has a close phonotactic relationship with the following vowel in that it restricts its quality. Selkirk (1982) employs evidence of this type to argue for the nuclear status of offglides in English. We consider (8) as well as (6) as providing phonotactic evidence that supports the co-moramic analysis of the [y] in CyV sequences. Hence, we conclude that the words in (6) and (8a) underlyingly have a diphthong with an onglide, namely /ju/. This diphthong has the structure in (9):

(9) Structure of /ju/
    a | i
    u

Given the structure in (9) it is not surprising that /ju/ can occur after the sonorant /m/, as seen in (6), since, as Steriade (1988) notes, onset consonants do not enter into a sonority distance relation with a following nuclear segment.

The proposed co-moramic structure of the English /ju/ onglide in (9), as opposed to a possible bimoraic structure of the onglide sequence as in (2b), is supported by the stress facts. If one considers nouns with three or more syllables containing the [y] onglide in an open penultimate syllable, the large majority of such words receive antepenultimate stress. Sample words include those given in (10) with the antepenultimate main stress indicated:

(10) accuracy, ambulance, amulet, argument, binoculars, calculus, Calígula, cópula, currículum, Drácula, tibia, fórmula, imáculoate, Portugal, spatula, terántula, tibia

These forms show that the onglide does not add weight to the penultimate syllable. The few exceptions to this pattern, like those shown in (11), would be lexically marked for penultimate stress and would be similar to other nouns with exceptional penultimate stress, such as vanilla and gorilla:

(11) Bermuda, Epicurus

We conclude that the phonotactic evidence treats the [w] onglide and the [y] onglide asymmetrically; the [w] onglide is treated as part of the syllable onset as in (11), while the [y] onglide is treated as co-moramic with the following vowel as in (2a). In the next section, we consider evidence from Pig Latin, and show that the Pig Latin forms of words with onglides provide additional evidence for the asymmetry of [w] and [y] onglides in English and for the analysis we have proposed.

3 Pig Latin

One of the most common language games in the English-speaking world is Pig Latin. Forms in Pig Latin are derived from their corresponding English words by taking the initial consonant or consonant cluster of the English word, moving it to the end, and then adding the vowel [e] after the moved consonant(s). We refer to this procedure as the Pig Latin rule. Some examples showing how the Pig Latin rule applies to derive Pig Latin forms are provided in (12). (English words are presented in their standard orthography and Pig Latin forms are presented in transcription.)

(12) English    Pig Latin
    sat         seut
    tip         tepj
    trip        trpej
    criminal    crimale
    scram       scram

Based on these forms, the English Pig Latin rule takes the initial onset (that is, the syllable-initial non-moraic material), moves it to the end and inserts [e]. A complication arises though with vowel-initial words. If the English word is vowel-initial, [e] is inserted at the end of the word and a glide is added before the inserted [e]. The glide is normally a glottal stop or [w], depending on the dialect. Some examples are given in (13):

(13) English    Pig Latin
    ice          iayse or iaywe
    apple        apeylfe or apeylwe
    only         olnife or onlwe

Since, as seen by the forms in (12), the English Pig Latin rule moves an entire initial onset cluster, we consider how English words that begin with CGV sequences form their Pig Latin counterparts. If the onglide moves with the initial consonant to the end of the word then that would be evidence that the glide is part of the onset; however, if the onglide stays
behind and does not move to the end then that would constitute evidence that the glide is not part of the onset, but forms the first part of a diphthong with the immediately following vowel. (We are assuming, following Davis 1983, that language games normally respect syllabic structure.) In the following subsections we consider how Pig Latin treats English words that begin with CwV and Cyv sequences. We will show that Pig Latin treats these words asymmetrically; [w] onglides are treated as part of the onset, but [y] onglides are not. However, Pig Latin forms based on English words with [y] onglides are somewhat complicated, in that there is dialectal variation with such forms. Nonetheless, we will maintain that the Pig Latin evidence, like the phonotactic evidence, argues for an asymmetric treatment of [w] onglides and [y] onglides.

3.1 Forms beginning with CwV sequences

English words that begin with CwV sequences are unproblematic in Pig Latin. They uniformly behave like other words that begin with a sequence of consonants, in that the entire cluster moves to the end, with the vowel [e] being added after it. Some relevant examples are given in (14):

(14) CwV sequences

<table>
<thead>
<tr>
<th>English</th>
<th>Pig Latin</th>
<th>English</th>
<th>Pig Latin</th>
</tr>
</thead>
<tbody>
<tr>
<td>queen</td>
<td>[inkwe]</td>
<td>swoon</td>
<td>[unswe]</td>
</tr>
<tr>
<td>twin</td>
<td>[intwe]</td>
<td>quote</td>
<td>[ortwe]</td>
</tr>
<tr>
<td>sway</td>
<td>[eswe]</td>
<td>schwa</td>
<td>[ašwe]</td>
</tr>
<tr>
<td>dwell</td>
<td>[eldwe]</td>
<td>swine</td>
<td>[aýnswe]</td>
</tr>
<tr>
<td>swagger</td>
<td>[egešwe]</td>
<td>thwart</td>
<td>[ortšwe]</td>
</tr>
</tbody>
</table>

Since, in (14), both the initial consonant and the following /w/ move to the end of the word to derive the corresponding Pig Latin forms, the /w/ is being treated as part of the onset. Thus, the Pig Latin data above, as well as the phonotactic evidence discussed in §2.1, clearly point toward the conclusion that the /w/ in CwV sequences is part of the onset.

3.2 Forms beginning with Cyv sequences

In Pig Latin, there are two main dialects with respect to the forms corresponding to English words beginning with Cyv sequences. In the first dialect (henceforth Dialect A) the [y] surfaces at the beginning of the Pig Latin form, while in the second dialect (henceforth Dialect B) it does not. Sample data from Dialect A and Dialect B are shown in (15a) and (15b), respectively:

(15) Cyv sequences

<table>
<thead>
<tr>
<th>English</th>
<th>a. Pig Latin A</th>
<th>b. Pig Latin B</th>
</tr>
</thead>
<tbody>
<tr>
<td>cute</td>
<td>[yukte]</td>
<td>[utke]</td>
</tr>
<tr>
<td>puke</td>
<td>[yukpe]</td>
<td>[ukpe]</td>
</tr>
<tr>
<td>mute</td>
<td>[yutmе]</td>
<td>[utme]</td>
</tr>
<tr>
<td>fuse</td>
<td>[yuzšе]</td>
<td>[uzše]</td>
</tr>
</tbody>
</table>

In deriving the Pig Latin forms in Dialect A, only the initial consonant moves to the end of the word. The original [y] of the Cyv sequences remains behind. Such forms strongly suggest that the [y] in Cyv sequences is not part of the onset. Moreover, people who have the Pig Latin forms in (15a) still have the forms in (14) for words beginning with CwV sequences, where the [w] moves to the end and does not remain behind. This precludes a possible analysis of the Pig Latin rule where only [+consonantal] onset elements move to the end of the word. Consequently, the Dialect A forms of Pig Latin provide additional support that [w] and [y] in Cyv sequences are treated asymmetrically, with [w] being part of an onset and [y] being part of a (rising) diphthong.

The forms in Dialect B, however, are unexpected if [y] is not part of the syllable onset. These forms seem to support an onset analysis of [y] since, for example, in order to derive [utke] from cute there seems to be an intermediate stage where the form is [utkyе], in which the /y/ has moved with the /k/ to the end of the word. But because the Cyv sequence violates English phonotactics, the [y] in [utkyе] deletes, thus resulting in the form [utke].

If we want to maintain the position that the /y/ in Cyv sequences is not part of the onset, as is suggested by Dialect A and the phonotactic evidence discussed in §2, we must account for the Pig Latin forms in Dialect B. In order to account for the forms in Dialect B, we adopt a proposal found in both Borowsky (1984) and Anderson (1988) that while the /y/ in a Cyv sequence is not initially part of the onset it does move into the onset by a later rule. We posit that while a form like cute has the structure in (16a) after initial syllabification, it surfaces with a structure like that in (16b):

(16) a. Structure of cute (after initial syllabification)

b. Surface representation of cute
Both Borowsky (1986) and Anderson (1988) posit a rule whereby the original [y] onglide becomes part of the onset. We will refer to this rule as the /I/-to-[y] rule, and formalise it as in (17):

(17) /I/-to-[y] rule

The rule in (17) plays an important role in accounting for the different forms in the two dialects. The different dialectal forms shown in (15a, b) can be derived by the crucial ordering of the /I/-to-[y] rule and the Pig Latin rule. In Dialect A, the Pig Latin rule applies first, while in Dialect B the /I/-to-[y] rule applies first. In (18) we show how the different rule orderings derive the different dialectal forms. In (18a), we exemplify the Dialect A rule ordering by showing the derivation for [yutke]; in (18b), we exemplify the Dialect B rule ordering with the derivation for [yutke] (where the symbol /I/ represents the non-onset status of the onglide and symbol [y] represents the onset status of it):

(18) Derivation of cute

<table>
<thead>
<tr>
<th>Dialect A</th>
<th>Dialect B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UR</strong></td>
<td>/yutke/</td>
</tr>
<tr>
<td>Pig Latin rule</td>
<td>/I/-to-[y]</td>
</tr>
<tr>
<td>/I/-to-[y]</td>
<td>yutke</td>
</tr>
<tr>
<td>PR</td>
<td>[yutke]</td>
</tr>
<tr>
<td></td>
<td>phonotactic fix-up</td>
</tr>
<tr>
<td></td>
<td>utke</td>
</tr>
</tbody>
</table>

The crucial ordering of the /I/-to-[y] rule with the Pig Latin rule is essential for both dialectal variants. In order to maintain this analysis we need to provide independent evidence for the /I/-to-[y] rule in (17). One piece of evidence comes from the observation that words (and, more generally, syllables) that phonetically begin with a nuclear element in English can always have an optional glottal stop inserted before the nuclear element so as to fill the onset position of the syllable. Thus the Pig Latin form in (15b), [yutke], can be pronounced as [yutke] since its first element is a nuclear segment. However, the Dialect A form in (15a), [yutke], cannot be pronounced as [yutke] with an initial glottal stop, suggesting that the [y] onglide has shifted into the onset, thus filling the onset position of the syllable.

A second piece of evidence showing that the initial [y] in a Pig Latin form like [yutke] is part of the onset is that the indefinite article that would occur before it is a, as in 'a [yutke]' instead of 'the [yutke]'. Since a occurs before words beginning with an onset (as opposed to an, which occurs before words beginning with a nucleus), it shows that at least at the postlexical level the initial sound of [yutke] is part of the onset. This is consistent with the /I/-to-[y] rule in (17).

We thus see that both Pig Latin dialectal forms for cute can be derived with the phonotagonal analysis of the [y] onglide as shown in (16a). If the [y] onglide were part of the onset, then the Dialect A forms like [yutke] would be extremely problematic to derive. Analysing such forms would entail claiming that the Pig Latin rule moves only the first consonant of initial CyV sequences to account for the dialectal forms in (15a), but moves both the consonant and glide of initial CyV sequences to account for the forms in (14). However, such an account is indicative of the observation that the [w] and [y] onglides in CyV sequences pattern asymmetrically. We take this as reflecting a structural difference whereby the [y] onglide is co-moraic with a following vowel, whereas the [w] onglide is not co-moraic with the following vowel.

Additional support for this analysis comes from the learning of the Pig Latin rule by adults. In an informal survey carried out in an introductory linguistics course taught by the second author, students were taught the Pig Latin game based on words not beginning with CGV sequences. They were then tested on words beginning with such sequences. Native English speakers who knew the game in advance produced forms as described above: Native speakers who did not know the game in advance fell into one of two dialectal groups. Non-native speakers, however, exhibited far greater variability and did not distinguish the two glides: for these speakers, the two onglides either both patterned in the onset or both patterned in the nucleus.

Notice that the behaviour of non-native learners also dismisses an alternative analysis of the Pig Latin asymmetry based on spelling. One might suppose that the asymmetry in the Pig Latin rule was somehow a function of the fact that the [w] onglide is spelled, but the [y] onglide is not. Two considerations argue against an analysis built on this observation. First, while the [w] is spelled, it is often spelled as a vowel letter ('u'), and we might therefore expect it to behave like a vowel than like part of the onset. Second, if the critical factor were the orthographic representation, we would expect non-natives to behave like natives since the orthographic representation is equally available to both groups. Consequently, we see that both the Pig Latin evidence and the phonotactic evidence support an asymmetry of the two English onglides in CyV sequences.

4 The 'Name Game'

In this section, additional facts supporting an asymmetry between CyV and CyV sequences are cited from a second language game: the 'Name Game'. The general pattern has been described elsewhere (Hammond 1990) and we refer the interested reader there for further details. Basically, names undergo a pattern of substitution whereby the first consonant or the
onset of the word is replaced by [b], [f] and [m]:

(19)  Harry, Harry, bo-harry
      banana, na-ba-ry
      me my mo-mar-r-y
      Harry

If a name begins with a consonant cluster, however, there are two dialects.
In one dialect, the entire cluster is replaced with the same consonants. In
the other dialect, only the first consonant is replaced. We focus our
attention on the first dialect and say no more about the second. Contrast
the behaviour of names like Claire, Gwen and Beula in this first dialect:

(20)  kler  gwen  byula
      ber  ben  byula
      fer  fen  fiyula
      mer  men  myula

The behaviour of names like Claire in this dialect shows that the
emergence of Cy sequences with names like Beula is not because the game
produces permissible onsets in the latter case. Rather it shows that Cw
clusters pattern like true onset clusters and Cy clusters do not.

The name game forms thus provide support for the structural
distinction we have proposed between CwV and CyV sequences. Names like
Gwen undergo substitution of the entire Cw sequence because it is an
onset sequence. Names like Beula do not undergo substitution of the
entire Cy sequence because the [y] is not part of the onset.

5 Against [y]-insertion

We have assumed that both CwV and CyV sequences are underlyingly
present in English. While the underlying status of CwV sequences is
uncontroversial, the existence of underlying Cyu sequences is
controversial. Halle & Mohanan (1985), following Chomsky & Halle (1968),
do not view Cyu sequences as being underlyingly present. Rather they
maintain that such sequences are derived through a rule of [y]-insertion.
In (21) we present a simplified form of this rule. (The actual version of
this rule as found in Halle & Mohanan is given in (26).)

(21)  [y]-insertion (simplified)

\[ \emptyset \rightarrow y/\langle + \text{cor} \rangle /_{\text{stress}} \]  Condition: if a then b

The rule accounts for the presence of the [y] before the [u] in words like
those in (22):

(22)  cute, feud, mule, argue, beauty, huge, united, putrid, view

All of these would be posited as lacking any onglide in underlying
representation and they acquire the [y] by the application of (21)
specifically, by the expansion without the angled brackets.

The condition encoded by the angled brackets in the rule in (21)
accounts for the fact that insertion takes place after a coronal if the
following [u] is stressless. This is exemplified in (23):

(23)  virtue, menu, Mathew, volume, continue, residual

Compare the words in (23) with those in (24), where there is a stressed
vowel after the coronal consonant. In the dialect under consideration,
these words do not have a [y] onglide.

(24)  tune, assume, nuclear, enthusiasm, voluminous, continuity

The condition in the rule in (21) prevents the insertion of a [y] in words
like those in (24). This condition neatly accounts for the [y]-0
alternations in pairs like those in (25) (where the relevant alternation is underlined and
transcribed):

(25)  a. volume   [yu]    b. voluminous   [ui]
      continue   [yu]    contingency   [ui]
      residual   [yu]    residue     [u]
      perpetual  [yu]    perpetuity  [ui]

The words in (25a) all appear with [y] after the coronal consonant and
before the stressless [u]. No [y] appears before [u] in the related words in
(25b) since the [u] carries stress in these words. The [y]-0
alternations in (25) then seem to provide solid evidence for a [y]-insertion rule like that in (21).

Under the [y]-insertion analysis, the asymmetry between CwV and
CyV sequences is quite different from what was maintained earlier, where
the [w] was argued to be part of an onset and the [y] to be underlyingly
part of a diphthong. The asymmetry under the [y]-insertion analysis
involves the underlying presence of CwV sequences as opposed to the
absence of underlying CyV sequences. In this section, we specifically
argue against the [y]-insertion analysis based on a variety of evidence. In
particular, we show that the [y]-insertion analysis has led to the posting
of a very abstract vowel system for English where there is absolute
neutralisation; we also note the empirical problems with the [y]-insertion
analysis that have previously been observed by Boworsky (1984, 1986),
and we demonstrate that the [y]-insertion analysis is quite problematic in
accounting for the Pig Latin dialectal data. Thus, we maintain that there is
no [y]-insertion rule and the asymmetry between CwV and CyV
sequences is one where the [w] is part of an onset and the [y] is
underlyingly part of a diphthong.

The major problem for a [y]-insertion analysis like that in Halle &
Mohanan (1985) is how to distinguish those instances of the vowel [w]
which trigger; insertion (as in cute [kju:ɪ]) from those that do not (as in cool
[ku:]). This leads to an analysis that involves absolute neutralisation. In
Halle & Mohanan, the [u] that triggers the (lexical) rule of [y]-insertion is
analysed as underlyingly being the high back unrounded vowel /i/. The
rule of [y]-insertion then actually applies before /i/ (and not [u] as in (21)). A later rule rounds all instances of /i/ to [u]. Thus, for example, the middle syllable of the word copula would underlyingly be /pi/ and would become [pyu] by the derivation in (27). In (26), we give the revised [y]-insertion rule

(26) \[ y\text{-insertion (revised)} \]
\[ \theta \to y /\langle \text{cor} \rangle_x \langle \text{stress} \rangle_b \]
Condition: if a then b

(27) Derivation of [pyu] in copula from /pi/ (cf. Halle & Mohanan)

UR /pi/
[y]-insertion pyi
/i/-rounding pyu
PR [pyu]

The analysis can be viewed as problematic because it makes use of absolute neutralisation; all instances of underlying /i/ are realised on the surface as [u]. While there are a few well-motivated examples of absolute neutralisation in the literature (such as the posited /u/ in Yawelmani Yokuts we take it as axiomatic that, ceteris paribus, the preferred analysis is one that avoids absolute neutralisation.13 This follows from the fact that any phonological system should be learnable, and, all else being equal, underlying representations that are similar to surface representations are more learnable.

There are also certain empirical problems with Halle & Mohanan's (1985) analysis that are observed by Borowsky (1984, 1986). In particular, Halle & Mohanan are unable to account for the observation made by Borowsky that [y] does not occur in a word-initial stressless syllable that begins with a coronal. This can be seen from a word like tuitio, which is specifically mentioned by Borowsky, as well as other words such as Teutonic, tumultuous and neurotic; all of these are predicted by Halle & Mohanan (1985) to surface with a [y] after the word-initial coronal.14

Borowsky makes the additional observation that Halle & Mohanan are unable to account for the lack of [y]-insertion in the name Agnew; relatedly, they cannot account for the lack of [y]-insertion in similar words like altruistic, altruism and affluent. If one examines the second syllable in these four words, the environment for [y]-insertion (26) seems to be met since the vowel appears to be the relevant one in terms of quality, the vowel is also stressless and is preceded by a coronal consonant. Nonetheless, the rule in (26) does not apply to these words.

The lack of [y]-insertion in words like Agnew and tuitio led Borowsky to posit a very different analysis of these forms and essentially to reject the rule of [y]-insertion. Let us consider her analysis in comparison with the [y]-insertion analysis.

One of the attractions of the [y]-insertion analysis is that it readily accounts for the [y]-o alternations given in (25). The rule of [y]-insertion applies before the [u] in the words in (25b) since that vowel is after a coronal consonant and is stressless. [y]-insertion does not apply to the related forms in (25b) since the [u] following the coronal consonant in those words is stressed. Borowsky (1984, 1986), though, is able to account for the [y]-0 alternations in (25) without a rule of [y]-insertion. She assumes that the transcribed syllables in (25) are underlyingly all /tu/.

She argues on the basis of independent evidence (following Selkirk 1982) that English has a rule of stress-based resyllabification that has the effect of resyllabifying an onset consonant of a stressless syllable into the code of an immediately preceding (stressed) syllable. Such a rule resyllabifies the lateral [l] of volume into the code of the initial syllable, but the lateral [l] of voluminous does not resyllabify since it is before a vowel with stress. In (28) we show the syllabification of these two words (where a period indicates a syllable boundary).15

(28) Syllabification of volume and voluminous

Initial syllabification: val.yum va.l(ys)um.a.nus
Effect of stress-based resyllabification: val.yum va.l(ys)um.a.nus

As the result of resyllabification, the onglide in volume is no longer in the same syllable as the preceding coronal consonant, /l/. On the other hand, in voluminous, resyllabification does not affect the lateral+onglide sequence, so the onglide remains in the same syllable with the coronal /l/. Now, recall the phonotactic constraint that was mentioned earlier in (7), that a coronal cannot occur before [y] in a syllable-initial sequence. The output of resyllabification shown for the word volume in (28) does not violate the constraint since the [l] and the [y] onglide are in separate syllables; both surface. On the other hand, in the word voluminous there is no onglide that surfaces. Stress-based resyllabification does not affect the /l/ since it is in a stressed syllable. Thus, after stress-based resyllabification the [l] and the [y] onglide in voluminous are in the same syllable. This violates the constraint in (7) and thus the [y] onglide deletes. That is, there is a rule of Onglide Deletion that deletes the onglide [y] when it is tautosyllabic with a preceding coronal. The rule is formulated in (29):

(29) Onglide Deletion

The implication is that the constraint in (7) is not one on underlying representations but on later syllabification. The onglide can follow a coronal in underlying representation (indeed, it can follow any consonant, which is exactly what we would expect if it is underlyingly a vowel
While the [y]-insertion analysis readily handles the two dialectal forms of *cute*, it makes the prediction that for the word *tune* there should be two Pig Latin dialectal variants. Speakers of Dialect A should have the Pig Latin variant [unte] for *tune* while speakers of Dialect B should have [unte]. This is shown by the two hypothetical derivations in (32):

(32) Hypothetical derivation of *tune* (assuming [y]-insertion)

\[\text{a. Dialect } A \quad \text{b. Dialect } B\]

<table>
<thead>
<tr>
<th></th>
<th>UR</th>
<th>Pig Latin rule</th>
<th>PR</th>
</tr>
</thead>
<tbody>
<tr>
<td>[unte]</td>
<td>[unte]</td>
<td>/tun/</td>
<td>[unte]</td>
</tr>
<tr>
<td>[y]-insertion</td>
<td>yute</td>
<td>/t/-to-[y] rule</td>
<td>[unte]</td>
</tr>
<tr>
<td><em>tune</em></td>
<td></td>
<td>/n/a</td>
<td></td>
</tr>
</tbody>
</table>

However, speakers of both Dialect A and Dialect B uniformly have [unte] for *tune*. This presents a serious challenge for the [y]-insertion analysis of Dialect A. That is, Dialect A speakers produce [yute] for *cute* but [unte] for *tune*. In order to derive this specific pattern of Dialect A, while maintaining a [y]-insertion analysis, different rule orderings are required for these two forms. The form [yute] requires the application of the Pig Latin rule before [y]-insertion, as shown in (31a), but the form [unte] requires the ordering of the [y]-insertion rule before Pig Latin, as shown in (32b). The fact that the [y]-insertion analysis is unable to account for the derivation of the Dialect A forms [yute] (for *cute*) and [unte] (for *tune*) in a unified manner calls into question the validity of the [y]-insertion analysis.

On the other hand, under our analysis, in which there is an underlying phoneme /t/ and no rule of [y]-insertion, the fact that speakers of both Dialect A and Dialect B uniformly have [unte] for *tune* is unproblematic. The word *tune* simply lacks an onglide in underlying representation since there is no dialect-specific evidence that an onglide is ever present. Recall from (18) that the Dialect A form for *cute*, [yute], was derived by ordering the Pig Latin rule before the /u/-to-[y] rule (17), while the Dialect B form, [kte], was derived by ordering the Pig Latin rule after the /u/-to-[y] rule. The form [kte] (for *tune*) is correctly derived in both Dialect A and Dialect B simply by the application of the Pig Latin rule. The /u/-to-[y] rule in (17) is simply not relevant. The specific derivations of Pig Latin [unte] for both Dialect A and Dialect B are shown in (33a) and (33b), respectively:

(33) Derivation of *tune*

\[\text{a. Dialect } A \quad \text{b. Dialect } B\]

<table>
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</tr>
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<td><em>tune</em></td>
<td></td>
<td>/n/a</td>
<td></td>
</tr>
</tbody>
</table>

Thus, we see that our analysis is able to account for the forms in Pig Latin Dialect A in which speakers have [yute] for *cute* and [unte] for *tune*. As
shown in (31) and (32), the [y]-insertion analysis of Halle & Mohanan is unable to account for this particular Pig Latin pattern of Dialect A.14 We take the cumulative evidence from the Dialect A forms of Pig Latin, the specific empirical problems noted by Borovsky discussed earlier, as well as the issue of the absolute neutralisation of /u/, as arguing against a [y]-insertion analysis of the [y] onglide in American English. Additionally, we have shown that none of these concerns arise in our analysis. The Dialect A Pig Latin forms are accounted for as shown in (18a) and (33a); there are no empirical problems concerning words like tuition and Agnew; and our analysis does not involve absolute neutralisation. We consider all this as constituting strong evidence for an underlying /u/ phoneme in American English.

As a final observation, it is interesting to note that in the derivations for the Pig Latin forms of the word cuit in (31), which reflects the [y]-insertion analysis, the rule of [y]-insertion crucially interacts with the Pig Latin rule. Such an interaction presents a counterexample to the observation made by Mohanan (1982) that language game rules (or secret code rules), like the Pig Latin rule, do not interact with the rules of the lexical phonology. That the Pig Latin rule applies before the lexical rule of [y]-insertion in the derivation in (31a) can thus be seen as constituting an additional problem for the [y]-insertion analysis.

Along these lines, it is also interesting to consider the discussion in the literature regarding the interaction of speech errors with (actual or potential) [yu] sequences. Anderson (1988) shows that the speech error evidence is compatible with an underlying /u/ analysis of English [yu] sequences.15 On the other hand, Myers (1983) shows that the speech error evidence is compatible with the [y]-insertion analysis of such sequences. We do not discuss the speech error evidence in the body of this paper because we believe it is conclusive with respect to the two different analyses. Most of the errors that are cited that relate to [yu] sequences can be accounted for either with the underlying /u/ analysis or the [y]-insertion analysis of [yu] sequences.16 What is interesting, though, is the observation that emerges from Myers (1993), that [y]-insertion is virtually the only lexical rule in English that interacts with speech errors. As Myers notes, speech errors provide virtually no evidence for other lexical rules like Vowel Shift and Velar Softening.17 The fact that both Pig Latin and speech errors have an interaction with [yu] sequences, but do not otherwise generally provide evidence for rules of the lexical phonology, is consistent with our contention that there is no rule of [y]-insertion in American English and that such sequences are underlyingly present.

6 Conclusion

Languages differ in their treatment of onglides. Some languages treat onglides as part of the syllable onset, while others treat them as part of a diphthong. In this paper we have argued that English onglides in CGV sequences display asymmetrical behaviour. The relevant phonotactic constraints and the language game Pig Latin treat the [w] onglide in CGV sequences as part of the onset while the same phenomena treat the [y] onglide in CyV sequences as part of a diphthong, co-moronic with the following vowel. The stress evidence in (10) shows that the [y] onglide is specifically co-moronic and not independently moraic.

Our analysis of these phenomena maintained that onglides are present in underlying representation. Thus we posit that English has an onglide diphthong /yu/. This required us to argue against a [y]-insertion analysis in which there are no underlying CyV sequences in English; all such sequences are derived by the lexical [y]-insertion rule. We argue against the [y]-insertion analysis by showing that it is quite problematic in that it can involve absolute neutralisation, it has various empirical problems and it cannot account for relevant Pig Latin forms. Moreover, the apparent interaction of both Pig Latin and speech errors with the lexical rule of [y]-insertion is problematic given that such external evidence does not normally reflect the workings of the lexical phonology.

We conclude that American English witnesses an asymmetry in the structure of its onglides. We leave for future research the issue of whether similar asymmetries are witnessed in other languages as well.

NOTES

1. We would like to acknowledge Kenneth de Jong, Richard Demers, Daniel Dinneen, Emmanuel Dupoux, Morris Halle, Richard Ianda, John Kanerva, Michael Kenstowicz, Yonggung Lee, James Myers, Donnal Jo Napoli, Paul Newman, Douglas Pulleyblank, Mary Ellen Scullen and Donca Steriade for comments and discussion on this paper. We also thank three anonymous reviewers and the editors for their critical comments. Earlier versions of this paper were presented at Indiana University, Swarthmore College, Pusan University of Foreign Studies, and the Annual Meeting of the Linguistic Society of America in January 1994. The usual disclaimers apply.

2. We assume the moraic syllable structure of Hayes (1989), in which pronominal onglides are the surface representation of the syllable by the term 'onset'. We sometimes refer to the diphthongal analysis of onglides, shown in (2), as the nucleus analysis of onglides. Given the syllable structure shown in (1) and (2), in the onset analysis, the onglide is not immediately dominated by a mora, whereas in the nucleus analysis it is dominated by a mora. Thus, we use the terms 'onset' and 'nucleus' for convenience and clarity. We do not take a position as to their formal status as constituents of the syllable (though see Dwyer, 1990 and Shaw, 1993 regarding evidence for their status as constituents even within moraic theory). Additionally, in this paper, we use the symbol [y] to represent a palatal glide.

3. We want to reiterate that we will only be examining a standard dialect of American English, that spoken by the authors, who are both from California. We are aware that the patterning of onglides is different in other dialects of English, but our aim in this paper is to offer a synchronic account of the onglide patterning in the dialect under consideration. We will not consider the comparative dialectal data nor the diachronic development of the onglides in English.

4. It is interesting to contrast the two types of constraints with respect to the pronunciation of onglides, the onglide of the Spanish word muve (muve) 'nine' (in which the initial [nv] sequence constitutes a sonority violation) is typically
Optimality Theory (Prince & Smolensky 1993). We do not do this here for several reasons. First, our proposal is independent of the potential merits of Optimality Theory. Second, a rule-based analysis is more familiar to most readers, and therefore more readily accessible and evaluated.

[10] In the example of copula the syllable with the inserted [y] does not attract stress. In cases such as Bermudan, in which the [u] that triggers [y]-insertion is also stress-attracting, the derivation is more complex than shown in (27). Essentially, in Halle & Mohanan's (1985) analysis, the stress-attracting [u] is distributed in BERMUDA as being underlingly the long mid back unrounded vowel /ɑː/. According to them, this vowel eventually undergoes vowel shift to [i]; [y]-insertion and /i/-rounding would then apply as in (27) to produce the surface [yu] for the penultimate syllable in Bermudan. In our analysis of copula and Bermudan, both words would have the underlying /ju/ unrounded vowel. As noted in §2.2 and shown specifically by the data in (10), this vowel is normally not stress-attracting since it is monomoraic; the word Bermudan would be lexically marked for penultimate stress in a way similar to words like 1sland and giant, which also have exceptional penultimate stress. It is important to note that all instances of /ju/ that surface with stress seem to be long, Levin (1987), whose analysis of [y]-insertion is similar though not identical to Halle & Mohanan's (1985), posits a rule tensing /i/ when it is stressed, which has the effect of lengthening it. In our analysis, in order to account for the surface length of the stressed /u/ in words like Bermudan (assuming that /yu/ is indeed long, as Levin maintains), we would posit a rule similar to Levin's that lengthens a stressed [u]. The representation of this long diphthong would be as in (i).

(i) /u/
realize that the underlying [u] sequence is discussed by both Myers (1992) and Anderson (1988). This is shown below:

(i) Error: /rud/ Target: feud

(Myers analyses this error as supporting the [u]-insertion analysis. Specifically, given that in the error the coronal [i] is inserted into the onset, the environment for the rule of [i]-insertion is destroyed; consequently, the [u]-insertion analysis correctly predicts that the rule should fail to apply. On the other hand, Anderson (1988) analyses the error in (i) as evidence that the underlying [u] in a [yu] sequence can be inserted on its own. Anderson seems to suggest that if [i] is replaced by an onset consonant [j] in the error in (i) and that this supports his view that [u] in [yu] sequences is derivatively associated with the onset (though...


