For Randy

VOWELLESS CHINESE?

AN APPLICATION OF THE THREE TIERED THEORY OF SYLLABLE STRUCTURE TO PEKINGESE

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Talk of "vowelless" languages no doubt still strikes many, or even most, linguists as impossibly paradoxical. The elegant analysis of Kabardian by A.H.Kuipers (1960), going one better than W.S.Allen (1956), who had shown that Abaza had only a single vowel phoneme, was greeted with widespread scepticism and some controversy (Szemerényi 1967, Halle 1970, with a reply by Kuipers 1976). As Stephen Anderson (1978) has shown, however, recent developments in generative phonology which have reintroduced the syllable into phonology as a basic organizational principle and have broken down the autonomy of the segment in the traditional sense, have made Kuipers' analysis seem more acceptable. It is not my purpose, however, to go over this old ground but to transfer the discussion to quite another type of language, namely Chinese.

Since 1963 I have been arguing that the vowel system of Old Chinese as revealed in the earliest poetic rhymes (ca.600 B.C.), like the Northwest Caucasian languages, had only a two-way contrast between a low /a/ and a non-low /ə/ (see also 1973 and 1977-78). This has been resisted on the grounds that such a vowel system is unnatural (see, for example, Ting 1975:32). Ting does not refer to the N.W. Caucasian parallels, perhaps because such strange languages, with their exceptionally large inventories of consonants as well as so few vowels, don't seem to be natural languages. Vertical vowel systems, with only an /ə//a/ contrast, and with a much more modest complement of consonants, have, however, been reported from other parts of the world, for example, Australia (Dixon 1980:131).

Of more direct relevance is the importance that the two-way contrast in vowel height symbolized by /ə/ and /a/ has played throughout the history of the Chinese language, a point that Ting himself refers to. This can be illustrated not only from Old Chinese but also from Late Middle Chinese and Early Mandarin (Pulleyblank 1982). In this paper, however, I shall only discuss the phonology of present day Mandarin which, in fact, provides a very good illustration, mutatis mutandis, of what I believe has been the underlying pattern of Chinese phonological structure throughout its history.

A "vertical" analysis of Pekingese in terms of three vowels, distinguished only by height, and the semivowels j, w and r was made by L.M. Hartman as long ago as 1944, developing suggestions made by Y.R.Chao in 1934. C.F. Hockett (1947, 1950) reduced the central vowels to two but rewrote the semivowels j and w as the vowels i and u, giving the vowel system a more normal appearance. Since then there have been many attempts, which I shall not take up space to discuss, to suggest better solutions to problems left by Hartman and Hockett or to provide new analyses in a generative framework. I shall only refer to my own recent article on the subject (1981), in which, by treating schwa as always epenthetic and /a/ as the syllabic form of the low glide /H/ (or /a̯/) which can also occur both initially and finally as a nonsyllabic margin, I open the way to a "vowelless" analysis comparable to that of Kuipers on Kabardian.

The more receptive climate that recent developments in generative phonology have created for this type of theory has

encouraged me to try to present these insights in a new framework. In so doing I have found my previous analysis not only confirmed but clarified and simplified in important ways.[1]

Pekingese Initials

k	k^h		x	H(~ɣ)
tɕ	$tɕ^h$		ɕ	j
tʂ	$tʂ^h$		ʂ	r
ts	ts^h		s	
t	t^h	n		l
p	p^h	m	f	w(~ʋ)

Table 1

Every syllable in Pekingese, with the exception of those which consist only of syllabic ɻ, such as <u>ér</u> "child", <u>ěr</u> "ear", <u>èr</u> "two", and a small number of interjections and clitics, begins with one of the consonants in Table 1.

The so-called "zero" initial, found in words like <u>ān</u> "peace" or <u>ēn</u> "favour", is the laryngeal glide /H/ in the above table. It must be emphasized that, though, for some speakers, this is realized as smooth voiced onset, as is implied by the usual

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[1]I am very much indebted to Moira Yip for making me aware of this and for her interest and patience in offering comments and suggestions. Patricia Shaw has also been helpful. All errors and misunderstandings are, of course, my own.

romanization, it is phonologically a consonant as much as /j/ or /w/ or /x/ or /k/. As was pointed out by Y.R.Chao (1948, 1968:20) the majority of the speakers of the dialect actually pronounce it as a "frictionless velar or uvular continuant". He notes that it prevents linkage of a preceding final -n. This is in contrast to the enclitic particles -a and -ou, which have true vocalic onset and link with a preceding syllable. Other, less common, pronunciations include glottal stop and the velar nasal ŋ. The latter, which is the normal pronunciation in several Mandarin dialects, is responsible for the traditional French romanization, which writes, for example, ngan for ān "peace". (See also F.K.Li 1966, who in a way, anticipates my "vowelless" analysis of Mandarin.)

It might help those who find difficulty with the idea of fully voiced laryngeal onset as a real consonant and not just the absence of a consonant if one were to call the Pekingese initial /ɣ/ and regard smooth onset, when it occurs, as merely a surface elision. In support of this would be, not only the majority pronunciation as claimed by Chao and Li, but also the way in which it patterns as the voiced counterpart of /x/. This would, however, fail to show the phonemic connection with the laryngeal glide /H/ (or /ă/, which is merely an alternative way of writing the same thing) in final position.

The phonological reality of the glide /H/ is a very important concept which, unfortunately, many people seem to find very difficult to understand or accept. Chomsky and Halle (1968) distinguish the high glides, /j/ and /w/, from low glides, which

they exemplify as /ʔ/ and /h/. Both of the latter, however, differ in important respects from the fully voiced high glides /j/ and /w/. In at least some languages /ʔ/ and /h/ pattern as voiceless stops and fricatives respectively. Even the so-called voiced /ɦ/ has a special type of phonation between full voicing and voicelessness (Ladefoged 1975:121ff.). The IPA classification of voiced /ɦ/ as a voiced fricative is quite appropriate in some respects to characterize its behaviour in Chinese. The true laryngeal counterpart of the high glides /j/ and /w/ is smooth voiced onset, which is inaudible as distinct from the vowel that accompanies it but constitutes a definite laryngeal gesture in contrast to other types of laryngeal gesture, /ʔ/, /h/ or /ɦ/, that can occur instead at the transition before a vowel sound.

/H/ as a postvocalic glide is a more familiar concept. It is none other than the phoneme /h/ used in the Bloch and Trager analysis of English vowels. Because of its phonetic contrast with initial h, Gleason (1961) uses /H/ instead, providing a precedent for my usage. The relevance of this to the analysis of Pekingese finals will be discussed in the next section.

There is no doubt that other languages besides Chinese have /H/ as an initial phoneme. This must be the original value of the Tibetan letter ha-chung or "little a", which contrasts with ʔa-chen or "big a", standing for glottal stop, in the Tibetan alphabet. Such an interpretation was proposed by Jäschke in 1881 and again by Clauson and Yoshitake in 1929 but has been much disputed, principally, I think, because of the difficulty that people have in accepting that a consonantal sign could be used to

write what seems to be phonetically simply the absence of a consonant. Yet it is quite natural given the conventions of the Tibetan writing system, which has no symbols for initial vowels as such. It is also the only interpretation that makes sense both of the known graphic origin of the sign and all its various uses in Tibetan (Pulleyblank 1983).

The so-called h-aspiré of French can also be interpreted as /H/. As is well known, some words with orthographic initial h in French behave as if they had an initial consonant in spite of the fact that phonetically in isolation they are indistinguishable from words that begin with vowels. This is shown by the fact that vowels are not elided in front of them, consonants are truncated, and they are preceded by the preconsonantal forms of adjectives. Compare le héros: l'enfant, petit héros [pəti ero]: petit enfant [pətit ãfã], beau héros: bel enfant. This is evidently very much like the difference in Chinese between words with initial /H/, which resist linkage with a previous syllable, and the enclitic particles, with a true zero initial, which do not. This will be discussed more fully below.

The glides /j/ and /w/ are not normally included in the inventory of Pekingese initial consonants but are treated as medials after the "zero" initial. This is particularly unsatisfactory in the case of /w/, which behaves in important respects like a labial initial consonant and which has an alternative realization as a labiodental approximant [ʋ], being thus the voiced counterpart of the fricative /f/ in the same way that /H/ is the voiced counterpart of /x/. Treating w as

always a medial has created a pseudo-problem over the syllable [wəŋ], which has been compared, not with [pəŋ], [fəŋ], [məŋ], which also have labial initials, but with [kuŋ], [k^huŋ], [xuŋ], which have underlying /kw/, /k^hw/, /xw/. The nonoccurrence of *[Huŋ] can be accounted for by a general rule excluding high glides after /H/ or deleting /H/ before high glides in underlying forms in Pekingese (though not in all forms of Chinese). (For earlier discussions of the syllable [wəŋ] see, for example, Hartman 1944, Hockett 1947, Cheng 1973, Chen 1976.)

The evidence for /j/ as an initial is not quite so clearcut. Phonetically, however, it is certainly present in a word like yáng "sheep". One of the difficulties that has prevented scholars from acknowledging it as a consonant in such cases has been the high degree of complementary distribution between the occurrence of [j] as a glide and [i] as a vowel, which has led people to wish to regard them as members of a single phoneme. This can be taken care of, however, by the rules of vocalization. As we shall see, when [i] or [u] appear as vowels, they derive from underlying /j/ or /w/ associating with the V node of the syllable template.

Another problem that has been much discussed in connection with the Pekingese initials is that of the palatals, which are in complementary distribution with not only the velars but also the alveolar sibilants ts, ts^h, s, and the retroflexes $t\c{s}$, $t\c{s}^h$, $\c{s}$. Historically this is very easy to account for, since the palatals have arisen in comparatively recent times through the palatalization, first of the velars and later of the alveolar

sibilants, in front of high front vowels. At the same time the high front vowels were lost after retroflexes. There is some evidence that synchronically the palatals are related to the velars (Chao 1968:21). Following the usual recent practice, I have treated them as autonomous phonemes.

The labial initials must be analyzed as having an inherent w component, which never surfaces as a w glide but which can vocalize as u under certain circumstances. The inherent labialization of labial consonants has been a characteristic of Chinese throughout its history, leading, for example to the dissimilation of final labial after labial initials which is very nearly universal in dialects that still preserve final -m and -p.

The palatal-labial glide ɥ also surfaces as an initial in words like yuǎn "distant". In the table of finals this is treated as a combination of j and w. This will also be discussed below.

Pekingese Finals

The traditional division of Chinese syllables into Initial + Final leads to ambiguities when the initial is a glide which can also occur as a "medial" between other consonants and the nucleus. The usual practice in such cases has been to treat the glide as a part of the final, with "zero" initial when it in fact surfaces as the syllable initial. One of the advantages of the new analysis of syllable structure that I shall propose is that it disposes of this problem. It will be convenient, however, to present the data first in the traditional way. This is done in Table 2, using the analysis of my article (1981).

Neutral	Palatal	Labial	Palatal-labial
ʐ̩, ɾ̩	i	u	y
əă [ɚ^]	iă [iɛ]	uă [uɔ^]	yă [yɛ]
aă [ɑ]	jaă [jɑ]	waă [wɑ]	
əj [ej]		wəj [wej]	
aj		waj	
əw [ow]	jəw [jow]		
aă̆w [ɑw]	jaă̆w [jɑw]		
ən	in	wən	yn
an	iăn [iɛn]	wan	jwan [ɥan]
əŋ	iŋ	uŋ	juŋ
aă̆ŋ [ɑŋ]	jaă̆ŋ [jɑŋ]	waă̆ŋ [wɑŋ]	

Table 2

The vertical columns in the above table correspond to the traditional four-fold classification of Chinese syllables as: (a) "open mouth" (kāikǒu), i.e. neutral in respect of palatal or labial features, (b) "level teeth" (qíchǐ), i.e. with spread lips = palatal, (c) "closed mouth" (hékǒu), i.e. having a high back rounded vowel or prenuclear glide, (d) "pursed mouth" (cuōkǒu), i.e. having combined palatal and labial features -- note that I write this, when a glide, as the sequence jw; this will be justified in a later section.

The horizontal lines of the table are arranged according to the final syllable closure, which may be zero, one of the three glides a, j or w, or one of the nasals ŋ or n. It will be seen that, except for syllables with no consonantal closure, which can only have syllabic ʐ̩ or ɾ̩ or one of the high vowels i, u, y, the remaining finals fall into pairs having the same closure and

relatively non-low and low nuclei. There are some gaps. Thus there are no finals in the palatal column ending in j and no finals in the labial column ending in w. The combined palatal-labial column is subject to both these restrictions. The syllable jaj, with j as initial, found in the one word yái "cliff", is still sometimes listed among Pekingese finals but it appears to be obsolete, having been replaced by an alternative form yá, which is also of ancient origin. Less systematic gaps, for which, however, historical explanations can be found, are *jwaă and *jwaăng.

The glide /H/ or /ă/ has been discussed above as an initial. Introducing it as a final closure for what have usually been taken to be open mid and low vowels has a number of important advantages that have been fully dealt with from a synchronic and diachronic point of view in Pulleyblank (1981). As in the case of initial /H/, similar advantages can undoubtedly be found in the analyses of other languages. For example the case of Turkish da: "mountain", which behaves as if it ended in a consonant in its inflexional forms, is discussed by Clements and Keyser (1981:46). As in their discussion of h-aspiré, they seek to explain it by an empty C node in the syllabic skeleton. A better explanation, I would suggest, is to assume that the melody contains the laryngeal glide /H/ as an actual consonant. This is historically well justified, since the word in question earlier ended in -ɣ and still shows a velar glide in some dialects. The final /H/ will account, not only for the long a: in the nominative but also for the fact that the dative form daa, i.e.

/daHa/, has short a in both syllables. When it has no vowel following, /H/ is in the same syllable as the preceding vowel but when the vowel suffix is added, it becomes the onset of the following syllable, as in (1).

(1)

da: daa

In the phonology of Pekingese positing /H/ as a final glide provides a simple and natural solution to such vexing problems as the distinction between kəăr from kəă "song" and kər from kən "root" which have bothered students of Pekingese phonology from Hartman onwards. Evidence, both diachronic and synchronic, for interpreting it as the nonsyllabic form of the vowel a will be given below.

The phonetic values for the combinations əă [ɚ˄], iă [iɛ˧], uă [uɔ˧], aă [ɑ] may be compared to those of the English vowels which have final /h/ in the Bloch and Trager analysis of English, e.g. Southern British fir [fɜ], dear [dɪə], pour [pʊə], far [fɑ]. Especially noteworthy is that in both languages the combination /aH/ is a low back unrounded monophthong with no noticeable offglide. This treatment of [ɑ] can probably be extended to other languages as well, making it unnecessary to distinguish the vowels [a] and [ɑ] in terms of backness and so disposing of apparent cases of more than three degrees of vowel height among front vowels. Refinements in the interpretations of some of the other vowels will be proposed below.

The pairing of finals with the same consonantal endings and relatively higher and lower nuclear vowels corresponds to a very ancient pattern in Chinese that was alluded to in the preamble to this article. Thus with final -n we have -ən and -an, -in and -iɛn, -wən and -wan, -yn and -jwan. With final -ŋ we have -əŋ and -aăŋ, -iŋ and -jaăŋ, -uŋ and -waăŋ, and so on. One of the perennial problems of Pekingese phonology has been to account for this pattern. A typical solution is that of Matthew Chen (1976), who postulates two underlying central vowels, ə and a, combining with the medials ø, i, u, y, thus: /ən/ /iən/ /wən/ /yən/, /an/ /ian/ /uan/ /yan/, /əŋ/ /iəŋ/ /uəŋ/ /yəŋ/, /aŋ/ /iaŋ/ /uaŋ/. In forms like -in, -yn, -iŋ, -uŋ it is assumed that the schwa has been deleted in the course of derivation (though little attempt has been made to explain case by case why such deletions occur). It is my contention, on the contrary, that schwa is not present in underlying forms but is inserted, as required, between consonants in the course of derivation. Before discussing this in detail, however, it is desirable to look at the one piece of morphology in Pekingese that throws light on syllable structure. This reveals further permutations of forms with and without schwa.

The analysis of final [iɛn] as iăn, that is with syllabic i and the glide ă, in contrast to wan, with nonsyllabic w and the vowel a, was another innovation of the present analysis. It is justified in the first place by the close phonetic resemblance to -iă [iɛ] as a separate final. Further synchronic evidence comes from the morphology of the r-suffix. The question will be

discussed again in the analysis of syllable structure and some further refinements in the interpretation of the finals [iɛn] [iɛ] [uɔ] [yɛ] will be proposed.

The vowels e and o are the forms taken by ə in front of j and w respectively. The fronting and back-rounding can be considered to be late rules of assimilation following vocalization by shwa insertion. This question will be discussed further below.

As noted above in connection with the initials, the front-rounded glide ɥ is not set up as a distinctive medial but is treated as a sequence jw. Arguments to justify this will be given below.

Tones

In additon to an initial and a final, Pekingese syllables have a tone. Since they have only a marginal bearing on the issues being discussed here, tones will be disregarded.

The Retroflex Suffix

In addition to the finals listed in Table 2, which occur in independent morphemes, there is a set of compound finals formed by adding the suffix -r, originally diminutive in meaning, derived from ér "child". This can be added to syllables of all kinds except onsetless syllabic r itself. The derivation of these forms is shown in Table 3.

z̩,ɻ̩+r->ər	i+r->jər	u+r->ur	y+r->ɥər
əă+r->əăr/ər	iă+r->jəăr/jər	uă+r->uăr	yă+r->ɥəăr/ɥər
aă+r->aăr/ar	jaă+r->jaăr/jar	waă+r->waăr/war	
əj+r->ər		wəj+r->wər	
aj+r->ar		waj+r->war	
əw+r->əwr	jəw+r->jəwr		
aăw+r->aăwr	jaăw+r->jaăwr		
ən+r->ər	in+r->jər	wər->wər	yn+r->ɥər
an+r->ar	iăn+r->jar	wan+r->war	jwan+r->ɥar
əŋ+r->ə̃r	iŋ+r->jə̃r	uŋ+r->ũr	
aăŋ+r->ãăr	jaăŋ+r->jãăr	waăŋ+r->wãăr	

Table 3

The alternative forms in əăr and ər in the second line are found in tones 1 and 2 and tones 3 and 4 respectively. Older speakers of the dialect have the forms in ar in line three but the forms in aar are said to be commonly used by recent immigrants to Peking.

The morphophonemic changes caused by r-suffixation can be summed up as follows:

(1) Syllabic z and r are dropped and replaced by schwa.

(2) Syllabic i and y are replaced by the corresponding glides and schwa is inserted except in the final -iăn in which a becomes syllabic.

(3) Final j and n are deleted before r.

(4) Final ŋ is replaced by nasalization of the vowel.

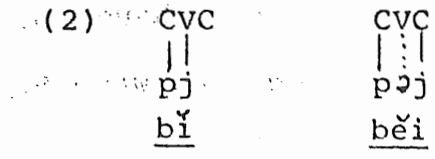
(5) Final w is retained unchanged before r.

(6) Final ă is retained before r after schwa in Tones 1 and 2, which end High, but is deleted in Tones 3 and 4, which end Low. Whether it is retained or lost after a has been much disputed. Y.R.Chao claimed never to have heard people distinguish between -ar from -aj or -an + r and -aăr from -aă + r but see Wang Fushi (1963), who says that such a distinction is common, especially among newer immigrants into Peking.

The Theory of Syllable Structure

Using a framework derived from J. McCarthy's studies on Semitic languages (1979, 1981), M. Yip proposes that, "morphemes in Chinese consist of an invariant monosyllabic skeleton [of the general pattern C(G)V(G)C] together with a phonemic melody consisting of segmental and tonal material. Since the skeleton is constant in any given dialect, it need not be specified for any given morpheme. The morpheme, therefore consists of the melody alone, just like Semitic morphemes"(1982:647). This will work for Mandarin as usually described, with schwa as a fully specified vowel in the underlying melody, but runs into difficulty if one claims, as I do, that schwa is always epenthetic, and if, furthermore, glides and vowels are segmentally identical and distinguished only by whether or not they occupy the nucleus of a syllable or belong to the consonantal margins. Thus if bǐ "compare" and běi "north" are analyzed respectively as in (2)

(2)



we clearly need some additional means to distinguish them in the lexicon.

Clements and Keyser (1981:8) suggest that, if one dispenses with the feature [syllabic] as a specification for segments, it is necessary to retain the feature [vocalic] to distinguish [+vocalic] vowels which must necessarily be dominated by V from [-vocalic] segments, including glides, which may be dominated by either C or V. In the present case, however we should have to reverse the rule and say that [-vocalic] segments must be dominated by C and [+vocalic] segments may be dominated either by C or V. This follows from the fact that in r-suffixation pi + r gives pjər, while, on the other hand, final glides never become syllabic.

Even such an unnatural stipulation would not really solve the problem. It would lead to a quite arbitrary division of post-initial glides into those that alternate with syllabic vowels and those that do not. Moreover, although syllable final glides do not normally interchange with vowels in the synchronic phonology of Pekingese, there are cases in which syllabic vowels have become final glides diachronically. Thus Early Mandarin had syllables like fi and vi which have now become /fəj/, /wəj/. It would seem to be quite arbitrary to require that underlying segments must undergo a feature change when such a change took place but that the synchronic change of pi to pjər involves no change of feature.

Another example of the same kind shows the change of syllabic a to nonsyllabic final ă. This occurred when syllables

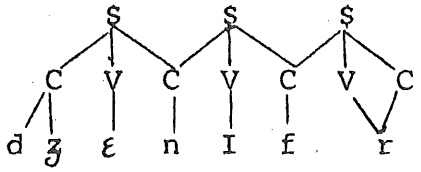
such as tçjaj and çjaj, which existed in Mandarin in the not very distant past, lost their final glides through dissimilation and became tçiă and çiă. There is even some evidence that this rule still exists synchronically in Mandarin. In the Mayka secret language of Peking when the syllable çjaj is generated it is changed automatically to çiă [çiɛ]. (Yip 1982:640).

At least as far as Pekingese is concerned, therefore, the feature [vocalic] seems to be of no use to distinguish glides and vowels. Moreover, it seem doubtful that a phonetic feature is at all appropriate for this purpose. Ladefoged classifies the high vowels and corresponding glides together as approximants and doubts whether there is any physical measure which can distinguish them, even duration (1971:81). It would be even more difficult to distinguish the low glide ă from the vowel a by anything but its position in the syllable. The feature [vocalic] seems to be still needed, but as a classificatory term to distinguish glides and vowels together from all other phonemes. Typically in all languages syllabic nuclei are occupied by [+vocalic] segments while [-vocalic] segments occupy the consonantal margins but this is not exclusively true in either case.

Another proposal of Clements and Keyser may offer the solution to our problem. Their autosegmental model of syllable structure posits an intermediate CV-tier between the syllable tier and the segmental tier. The successive C (nonsyllabic) and V (syllabic) points define the permitted syllable structure of the language. That is, they constitute a skeleton in the sense

used by McCarthy and Yip, to which segments of the melody are "anchored". At each level, there may be one-to-many and many-to-one association lines between the tiers, subject to the general rule of autosegmental phonology that association lines may not cross. As an illustration they give the following syllabic analysis of the English word Jennifer.

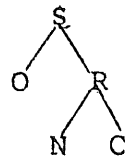
(4)



Thus, C nodes may belong to two successive syllables, as the Coda of one and the Onset of the next. On the other hand, two segments may be attached to a single C node, as in the case of the affricate d , and one segment may be attached to both a V node and a C node, as in the case of the final syllabic r.

One noteworthy difference between their scheme and those of others is that they reject the principle of binary branching which has led to the assumption that syllables must branch first into Onset and Rhyme, after which, if there is a final consonant, the Rhyme branches into Nucleus and Coda.

(5)



Instead, Clements and Keyser link all V and C nodes directly to the $-node, so that there may be syllables such as:

(6)

Their arguments seem persuasive and, as will be shown below, n-ary branching from the $-node solves certain problems in a very satisfactory way.

The feature of their proposal that offers a solution to the problem of distinguishing the underlying forms of bĕi and bĭ is the possibility of morphemes with empty C and V nodes in the underlying form. Thus, if in accordance with Yip's scheme we set up the invariant CV skeleton for Pekingese as C(C)VC (where the second C in parentheses is restricted to a glide), these two morphemes will have the underlying structures shown in (7).

(7)(a)

bĭ

(b)

bĕi

The second C node, or G node, being optional is not present if it is not filled. In both morphemes the V node is empty in the underlying form but in (a) the last C node is also empty and in (b) it is filled.

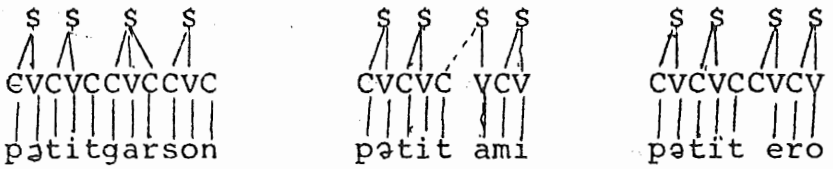
Before discussing the structure of Pekingese syllables in detail, let us look at some problems of French phonology that are discussed by Clements and Keyser. The solutions that I shall suggest will be slightly different from theirs but are based on the same principles.

First they take up the problem of liaison, i.e. cases where words that have no final consonant in isolation or before a consonant insert a particular consonant before a vowel initial word, e.g. un petit [œ̃pti], un petit garçon [œ̃ptigarsɔ̃], un petit

enfant [æptitãfã]. Words ending a nasalized vowel in isolation or before a consonant similarly have [n] before a vowel initial word.

In order to account for this they suggest that such words have latent final consonants which are "extrasyllabic", that is, not attached to a syllable node, but can become attached, and so pronounceable, under suitable conditions. They cite the parallel of "floating tones" that have also been postulated in autosegmental theory. Thus petit would have the structure in (8). Before a vowel initial word this would link up with the following syllable. They further argue that the reason why linking does not occur before h-aspire is that in such words there is already an empty C node which blocks the association of the floating consonant.

(8)

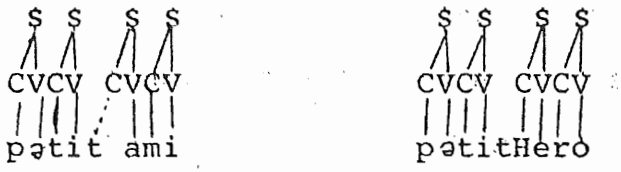


But this is surely very curious. One would expect that an empty C node would be looking for segmental material with which to associate, not to be an obstacle to such association.

The solution has already been suggested above where it was argued that h-aspiré should be regarded neither as an empty node nor as an abstract underlying consonant but as an actual consonant that surfaces, namely the laryngeal glide [H]. Vowel initial words, on the other hand, must be assumed to have an empty C node which is filled epenthetically by [H] if the word occurs in isolation but otherwise attaches to a preceding

consonant. What this really means is that, although vowel initial words in isolation must begin with a smooth voiced transition, i.e., the laryngeal glide [H], they do not have this as part of their underlying structure and are able to fill their empty C slot by any available consonant. H-aspiré words, on the contrary, do have this on-glide as part of their underlying structure and cannot, therefore, substitute another consonant in its place. Another objection to the proposal as formulated by Clements and Keyser is that there seems to be no good reason for postulating a floating C node as well as a floating segment for a word like petit. Earlier in their paper they argue for the existence of extrasyllabic consonants which do surface. These are attached to a C node which is not dominated by a syllable. They give as examples foreign names such as Pnin or Ghotbzadeh which contain consonant clusters that are not permitted in native English words but may be deliberately pronounced as exceptions. A latent consonant which does not surface should surely exist only on the segmental tier without a C node to which it can attach. In that case we can reformulate their proposal as in (9).

(9)



[pətitami] [pəti ero]

H-aspiré words thus fall into the same class as words, mostly of foreign origin, in which a high glide behaves like an initial consonant in blocking liaison, e.g. petit whisky

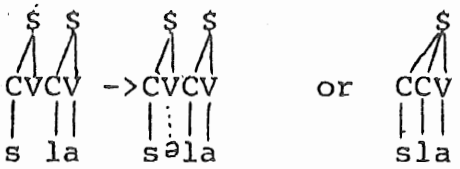
[pətiwiski], petit Yougoslave [pətijugoslav]. These contrast with glide initial words of native origin like oiseau that are treated like vowel initial words in allowing liaison. One may assume that the latter have two C nodes, the first of which is empty and the second of which associates with the glide, as in (10). Compare words like loi [lwa] or fière [fjɛr] that have consonant + glide initial clusters.

(10)

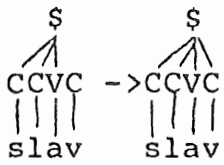
[pətitwazo] [pəti wiski]

If one can have empty C nodes in French, can one also have empty V nodes? Surely one can. This must be the explanation for the "mute e" or schwa that causes so much perplexity in French phonology. If one regards schwa as a real underlying vowel phoneme, it is indeed a strange phenomenon for it is apparently identical in every respect with the vowel [œ] except that the latter is stable in all its contexts while "mute e" appears and disappears in accordance with rules of syllabification. It has been suggested that it is purely epenthetic (cf. Martinet 1964:73, 1972) but this been rejected on the grounds that initial clusters that arise from schwa elision cannot be distinguished from stable clusters that do not permit of schwa insertion, e.g. cela [səla] or [sla], as opposed to slave [slav]. This objection can be disposed of, however, if we suppose different underlying syllable structure in the two cases, with two V nodes in the one and only one in the other, as in (11).

(11)(a)



(b)



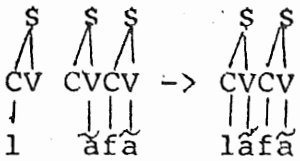
Thus, syllables with an empty V node can either fill it epenthetically with schwa or resyllabify, if that possibility is available, or leave the V node unfilled if it occurs at the end of a phrase.

There is, of course, a certain equivalence between postulating an underlying vowel that gets deleted and an underlying V node that gets filled or left vacant according to various rules, but the implications are not all the same and it seems to me highly probable that the latter hypothesis will turn out to offer the better solution. At least it will have the advantage of disposing of the strange discrepancy between the behaviour of "mute e" and all other vowels.

I shall not attempt a full scale discussion but one can offer a few further remarks.

If "mute e" is an epenthetic schwa, its nonappearance before vowel initial words is because the empty V node of the first word and the empty C node of the following word collapse into a single syllable as in (11).

(11)



l'enfant

Before an initial glide, i.e. h-aspiré or initial j or w in words of foreign origin, this is not possible and schwa is inserted as in (12).

(12)

le héros le whisky

Clements and Keyser note a difference between the behaviour of schwa before h-aspiré and before consonant initial words, including those with consonantal high glides like whisky, namely that schwa is not optionally deletable. They suggest, following Tranel (1981:307), that there must be a special rule of schwa epenthesis that applies to h-aspiré alone. A simpler solution seems to be that [H] avoids clustering with another consonant. Such clustering does occur unavoidably when h-apiré is preceded by a word with a stable final consonant. It has been noted that in such circumstances a glottal stop may be pronounced, as in il hache, [il?aʃ] (Dell 1980:237, Tranel 1981:310). This may be compared with the various ways in which /H/ may surface in Pekingese, as [ɣ], [?] or [ŋ]. In the French case it may be looked on as a way of avoiding the collapse of [H] in contact with another consonant. Unlike a high glide, such as j or w, (or even the velar glide ɤ̞ -- see Henderson 1980), the laryngeal glide H cannot form a cluster with preceding consonant which will be audibly distinct from that consonant alone. Hence the replacement of H by the voiceless laryngeal ?. The obligatory insertion of schwa when an empty V node is available seems to be another solution to the same problem.

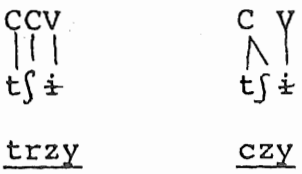
The V nodes in the underlying forms of morphemes in French, as in Pekingese, enable us to define initial clusters which cannot be separated by schwa.

The same analysis can be applied to the inseparable clusters of Kabardian. In that language as analyzed by Kuipers schwa is always epenthetic but it cannot be inserted between any two consonants whatsoever. Many morphemes consist of single consonants but there are also two and three consonant clusters that share the same phonation features and features of palatalization or labialization. These syllabify as units which Kuipers calls "segments". Examples are pŝ, bẑ, p'ŝ', st, zd, st', dw, t'?°, pŝḫ (1960:30). In terms of the theory of syllable structure we are using here, it would appear that Kabardian syllables have the skeleton (C)(C)CV, where V can either be empty or filled with a. It is the presence of a V node that defines what is a cluster. It is therefore unnecessary to regard the clusters of Kabardian as complex segments as suggested by Anderson (1976). The kinds of restrictions on possible clusters and the sharing of features by the members of a cluster that are found in Kabardian seem to be not different in principle from the rules that apply to initial clusters in other languages, for instance the neutralization of the voicing and aspiration of stops after s in English. The question of complex segments and how to provide for them is, however, the next important question that we must discuss.

The possibility of many-to-one associations between the segmental tier and the CV tier is another feature of the Clements

and Keyser model, illustrated in their example of the structure for the word Jennifer in (4) by the affricate dʒ. They refer to proposals that have been made by various scholars including Hoard 1967 and Campbell 1974 for analyzing such phonemes as affricates and prenasalized stops as complex segments which undergo a change of features within a single segment. They cite Hoard's example of the Polish minimal pair tzry "three", composed of three segments [t] [ʃ] [ɨ] , and czy "whether", composed of two segments [tʃ] [ɨ], which they propose to analyze as in (13)

(13)



trzy czy

This is very attractive. It offers a simple way, for example, to account for the historical development of the Old Chinese cluster tr, which had become an affricate tr, counting as a single segment, in Middle Chinese. Later the second element of the complex segment, or segmental cluster as one might call it, changed from sonorant [r] to strident [ʂ], providing one source for the retroflex affricate [tʂ] in Mandarin (Pulleyblank 1982).

Another application of the notion of complex segments that is discussed by Campbell is as a way of handling secondary articulations like palatalization and labialization. Thus one can distinguish a velar + w sequence, as in Pekingese, from a labialized velar, as in Cantonese as follows (14).

(14)

We can make use of this to show the inherent labialization of labial consonants that is a feature of Pekingese as well as many other forms of Chinese. Though the glide w never surfaces after labial initials, so that there are no such syllables as *pwan or *fwej, we shall wish to derive the finals -u and -uă after labial initials from this inherent labialization of the initials themselves, the latter to the exclusion of *-ɔă. This can be accounted for if we assume that labials have the complex structure shown in (15) in contrast to clusters of C + w.

(15)

This difference in structure provides a very natural explanation for the difference in pronunciation of the final -uă after labials which has led to its being represented as a single vowel -o rather than the diphthong -uo in both the guoyin zimu (National Phonetic Alphabet) and the official pinyin romanization, for example, bō "wave" in contrast to guó "country", duō "many". It is clear that native speakers feel that there is a discrete glide after other consonants but not after labials. (More will be said about the vowel in this final below.)

Campbell includes labialized labials among his examples of complex segments. In one respect his discussion seems to be not quite accurate. He claims that "the labialization of p^W is not inherent or simultaneous, but must actually await the release of the stop before it can be realized" (1974:60). Now it is certainly true that it cannot be heard as distinct from the stop

unless it is continued after the release of the stop but the articulatory conformation which it implies is surely simultaneous with the stop and our Chinese example would suggest that it may be phonologically present even if it is not separately audible. Even when it manifests itself as a rounding of the following vowel there is no discrete glide and there is no reason to think that there is any difference in those cases in the articulation of the consonant. That is, one would certainly not be justified in postulating labialized p^w in bu and bo but plain p in ban and ben. The labialization of labials in Chinese, both initially and, where they occur, finally, must be what is responsible for the tendency for dissimilation between final and initial labials and between rounded vowels and labials that has been a constant feature of the language throughout its history.

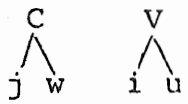
Labialized velars are also commonly written as if the labialization followed the obstruent or nasal but the IPA is surely right in insisting that the labialization is simultaneous and writing it under the consonant -- $\underset{w}{k}$ instead of k^w. Syllable final labialized velars that are found in some Chinese dialects such as Fuzhou show the labialization in front of the stop or nasal instead of after it but this does not mean that there is a difference in structure between such phonemes and labialized velars occurring initially.

This means that if one shows labialized consonants as two segments associating with a single C node the two segments are not to be considered as in a linear sequence but as simultaneous, even though in a two dimensional display one can only show the

glide on one side or the other of the other consonant. The same must be true of the palatal glide in the case of palatalized consonants.

If glides can combine simultaneously with obstruents or nasals to form complex segments, we should expect them to be able to combine in a similar way with each other and this should be true also of vowels, since we are assuming that glides and vowels differ only in whether they are dominated by C or V nodes. This suggests exactly the solution that we need to account for the front rounded glide [ɥ] and its syllabic counterpart [y]. That is, we may suppose that they are structured as in (15), it being understood that the linear order is irrelevant and the two elements are actually simultaneous.

(15)



There is a precedent for such an analysis in J. McCarthy's work on Arabic. Though front-rounded vowels do not seem to be a normal feature of Semitic languages, he mentions an interesting case of the merger of u and i. In standard Arabic forms like quwila, suyira delete the intermediate w or y and assimilate the first vowel to the second giving qiila, siira. In one dialect, however, this assimilation does not take place, resulting either in the diphthong ui or in long yy. This is described by native orthoepists as "the scent or taste of u." (1979:129) McCarthy analyzes it as a many-to-one association of the melody u-i to a single V slot.

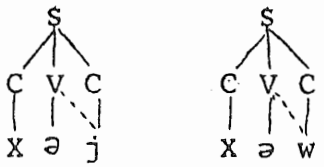
In Chinese the treatment of front-rounding as combining fronting and (back-)rounding is part of the native tradition of rhyme table phonology. It simplifies the phonology of Pekingese in several ways. It avoids the necessity of setting up the front-rounded glide ㄩ as a separate initial and medial phoneme. While j and w are fully integrated into the system of consonants, there are no other labial-palatal phonemes besides ㄩ. Indeed, this seems to be a linguistic universal. Ladefoged (1971:60) notes the occurrence of the palatal-labial approximant, as he defines ㄩ, in several languages but knows of no example of labial-palatal stops or nasals.

In terms of distribution there ~~a number of~~ are several arguments for supposing that ㄩ and y represent combinations of jw and iu. Palatalization of velars and alveolar sibilants has occurred before ㄩ and y as well as before j and i. On the other hand neither ㄩ nor w can follow labial initials. Medial j cannot co-occur with final j and medial w cannot co-occur with final w. Medial ㄩ can co-occur with neither. Another point that will be seen below when we discuss the vocalization of Pekingese syllables in detail is that ㄩ under the G node may vocalize either as y, in -y and -yn, or as ju, in -juŋ. This is easy to accommodate if it interpreted as a segmental cluster of j and w but requires a special rule if it is a unitary phoneme. This, in a different formulation, is one of the principal arguments used by Hartman (1944) for treating ㄩ as a combination of j and w. On the other hand, the principal argument used by Cheng (1973) for rejecting such an analysis, that is, the increase in the

complexity of syllable structure that it apparently requires, ceases to be applicable if the two components form a complex segment attached to a single C node.

If this analysis of ɥ and y is correct, we may expect to find that other combinations of glides and vowels can be attached to single nodes in the CV tier. One may, for example, wish to apply it to the fronting and rounding of ə before the glides j and w in the finals -ej and -ow, assuming the following structures (16).

(16)



That is, the V node is filled epenthetically by ə, but it also associates secondarily with the final glide, creating the complex vowels əi and əu which surface as [e] and [o]. If it were filled simply by leftward spreading from the glide, we should get -ij, -uw, which is clearly not the case.

This hypothesis unexpectedly accords with an insight that I tried to capture using a different formulation in an earlier article (Pulleyblank 1972). In that paper I attempted to show that non-high vowels that show the features [+front] or [+labial] somehow contain the high vowels i, u or y as part of their make-up. What I had not grasped at that time was that such complex vowels should be conceived not as sequences in which the elements retain their linear order, but as fusions in which the elements are realized simultaneously while still retaining their underlying separate identity. Further applications of this

principle emerge in the detailed discussion of Pekingese vocalization.

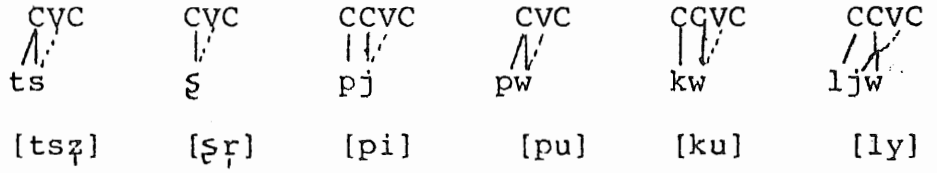
Before leaving this topic it should be mentioned that Clements and Keyser propose a different interpretation of structures in which two vowel segments associate with the same V node. They propose to explain in this way a phenomenon in Spanish whereby in rapid speech successive vowels form diphthongs which occupy the same unit of time as single vowels. The actual vowel qualities do not fuse into monophthongs, however. It seems to me that this phenomenon, which refers only to the surface production in a particular style of speaking, is quite different in principle from that of complex segments like affricates which are present in the underlying forms of morphemes and are unaffected by variations in tempo.

The vocalization of Pekingese syllables

We may now return to consider in detail the underlying structure of syllables in Pekingese and the rules for vocalization that apply in each case. According to the analysis presented in Table 2, the finals of Pekingese fall into three sets: (a) those with no final consonant, which can have syllabic r̩ or z̩, or one of the high vowels i, u, y, (b) those in the upper of each pair of rows ending in one of the three possible final consonants, which can have schwa (including its allophones e and o) or one of the high vowels, (c) those in the lower of each pair of rows which have an a-vowel of some kind.

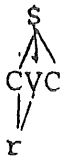
Let us first consider set (a). It seems clear that syllabic z̩ and r̩, which only occur after homorganic consonants, result from the spreading of features from the initial to fill an empty nucleus. This is obviously simpler than to postulate an underlying vowel, such as /ɨ/, which is found only in these finals and which is deleted in r-suffixation, giving ər. Alternations such as pi/pjər, ly/ljwər in r-suffixation lead us to a similar conclusion, except that in these cases the vocalization derives from a post-initial glide rather than the initial consonant itself. Finals in -u remain unaffected when -r is added but the analogy of the other finals leads us to assume the same kind of derivation in their case also. The arguments for assuming that labial consonants are inherently labialized and the source of vocalization for pu, mu, etc., have been discussed in the previous section. These derivations are illustrated in (18).

(18)



In the above derivations I assume that these syllables have the same invariant C(C)VC templates as all other Pekingese morphemes, with an empty final C slot as well as an empty V slot. One of the reasons for this emerges from the analysis of onsetless syllables with syllabic r̩. Such syllables are in minimal contrast with rì [rr̩], "day", which must have the structure shown in (19) on the analogy of other words with retroflex initials and syllabic r̩.

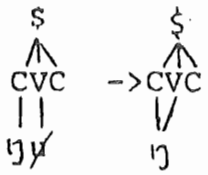
(19)



Historically the evolution of the word rì [rr̩] is one step behind that of words like èr "two" [r̩]. The latter were [ri] in Late Middle Chinese (LMC, 8th century) and had become [rr̩] by Early Mandarin (EM, 14th century) by the same rule, deleting i after retroflexes, that changed words like shi "poem", LMC ʂi, to EM ʂr̩. The word "day" was rit in LMC, with a final stop that protected its front vowel. By EM, however, the stop had been lost and it was pronounced [ri]. Compare words like shi "lose", LMC ʂit EM ʂi. Since the 14th century EM rr̩ has become [r̩], while EM ʂi and ri have become [ʂr̩] and [rr̩].

One might account for the difference between [rr̩] and [r̩] by supposing that the latter is attached only to the V node in the underlying form. This is equivalent to saying that it is marked as syllabic. This seems very improbable, especially since, as we shall see, even the vowel a cannot occupy the V node if the final C node is empty. Moira Yip's discussion of syllabic ŋ̍ in the Kunshan dialect is useful in helping to resolve this dilemma (1982:659). She quotes a suggestion of Morris Halle that such syllabic sonorants can only be linked to V slots if they are also linked to C slots. In the case of syllabic ŋ̍ she suggests that it is in fact linked to the initial C slot even though it does not appear to have a distinct initial ŋ phonetically. Historically this makes sense because such words formerly had the vowel u. It is therefore plausible to derive them as in (20).

(20)



This solution will not work for syllabic r̩ in Mandarin, however, because of the contrast with rr̩. Yip hints at what must be the solution in a footnote: "Why the nasal does not associate with the last C is a mystery -- perhaps it does."(1982:659) It seems to me that her suspicion is justified. That is, we must suppose that after the loss of the vowel and the spread of the sonorant from the initial to occupy the V slot, a further change takes place by which it loses its attachment to the prenuclear C slot and associates instead to the final C slot, as in (21).

(21)

[ŋŋ]->[ŋ̩ŋ̩] [rr̩]->[r̩r]

This not only solves the problem of the contrast between ri and er but also seems to fit the phonetic facts better.

Synchronically there are thus two types of morpheme with only the consonant r as the melody, distinguished by the nodes which are left empty, as in (22).

(22)

[rr̩] [r̩r]

The second is probably to be regarded as the universal unmarked case for syllabic nonvocalic sonorants. It is certainly rarer

to find combinations like [mm̩] or [ll̩] than syllabic nasals or liquids alone or preceded by another consonant. In the case of Pekingese /r/, it may be relevant that, although phonologically a sonorant, it does have a certain amount of friction. It is often transcribed phonetically as [ʐ] and is romanized as j, meaning [ʒ], in both the traditional French system and the Wade-Giles system. Even so, I have the impression that in casual speech the initial in rì "day" is often dropped, making the word a homophone of èr "two". In the Xi'an dialect the merger of ri with er has already taken place.

The finals in set (b) have the initial and final C slots filled but the V slot can only have schwa or one of the same high vowels, i, u, y, that are found in set (a). Moreover i and y show the same alternation with j and ɥ + schwa in r-suffixation that we find in set (a) and, even without the addition of the r suffix, we find such contrasts as in/wən, in/jəw, wəj/uŋ, which have led previous scholars to assume underlying schwas but which we have preferred to interpret as evidence for underlying zeros. (See p.12 above). This leads to the assumption that in this set the V slot is empty in the underlying form and is filled either by association with a preceding glide or by schwa insertion. Since schwa insertion is possible, filling of the V slot by spreading from a sibilant or initial r is not found in this set.

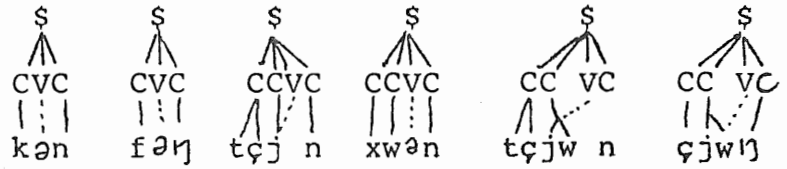
Vocalization from a preceding glide is largely, though not entirely, predictable by the frontness of the final consonant, ă being for this purpose, neutral. Thus j becomes syllabic i before ă and n but, not before w; w become syllabic u before ă

and ŋ, but not before n and j. An exception to this rule is the final iŋ, but it has been observed that this is tending to be replaced by jəŋ in Tones 3 and 4 (Wang Fushi 1963). When j and w combine as ɥ, there is obviously a conflict. In the case of yn, the frontness feature prevails in the standard language but ɥə n occurs dialectally. In the case of juŋ, the glide is resolved into its two components.

In general labial initials do not give rise to syllabic u in this set but vocalize by schwa insertion. The exception is in front of the glide -ă, as has been noted above.

Illustrations of some of these vocalizations are given in (23)

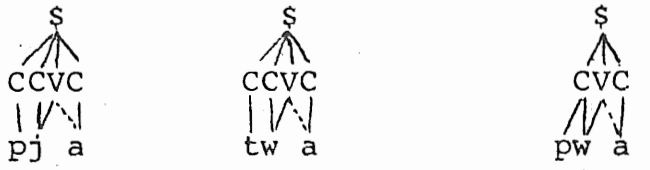
(23)



[kθn] [fəŋ] [tçin] [xwən] [tɕyn] [ɕjuŋ]

Spreading from the final glide after schwa insertion was proposed in the last section as an explanation for the front and back rounded vowels in [ej] and [ow]. If we assume a similar leftward spreading from the final -a glide, it will account very nicely for the actual pronunciation of the finals in /iă/ and /uă/(24).

(24)

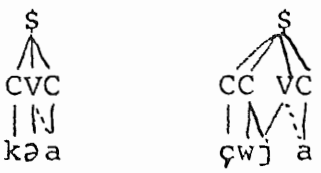


[pjɛ] [twɔ^] [pɔ^]

That is, the simultaneous association of the V node with j and ă results in the low front vowel [ɛ], and the simultaneous

association with w and ă results in low back rounded [ɔ]. The on-glides remain except in the case of labial initials, which have w associated under the same C node. The off-glides are also present, though they are often ignored in phonetic transcriptions since they are not distinctive. The phonemicization as /iă/ and /uă/ was justified in so far as i and u are present as part of the syllabic nucleus, as well as being glides, but it does not do justice to the full complexity of the situation. Phonetically the vowels in these finals are more like those in Southern British chair [ɛə] and pour [ɔə] than dear [Iə] and poor [Uə] (for those who distinguish poor from pour), to which we compared them above. The reanalysis in terms of syllable structure enables us to account for this in a very simple way. The backer quality of the vowel in /ə̯ă/ [ɚ^], as compared to [ə] in [kən], can presumably be accounted for in the same way. The finals in /yă/ do not conform exactly to the same pattern. It would appear that only the j component of the glide associates with the nucleus. Otherwise we should expect to get [ɥœ], not [ɥɛ].

(25)



[kɚ^] [ɕɥɛ]

Note that writing the glide cluster as wj instead of jw is irrelevant since the two components are in fact simultaneous.

The third and last set of finals consists of those which have a between the initial and final consonants. It is natural to assume that in this case vocalization takes place through association of a with the V node. This goes against my previous analysis of the final [iɛn] as /iăn/, with ă as a postnuclear

glide. The fronted quality of the vowel is, however, sufficiently accounted for if we assume that there is also an association with the post initial glide, giving rise to the vowel cluster i̯a = [ɛ](27). R-suffixation results in breaking the association of the front glide with the nucleus. This has the same effect as my previous hypothesis that the effect of r was to prevent i from appearing in the nucleus but expresses it in a way that is in conformity with the new theory of syllable structure being applied here.

(27)

[tjɛn]

The back unrounded [ɑ] found before ŋ and w can be accounted for by assuming association lines from the nuclear a to the final C, as in (28).

(28)

[tɑŋ] [ljɑw]

The rightward association of a with final ŋ must be what inhibits a rightward spreading of the glide w before the back consonant in words like guang "light" [kwɑŋ]. On the analogy of [jɛn] one might expect *[wɔŋ]. There is evidence for this [ɑ] vowel before final velars already in Late Middle Chinese, where it had a number of phonological consequences for later developments (Pulleyblank 1982).

When a falls in both the V slot and the final C slot, it might be argued that there was only one a in the underlying form, which associated with both nodes, as in (29a). This corresponds to the structure that Clements and Keyser set up for long open a: (1981:9). In our case, however, we must assume that there are two a's, as in (29b).

(29a)

(b)

There are strong reasons for assuming that if only one a is found in the melody, it must associate with the final C node and be vocalized like the finals of set (b). See p. 16 above where the diachronic change of /jaj/ to /iă/, found also synchronically in the Mayka secret language, was discussed. Another diachronic example of the same kind is the development of syllables in -ap, -at in Late Middle Chinese. With the loss of the final stops the nuclear a in such syllables moved to the margin, necessitating schwa insertion to maintain syllabicity, e.g. gē "cut"/kəă/ < LMC kat, hé "join" /xəă/ < LMC xɦap. Words in -t and -p that give Pekingese /aă/ had long aa in LMC, still reflected in Cantonese [a:t] [a:p]. (For details see Pulleyblank 1982.)

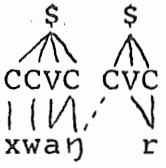
The structure in (29b) may justify the phonetic distinction made by Y.R. Chao between [A], in open syllables and [ɑ] before ŋ and w, where [A] means a low central unrounded vowel between back [ɑ] and front [a].

R-suffixation reviewed

Let us now review the rules of r-suffixation in the light of this analysis of Pekingese syllable structure.

As we have noted above, the r suffix is derived from the morpheme <u>ér</u> "child" and originally had a diminutive meaning. It is said to be still pronounced as a distinct syllable by some elderly Peking speakers (Li Rong 1957:137). We have proposed above that such syllables have a true zero onset. This agrees with Li Rong's observation that when the suffix <u>er</u> remains a full syllable, it undergoes linking to a preceding final ŋ, as in <u>huáng-er</u> "egg yolk" [xwaŋ-ŋr̥]. This can be represented as in (30)(a). The next stage was for the V node of the suffix to collapse, causing the two syllables to coalesce, as in (30)(b).

(30)(a)



(b)

If the final C node of the first syllable is empty, that is, in set (a) of the finals as discussed in the previous section, it merges with the final C node of the suffix and r becomes the final consonant of the syllable. Otherwise consonant clusters are formed which simplify according to various rules. That is, j and n are deleted before r, ŋ is replaced by nasalization of the vowel, w is retained and a is sometimes deleted and sometimes retained. In all cases the front glides j and ɥ disassociate from the V node. This is no doubt because retroflex r is

[-front] (or [+back] in the Chomsky-Halle system).[2] The incompatability between the feature [+front] in the nucleus and r in the coda is thus a special case of the general tendency that we have observed to avoid nuclear vowels that are opposite in frontness to a following consonant. We may assume that the presence of a final consonant also causes the sibilant initials and r to disassociate from the nucleus, not because of a conflict of [frontness] but because vocalization from an initial nonvocalic consonant only occurs when other means of vocalization are not available.

The vowel u is not affected by r. Hence the new syllables created when r is added remain vocalized and appear as -ur, -ũr, -uăr [wɔr] [ɔr].

In the case of [iɛn], the disassociation of the initial glide from the nucleus leaves it occupied by the vowel a, giving [jar].

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[2]The features of retroflex consonants and vowels are inadequately handled in the feature system of Chomsky and Halle 1968. Moira Yip (personal communication) informs me that a proposal to assign the feature [+back] to retroflex consonants has been in the air at MIT for some time though nothing seems to have appeared in print. An hypothesis of this kind is certainly need to account for the persistent tendency in Chinese to eliminate high front vowels in the presence of retroflex consonants. See Pulleyblank 1981 and 1982.

In cases where the detachment of j or jw from the nucleus leaves it empty revocalization must take place. Up to this point I have assumed that this is simply by schwa insertion, giving -jər, -jwər, with nasalized -jə̃r in the case of -iŋ + r (see Table 3). A detail which I had overlooked is that the finals that I have been interpreting as -ər, -jər, -wər, -jwər are regarded by native scholars as having the same vowel as the syllable er, which I have now reinterpreted as -r̩r. We can account for this if we assume that, as in the case of -əă, -əj, -əw, the final consonant spreads leftwards into the nucleus, with the difference that r, unlike the vocalic glides, effectively obliterates the schwa. There may be a linguistic universal in this. Compare the interpretation of English -er in Jennifer by Clements and Keyser as shown in (4) above. They interpret the stressed vowel in bird in the same way (1981:16). Contrast the schwa vowel in the final syllable of a word like bucket.

Since r can be added to syllables with retroflex initials, like shi "affair", it means that we must distinguish [ʂr̩], with no final consonant, from [ʂr̩r], as in (31).

(31)

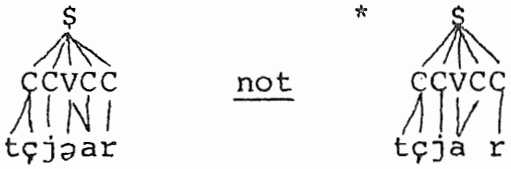
One can even have the syllable [r̩r̩r], for example, when the suffix r is added to the word ren "man, person" or to rì itself, not in the sense of "day", but in vulgar Pekingese expressions in

which rì means "enter" in a sexual sense (actually the same word as rù "enter", which has changed its pronunciation to avoid the obscene connotation). (Li Rong 1982; Chunichi daijiten)

Note that -wən + r gives [wɻr], not [ur]. This shows that revocalization takes place on the basis of the surface forms before suffixation, not from underlying forms. Otherwise one might expect w to vocalize to u before the back consonant.

The finals in -ăr belonging to set (b), apart from those in -uăr, lose ă in Tones 3 and 4 and merge with the finals in -ɻr. Hence xiăo jī "chicks" and xiăo jiē "small street", both Tone 1, remain distinct when r is added but jiĕ + r "sister, girl" and jĭ "how many", both Tone 3, become homophones [tɕjɻr]. In the case of words like jiē "street" there seems to be no reason why the secondary association between the final glide and the V node that we have postulated as the source of the vowel [ɛ] should be broken along with the association to the initial glide. Nevertheless schwa is inserted. This shows that postnuclear glides cannot, of themselves, provide vocalization, though they can colour a preceding schwa.

(32)

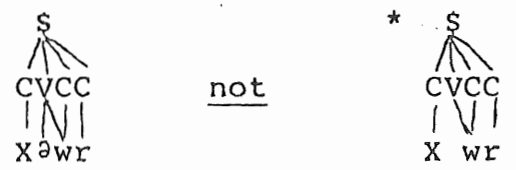


[tɕjɚr] *[tɕjɑr]

In such cases, a remains under a C node, and is a glide, not a vowel, even though a second postnuclear consonant has been

added. This is parallel to the case of words in -owr, which do not become -uwr, the only difference is that the schwa in (32) is newly inserted after suffixation , while that in (33) is already present (where X stands for any consonant).

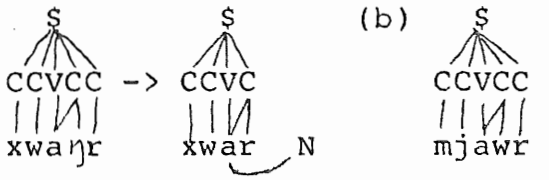
(33)



[-owr] [-uwr]

In set (c) finals there is no reason why the association lines between the vowel a and the back consonants -ŋ and -w to which we have attributed the low back vowel [ɑ] should be broken as a result of r suffixation, and, in fact the vowel remains unaffected, even though, in the case of ŋ, the nasal loses its closure. This may be represented as in (34)(a). That is, its C node is deleted and the nasalization feature moves onto a separate autosegmental tier.

(34)(a) (b)



[xwãr] [mjɑwr]

This is a further reason for assuming a different structure in the case of finals in -aă, since for many speakers these simplify to -ar, merging with -an or -aj + r, e.g. <u>pá</u> "rake"and <u>pán</u> "dish" (35).

(35)

Conclusion

This investigation began with the question whether and in what sense Pekingese could be called a "vowelless" language. From one point of view, at least, the claim has been vindicated. It has been shown that all of the vowels that appear on the surface are either schwas inserted epenthetically or derived from underlying glides. Even the vowel a, which can appear in underlying forms associated with the V node provided that the C nodes are occupied on either side of it, can also appear as a nonsyllabic glide and automatically shifts to the final C node if the latter is unoccupied.

Our study has also provided support for the "three-tiered theory of syllable structure" of Clements and Keyser, while offering different interpretations of certain phenomena. Among the latter the most important seem to be, (a) the concept of a fully voiced laryngeal glide H, the nonsyllabic form of the vowel a, that can function as a consonant both in syllable initial and syllable final position, (b) the theory of complex vowel segments which offers a way of analyzing all intermediate vowels as simultaneous blends under a single V node of various combinations of the primary vowels i, u, a, and schwa (to which should be added high back unrounded ɨ, which has not been discussed but which seems to have rather intimate connections with a -- in the same way that a velar glide can replace or be replaced by H). The implications of these proposals are quite far-reaching and cannot be explored in detail on this occasion.

Our conclusion that Pekingese has an invariant C(C)VC morpheme structure seems to cast doubt on the claim that CV is the universal unmarked form for the syllable (Cairns and Feinstein 1981; Kaye and Lowenstamm 1981). It is true that Pekingese does have CV syllables but these have empty V nodes in the underlying form and also postnuclear C nodes which can associate with segmental material if it becomes available. Moreover a language like Cantonese which has long and short vowels and allows only long vowels in open syllables, apparently has only CVC, CVV and CVVC syllables even on the surface.

The evidence that in the underlying structure of morphemes segmental material associates first with the pre- and postnuclear C nodes and that the V node is only filled thereafter by a, if it is separately present in the melody, or by schwa insertion, or by association with a preceding glide or, exceptionally, by feature spreading from a nonvocalic phoneme suggests certain a parallel to Semitic morpheme structure as analyzed by McCarthy (1979, 1981), where the basic semantic content is carried by a triconsonantal root (including glides as consonants) and the V slots of the CV skeleton are filled after the C slots have been occupied from a separate autosegmental tier by melodies with a morphological content. We could similarly think of Pekingese syllables as having a primary C-C tier and a separate V tier whose only members were a and zero. This has no morphological significance at present but there is reason to think that in Old Chinese /a/ did play a morphological role both as a prefix and as an infix (Pulleyblank 1983).

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