CHAPTER 9

The syllable

9.1 The syllable

The syllable is at the heart of phonological representations. It is the unit in terms of which phonological systems are organised. It is a purely phonological entity. It cannot be identified with a grammatical or semantic unit. There are syllables like [ʌn] as in *unusual* which are co-extensive with the morpheme; there are syllables like [kæt] *cat* which are co-extensive with the word; there are syllables like [kæts] *cats* which represent more than one morpheme (the noun root *cat* and the plural marker *-s*) and there are syllables like [mʌn] and [kɪ] in [mʌŋkɪ] *monkey* which represent only part of a morpheme.

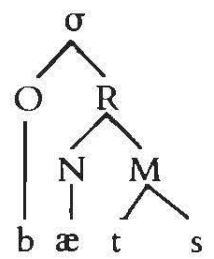
9.2 The representation of syllable structure

The syllable has received a very considerable amount of attention from phonologists, especially in recent years, and a number of alternative models of the syllable have been offered. A serious attempt to compare them is beyond the scope of an introductory textbook of this kind. All that can be presented here is a very brief outline of some of the main trends before focusing on the one that we shall be using.

Many phonologists envisage a BRANCHING, HIERARCHICAL syllable structure. For a traditional structuralist statement of this position see Pike (1967) and Pulgram (1970). More recently, writers like like Kiparsky (1979), Halle and Vergnaud (1980), Steriade (1982) and Harris (1983) have presented a revamped version of the hierarchical branching theory in the framework of a MULTI-TIERED

PHONOLOGICAL THEORY. (This is an approach where phonological representations are viewed as consisting of a number of independent levels that are linked to each other. See Chapter 10). On this view, syllable structure can be represented as in [9.1]:

[9.1] (a)

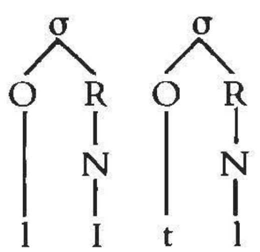


'bats'

(b)

'ever'

(c)



'little'

Note: σ = syllable, O = onset, R = rhyme, N = nucleus and M = margin

Bats consists of one syllable. That syllable has two constituents, namely the ONSET which comes at the beginning and the RHYME which follows it. In the first syllable of *e-ver*, the rhyme is simple. It does not BRANCH. It contains just one constituent: the vowel. The rhyme of *bats*, on the other hand branches. It contains a vowel which is followed by a consonant. The examples above show that the rhyme is the HEAD CONSTITUENT (i.e. the only compulsory constituent) of the syllable. The onset is the part that branches off on the left of the rhyme, coming from the same node. Thus, in English, it is possible for a well-formed syllable to contain no onset, as in the case of the first syllable of *e-ver*. But it is not possible for a well-formed syllable to exist without a rhyme.

The binary partition of syllables which we are suggesting is supported by versification practices in English:

[9.2] Two syllables with the same onset but different rhymes alliterate (e.g. *pan*, *pet*, etc.) while two syllables with the same rhyme, but different onsets, are said to be rhymes (e.g. *pan*, *man*, etc.). In contrast, the onset and nucleus (e.g. *pan*, *man*) do not form a significant grouping for verse.

We noted above that the rhyme is the only essential element of the syllable in English. What is true of English is also true of other languages. The rhyme is always obligatorily present in all syllables in all languages. What varies from language to language are the elements that can be part of the rhyme. Typically the nucleus slot in the rhyme is occupied by a vowel but occasionally a consonant may fill that position, as in [9.1c] above where the final [l] of *little* is syllabic.

Find two more examples of syllabic consonants in English or in some other language. What kind of elements can precede or follow the syllabic consonants? Refer back to section 3.3.1 on page 43.

Another model – that of Hyman (1985), has a different slant. Hyman suggests that the core of phonological representations consists of rhythmic WEIGHT UNITS rather than onsets and rhymes or C and V slots proposed by other writers (see next section). Segments have weight units associated with them underlyingly. But only associations between weight units and vowels tend to survive to the surface. Normally consonants lose their weight units and get re-associated with the weight unit of an adjacent vowel by the syllabification rules. Only those segments whose association with a weight unit is preserved to the end of a derivation are syllabic.

9.3 The CV-tier

Most current work in theoretical phonology assumes a model that incorporates a CV-tier (Consonant-Vowel tier) in terms of which the canonical forms of morphemes are stated. Precursors of this approach are Hockett (1947) and Abercrombie (1967). Using a multi-tiered approach in studies of classical Arabic, McCarthy (1979, 1981, 1982) has shown that PROSODIC TEMPLATES (see section 10.5 below) are needed to represent sequences of CV elements which function as morphemes. Though McCarthy's work has great phonological interest, his concerns are primarily morphological.

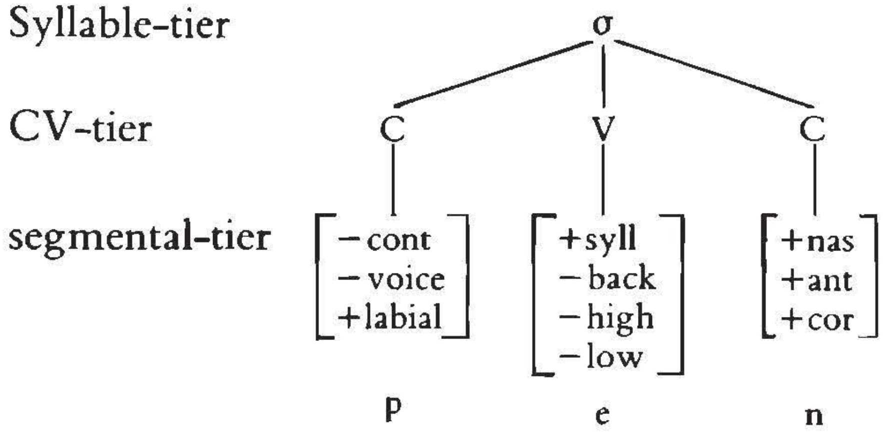
9.3.1 A generative CV-phonology model of syllable structure

It is Clements and Keyser (1983) who have expounded a CV-model of phonology specifically designed to deal with the syllable. Theirs is the model that I shall use in the rest of the book. Clements and Keyser require the theory of the syllable to perform three tasks:[1]

[9.3] (a) state universal principles governing syllable structure;
(b) state syllable structure TYPOLOGY, i.e. define the range within which syllable structure may vary from language to language;
(c) state language-specific rules governing syllable structure

In order to fulfil function (a), the syllable is assumed to have a THREE-TIERED STRUCTURE consisting of a SYLLABLE NODE 'σ'; a CV-TIER whose C and V elements DOMINATE (i.e. have below them as constituents in the syllable tree) consonantal and vowel segments; and a SEGMENTAL TIER consisting of bundles of distinctive feature matrices which represent consonant and vowel segments (for convenience these features may be abbreviated using letters of the phonetic alphabet):

[9.4]



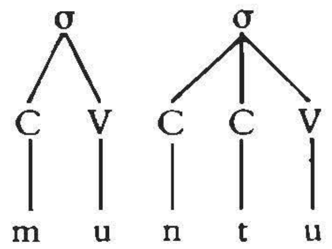
Roughly translated into the terms of the theory in [9.1], a V element of the CV-tier represents a syllable NUCLEUS i.e. peak of sonority (see below) while a C element represents a syllable ONSET or MARGIN, i.e. an element which is not the peak.

Nowadays a CV-phonology model of some sort is assumed by many phonologists. The version proposed by Clements and Keyser has the advantage of being conceptually simpler than the alternatives. Intervening between the syllable node and segmental tier there is a 'flat' CV-tier, lacking internal constituent structure. Contrast this with the more complex syllable models with onsets and rhymes which are illustrated in [9.1].

As in syntax, a tree like [9.4] shows IMMEDIATE CONSTITUENT STRUCTURE. An element is an immediate constituent of a higher element within which it is contained. This is shown by a constituent being IMMEDIATELY DOMINATED by that higher element. Thus, in *pen* the elements CVC of the CV-tier are all immediately dominated by σ while the elements [p,e,n] of the segmental tier are immediately dominated by C V and C respectively.

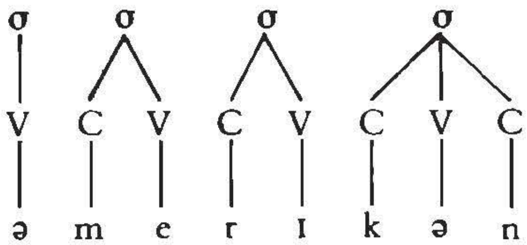
In a theory where several tiers are posited it is essential to specify how the tiers are LINKED. In CV-phonology, the linking is done using ASSOCIATION LINES which are subject to a WELL-FORMEDNESS CONDITION (this principle is discussed in more detail in the next chapter). To relate the CV-tier to the segmental tier, association lines are drawn following certain universal rules. Normally, these rules link V elements to [-cons] segments (vowels) and C elements to [+cons] segments, as you can see:

[9.5] (a)



'person' (Luganda)

(b)



American

One of the functions of the syllable in all languages is defining syllabicity for segments. Any segment dominated by a C-element of the CV-tier is nonsyllabic while any segment dominated by a V-element is syllabic. An interesting consquence of this model is that it obviates the need for the feature [syllabic] (section 3.3.1): the V element of the CV-tier is the constituent of the syllable that contains the SONORITY PEAK.

The class of segments capable of functioning as syllable peaks is not arbitrary. It has been noted by generations of phoneticians and phonologists that the distribution of segments in syllables follows a clear pattern which can be stated in terms of the SONORITY HIERARCHY in [9.6] below which was suggested by Hooper (1972, 1976). This hierarchy was introduced earlier in section 6.2.1.

[9.6] Sonority hierarchy

least sonority

1 voiceless obstruents
2 voiced obstruents
3 nasals
4 liquids
5 glides
6 ↓ vowels

greatest sonority

The phonological sonority hierarchy has the phonetic correlates of openness and propensity for voicing. The more sonorous a sound is, the more audible it is likely to be. The sonority hierarchy is a mirror image of the strength hierarchy (section 6.2): sonority is in inverse proportion to strength (Hooper 1976).

The element dominated by V (which in other approaches is called the NUCLEUS) is relatively more sonorous than the consonants that surround it. (These are recognised as the ONSET and MARGIN of the syllable in other models). In a word like *bat*, the vowel /æ/ is dominated by V and it is more sonorant than the consonantal segments /b/ and /t/ which it is flanked by. The chart in [9.6] correctly predicts that vowels are the most likely and obstruents the least likely segments to be dominated by V, with other sounds occupying intermediate points on the hieararchy.

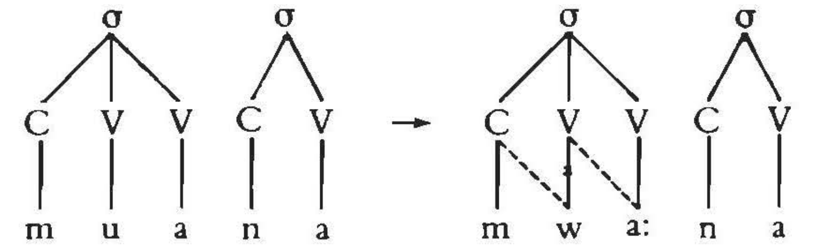
As the syllabic potential of a sound depends on its propensity to vocalise, it is only to be expected that the more open a vowel is, other things being equal, the more likely it is to be the peak of sonority in its syllable. The algorithm (i.e. formal procedure) that assigns syllabicity works by ranking consonants and vowels on the sonority hierarchy. The most sonorous segment is assigned to the V-element (the nucleus). Less sonorous sounds preceding the nucleus are assigned to the initial C-element (onset) and those following it are assigned to the other C-element (also variously known as the CODA, MARGIN, or TAIL). This principle predicts that the vowel /u/ is dominated by a V-element in [9.5a].

It also predicts that, in [9.7] the vowel /u/ is initially assigned to the V-element because it is higher up the sonority hierarchy than the consonant /m/ which precedes it. But when the fact that it is followed by /a/ is taken into account, association lines need to be re-drawn, making /a/ the only [-cons] dominated by V and linking /u/ instead with the preceding C-element. This makes it a nonsyllabic glide:

Clements and Keyser's model performs the second task of describing syllable typology by including a range of CORE SYLLABLES. Linguistic elements which are part of the CORE GRAMMAR are present in all langauges. At the

[9.7] Glide formation

Glide formation



'child' Luganda

Note: (a) a broken line is an instruction to 'LINK' i.e. insert new association line;
(b) an association line with two lines through it shows DELINKING i.e. termination of an association.

level of the syllable, CV type syllables meet that requirement. So far, no language has been reported to lack CV type syllables. Other syllable types may be seen as modifications of the prototypical CV syllable. Many languages, English included, have syllables containing only V, (see *e-ver*). Such languages may be assumed to have a rule at the entry to the phonological component which deletes the syllable initial C and thus allows canonical syllables with V only. Languages may also have CVC syllables which are obtained by a rule which adds a C after the V element to form canonical CVC syllables. Languages may have any one of the following canonical syllable types:

[9.8]	Type 1:	CV	e.g. *ta*
	Type 2:	CV, V	e.g. *ta, a*
	Type 3:	CV, CVC	e.g. *ta, tat*
	Type 4:	CV, V, CVC, VC	e.g. *ta, a, tat, at*

(based on Clements and Keyser 1983:29)

Make up two long words (in a real or imaginary language) which have each one of the four syllable types in [9.8].

Further embellishments of the syllable types in [9.8], peculiar to different languages, do occur. To fulfil the third requirement of syllable theory set out in [9.3c] a mechansim is needed to deal with language-specific syllable structure principles. There are languages which allow core syllables to have C* or V* (where C* or V* represents sequences of C or V elements) so that well-formed core syllables may contain combinations like CCCVCC or CCVVC or V elements. Thus, while [9.5] only shows single C and V elements following each other, languages like English allow syllables with CCCVCC sequences as in the word *strand*. The theory has to provide a mechanism for stating such language-specific facts. We shall explore this in section 9.4.1.

9.3.2 Syllabification

The theory has to provide a way of grouping arrays of CV elements into syllables in situations like this: VCVCCCVC. From the foregoing it is clear that each V-element will be associated with a syllable peak. What is yet to be shown is: to which syllable node are C-elements assigned in ambiguous cases, where they could go with either the preceding or the following vowel? To which syllable, for example, should the middle consonant of *panic* (CVCVC) be assigned?

The ONSET FIRST PRINCIPLE (Kahn 1976, Clements and Keyser 1983) has been proposed to deal with such situations. It is stated in [9.9]:

[9.9] (a) 'Syllable-initial consonants are maximised to the extent consistent with the syllable structure conditions of the language in question.
(b) Subsequently, syllable-final consonants are maximised to the extent consistent with the syllable structure of the language in question.'
(Clements and Keyser 1983:37)

Principle (a) applies before (b) in any derivation. In potentially ambiguous cases initial consonant clusters take precedence over syllable final ones. This means that unless there is an overriding language-specific reason for doing otherwise, given a string like VCV, the Onset First Principle requires that the string be divided up as V-CV rather than VC-V : a word like *ever* [evə] is divided up as [e-və] and not *[ev-ə]. To take another example, English allows CC sequences like [sp]. They can be initial as in *spoon* or final as in *grasp*. In a word like *aspire*, where the [sp] cluster could be regarded as syllable initial or syllable final, the word can be syllabified as either *a-spire* or *asp-ire*. The Onset First Principle predicts that the former is the correct syllabification.

The theory incorporates the following algorithm (formal, step-by-step procedure) for building syllables, with the procedures being applied starting from V outward to successive C-elements in the order specified in [9.10] below, which is based on Clements and Keyser (1983:38):

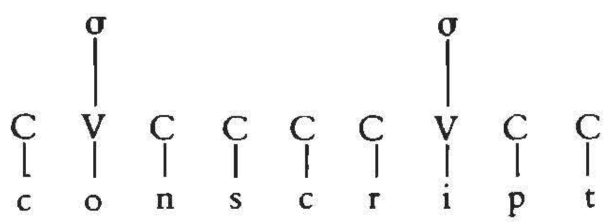
[9.10] (a) Underlyingly every V of the CV-tier is linked to σ; this merely reflects the fact that no syllable exists without a V element (as nucleus).

(b) Link each C element to the nearest V-element to its right provided the resulting sequence of segments does not violate any language-specific rules. This procedure creates syllable onsets.

(c) Repeat the procedure in (b), this time linking the C-elements to the nearest V to its left. This procedure creates syllable margins.

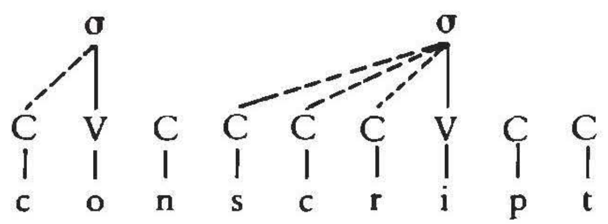
The effect of this algorithm is illustrated in [9.11]

[9.11] (a)



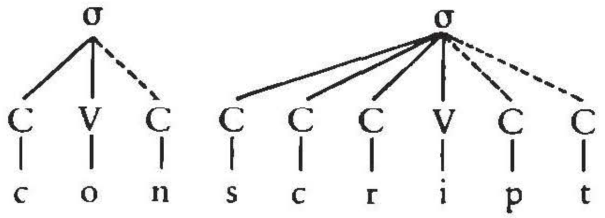
V-elements are pre-linked with σ by convention [9.10a]

(b)



By convention [9.10b], link C-elements to the V on their right, one at a time, provided the resulting sequence is permissible in the language in question. Thus, in this case the procedure creates *scri* but stops short of **nscri* because in English nasals are not allowed to occur at the beginning of a syllable initial consonant cluster (see section 9.4.1 below).

(c)

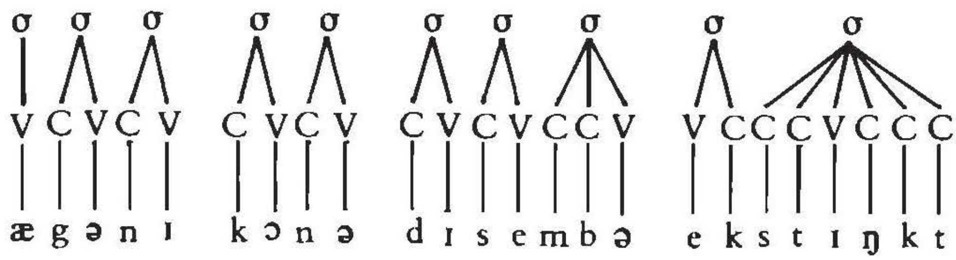


By convention [9.10c] link C-elements to the V preceding them so long as the resulting sequence is allowed in the langauge.

Write rules and produce derivations similar to [9.11] above to account for the syllabification of the following words: *agony* [ægənɪ], *corner* [kɔnə], *December* [dɪsembə], *extinct* [ekstɪŋkt]

You should come up with trees like the following:

(d)



It must be emphasised that any language-specific restrictions on consonant clustering override universal principles. For instance, since *tl-* is not a permissible combination syllable-initially in English, a word like *atlas*, the Onset First Principle notwithstanding, cannot be syllabified as **a-tlas*; rather it must be divided up as *at-las*. Universal principles can be viewed as providing the default state of affairs which applies, unless specific instructions to the contrary are given by the grammar of a particular language.

9.4 Functions of the syllable

In early generative phonology, although the feature [syllabic] was used, the syllable was not given a place in the theory. It was assumed that segments, boundaries and rules stating permissible combinations of segments in morphemes and words were sufficient to describe the sound systems of languages. That is the stance taken in SPE. But subsequent work (e.g. Hooper 1972; Vennemann 1972; Bell and Hooper 1978; Kiparsky 1979; Selkirk 1980) showed that there are good reasons for rejecting that position. Today the place of the syllable is secure. Below I show the central role it plays in phonology.

9.4.1 The syllable as the basic phonotactic unit

One of the most basic functions of the syllable is to regulate the ways in which lower level units (consonants and vowels) of the phonological hierarchy can combine.

Knowledge of the phonological system which speakers of a language have consists in part of a knowledge of the phonemes of that language and their allophones. But this is not all.

Suggest at least one reason why phonological knowledge must go beyond knowledge of phonemes and their allophones. Use the data in [9.12] to support your argument.

[9.12] **tl*eg (compare [bu*tl*eg] *bootleg*)
**nd*aɪz (compare [mɜtʃə*nd*aɪz] *merchandise*)
**bm*it (compare [sʌ*bm*ɪt] *submit*)
*psɪŋ (compare [kəlæ*ps*ɪŋ] *collapsing*)

What [9.12] illustrates is the importance of constraints on the combination of sounds. All the starred pseudo-words contain English phonemes; all the consonant sequences at the beginning of the pseudo-words are permissible in English: [tl] occurs in *bootleg*, [nd] occurs in *merchandise*, [bm] occurs in *submit* and [ps] occurs in *collapsing*. But, the sequences in [9.12] are not potential English words. Just as at the level of grammar not all sequences of words produce a well-formed grammatical sentence, so it is in phonology: not all combinations of sounds produce possible words. Some non-occurring nonsense words, like those in [9.12] are beyond the pale, while other non-occurring words could easily be turned into real words if a meaning could be found for them. For instance, if you invented a machine which automatically does phonological analysis, you could call it by any one of these names:

[9.13] [fɒnəlaɪzə]
[aʊsl]
[glukə]

As a speaker of English, you know that the non-occurring words in [9.13] are potential words while those in [9.12] are not. The rules which reflect speakers' knowledge of what combinations of sounds are allowed in their language are variously referred to as PHONOTACTIC RULES or MORPHEME STRUCTURE CONDITIONS.

The syllable is the unit in terms of which phonotactic rules are best stated. Thus, for instance, in English the sequence [tl] is allowed so long as the *t* and the *l* belong to different syllables as in *boot-leg* [but-leg], *at-las* [æt-ls], *part-ly* [pɑt-lɪ] or *litt-le* [lɪt-l̩] (syllabic *l̩* is the nucleus of the second syllable (see [9.1c]). But the sequence *tl* is not allowed in the same syllable. Hence the impossibility of **tleg* as an English word since it has tl as a syllable onset. Likewise, [bm] can occur in English if there is a syllable boundary separating them as in *sub-mit* but [bm] would not be allowed where those two sounds belonged to the same syllable as in our imaginary word **bmit*.

Another English example of a phonotactic constraint is the rule which only allows vowels to follow syllable-initial affricates: while *cheap*, *judge* and *adjust* are English words, **chleep*, **jpudge* and **adjpudge* are neither real nor potential words in English.

Supply three examples of your own of:
(a) non-occurring **possible** words in English;
(b) non-occurring **impossible** words in English.
Explain the grounds for your decisions.

Constraints on syllable structure serve as a filter allowing only certain sound sequences to occur. These constraints are specific to a particular language. What is a well-formed syllable in Swahili may not be in English. In Swahili (and in many other African languages) for instance, NC sequences like [nd] as in [ndugu] 'brother' or [ŋg] as in [ŋguruwe] 'pig' are allowed in syllable- (and word-) initial position but they are outlawed in that position in English: *[ndu], *[mpig] and *[ŋget] are not potential words in English. (That is why the names of African leaders like *Nkrumah* and *Nkomo* tend to have a short [ɪ] or [ə] vowel inserted before them to make them pronounceable by English speakers.)

The nativisation of foreign loanwords and the phenomenon of 'foreign accent' provide interesting evidence of how deeply ingrained syllable structure rules are. For the same reason that native speakers of English insert a vowel before a word-initial (and syllable-initial) velar nasal in words like *Nkrumah*, speakers of languages like Walpiri (Australia) and Luganda, which only have syllables ending in V in the phonetic representation, will insert a vowel after a syllable-final consonant in borrowed words such as [wʌn] 'one'. In Walpiri *one* is rendered as [wani] and in Luganda as [wanu]. Likewise, English loanwords in Japanese are normally modified to fit in with the predominantly CV syllable structure of the language. So, 'baseball' and 'milk' become [besuboru] and [miruku] respectively.

9.4.2 The syllable as the domain of phonological rules

The relevance of syllable structure constraints is not restricted to loanwords and mother tongue interference. Syllable structure often plays an important role in conditioning the application of phonological rules internal to a language.

A frequently cited example of the relevance of the syllable in determining whether a phonological rule applies is some form of obstruent devoicing rule which is found in many languages including Russian, German and Turkish. In Turkish it is responsible for alternations like [rengi], (possessive), [renkten] (ablative) and [renk] (nominative) 'colour'; in German for the alternation between [tāk] 'day' and [tāgə] 'days'; in Russian for the alternation between [gorat] 'town' and [garada] 'towns'.

The rule can be written as follows:

$$[9.14]\quad [\text{-sonorant}] \rightarrow [\text{-voice}] / \_\_ \begin{Bmatrix} C \\ \# \end{Bmatrix}$$

This rule correctly states that obstruents are devoiced word-finally or before another consonant. But it misses the point that the environments 'word-finally' and 'before another consonant' are not accidentally related contexts. The two environments share the property of being syllable final.

The makeshift nature of the solution provided by rule [9.14] becomes even clearer when it is appreciated that the environment 'word-finally or before another consonant' turns up frequently not only with respect to obstruent devoicing, but also with respect to other rules. Take the nasalisation rule of French (which is similar to a nasalisation rule found in numerous languages):

$$[9.15]\quad V \rightarrow [+\text{nasal}] / \_\_N \begin{Bmatrix} C \\ \# \end{Bmatrix}$$

Vowels are nasalised when followed by a preconsonantal nasal as in /enfle/ [ɑ̃fle] *enflé* 'swollen' or word-finally as in /bon/ [bɔ̃] *bon* 'good'.

Account for the nasalisation of the vowel in *grand* [grɑ̃] 'big' and *sentiment* [sɑ̃timɑ̃] 'feeling'.

The same nasalisation rule applies even where on the surface the nasal is not syllable-final in words like *sentiment* [sɑ̃timɑ̃] (*sentimental* [sɑ̃timɑ̃tal] 'sentimental'); and *grand* [grɑ̃] (*grande* (feminine) [grɑ̃d]). A derivation is worked out for *grand* to show this:

[9.16] *UR*: /grand/
Rule a
Vowel nasalisation before syllable-final NC:
grand → grãnd (see [9.15])
Rule b
Consonant deletion: grãnd → grã (see [7.4])
PR [grã]
(Note: rules a and b may apply simultaneously as the underlying representation satisfies the structural descriptions of both rules.)

If the relevance of the syllable is not recognised, the fact that the same environment turns up in various rules in different languages remains a puzzling mystery. If, however, the syllable is recognised, it becomes obvious that these processes are conditioned by the presence of a syllable boundary.

Furthermore, probably in every language there are phonological processes whose motivation is the preservation or the creation of preferred syllables. The function of such rules can only be understood if they are approached in terms of the syllable. A classic example in the literature comes from the Californian language Yawelmani. In this language consonant clusters are allowed only if they do not exceed two consonants. When a consonant-commencing suffix such as the aorist[2] suffix – *hin* is added to verb roots whose last two segments are consonants, a vowel is inserted between the last two root consonants to prevent a triconsonantal sequence from occurring:

[9.17] *root – aorist*
/ˀilk – hin/ → [ˀilɪ̠khin] 'sang'
/paˀt̥ – hin/ → [paˀɪ̠thin] 'fought'
(t̥ is retroflex)

If a vowel-commencing suffix like the dubitative suffix *-al* is added, however, no vowel insertion takes place since the requirement of a maximum of two consonants in a cluster is not violated. (The dubitative mood is used to express doubt.)

[9.18] *root – dubitative*
/ˀilk – al/ → [ˀilkal] 'might sing'
/paˀt̥ – al/ → [paˀtal] 'might fight'

9.4.3 The syllable and the structure of complex segments

The syllable not only regulates the combination of segments, it also controls the combination of features which make up segments. In this, current thinking differs from that of early generative phonology which assumed that phonemes were bundles of features with these two characteristics:

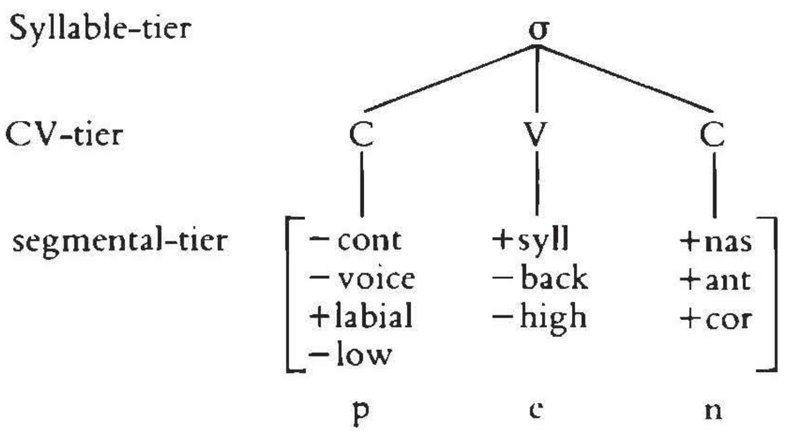
(i) the scope of each feature was one segment and no feature could extend over adjacent segments;
(ii) within a single phoneme the features were unordered which meant that there was no subphonemic structure.

Both these assumptions fail in many cases. Frequently articulatory gestures are not started and completed within a single phonological segment (Firth 1948). Obvious examples are words like *guard-room* and *barbarism* in which the feature [+voice] is not restricted to particular segments but extends over the entire word. We need not labour the point that was made in Chapter 4 that since speech organs are not mechanical ratchets, it is only to be expected that articulatory gestures are going to overlap in the transition from one segment to the next.[3]

One of the main functions of the syllable is to provide an analysis of the internal structure of segments and to indicate the number of rhythmic units present in a syllable. This depends on the way C and V elements present on the CV-tier are linked with consonant and vowel segments on the segmental tier (Hyman 1985). Three patterns of internal segmental structure are possible:

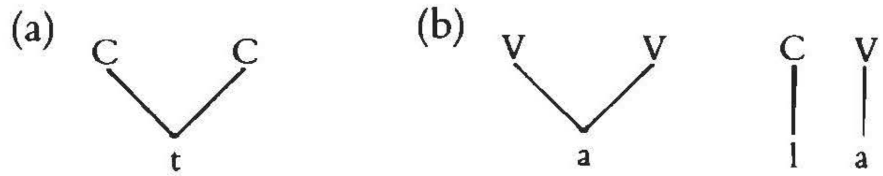
(a) A one-to-one association of V or C with a segment:

[9.19]



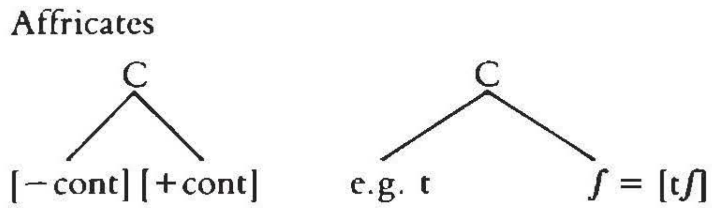
(b) Simultaneous association of one segment with two C or V slots. That is the case when consonants are GEMINATED (i.e. the same consonantal articulation is held for the duration of two consonantal beats) or when a vowel is lengthened (i.e. the same vowel quality is maintained over two V slots). I represent both possibilities with a Luganda example in [9.20]. The word *ttaala* [t:a:la] 'lamp', begins with a geminate *t* followed by a geminate vowel.

[9.20]



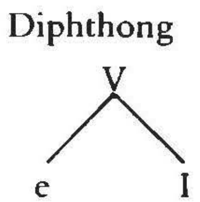
(c) The third possibility is the simultaneous association of a single C slot with two segmental distinctive feature matrices. This is what happens when complex segments like affricates occur. Affricates like [pf], [tʃ] and [dʒ] are described using the feature [+delayed release] in SPE (see section 3.3.6). But they can be more revealingly represented in this way:

[9.21]



This makes the feature [delayed release] superfluous. Diphthongs are treated in analogous fashion:

[9.22]

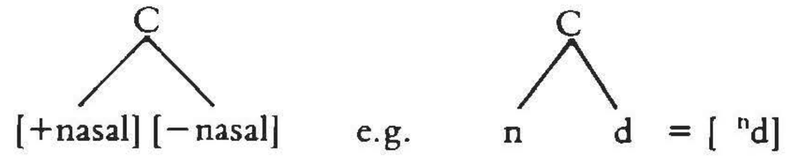


(as in [eɪt] 'eight')

Many languages have prenasalised consonants which, like the complex segments above, do show sequential organization of features at the subsegmental level. An example of a prenasalised consonant is the sound [^{n}d] as in Kikuyu [^{n}dɛgwal] 'bull'. In the light of [9.21], how should pre-nasalised consonants be represented?

A prenalised consonant can be represented as follows:

[9.23]



9.4.4 Compensatory lengthening

In addition, the approach to the syllable outlined in the last section accounts in a natural way for some traditional problems in phonology such as COMPENSATORY LENGTHENING. In many languages, if an underlying syllabic segment is deleted or is released as nonsyllabic, an adjacent syllabic gets lengthened 'in compensation'. We shall exemplify this with the data from Luganda in [9.24].

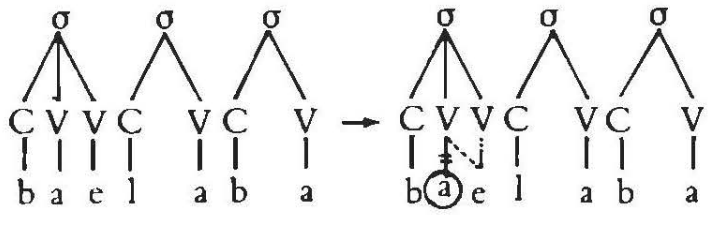
[9.24] /ba+a+lab+a/ [ba:laba] 'they saw'
(but /ba+ku+lab+a/ [bakulaba] 'they see you')
/ba+e+lab+a/ [be:laba] 'they see themselves'
/mu+a+lab+a/ [mwa:laba] 'you saw'
(but /mu+tu+lab+a/ [mutulaba] 'you see us')
/li+ato/ [lja:to] 'boat, canoe'
/ma+ato/ [ma:to] 'boats, canoes'

The rule is that a high vowel is realised as a nonsyllabic glide if it appears followed by another vowel; it is delinked from a V slot and re-associated with a C slot (see rule [9.7] above). But a nonhigh vowel is deleted altogether if it appears followed by another vowel. The motivation for the glide formation and vowel deletion rules in Luganda is to prevent two dissimilar vowels from being adjacent to each other in the phonetic representation. Interestingly, the number of V-elements on the CV-tier remains stable regardless of the fate of the first vowel. How can this be explained?

Let us assume that in the underlying representation each C and each V element of the CV-tier has a certain amount of potential duration. This can be represented as a BEAT or TIMING UNIT (or WEIGHT UNIT). Normally only those timing units which are associated with vowels survive in the phonetic representation. Timing units tend to reflect syllabic peaks because the syllabification rules in [9.10] ensure that only the timing unit of the more sonorous segment is retained when segments are grouped together in a syllable.

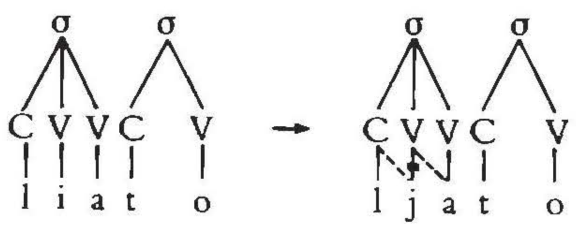
We can now interpret compensatory lengthening as follows: when the first vowel is deleted or realised as a nonsyllabic glide, its V-slot (and timing unit) is inherited by the second vowel which becomes simultaneously associated with two V slots and hence has virtually the duration of two vowels in the phonetic representation:

[9.25]



[be:laba]

[9.26]



[lja:to]

See if you can find an example of compensatory lengthening in a language that you know.

9.4.5 The syllable as indispensable building block for higher phonological domains

In recent years, phonological research has amassed evidence showing that the syllable is the hub of phonological organisation. In many languages, higher prosodic phenomena like stress, nasalisation, and quantity (length) can only be insightfully described in terms of the syllable because often, in order to determine whether a given rule is applicable, the number of syllables in a word (or part of a word) has to be counted. There are rules which require main word stress to fall on a certain syllable of the word which could be, say, the last syllable or second syllable from the end (penultimate syllable) of a word. We shall preview this kind of rule here and return to it in more detail in Chapter 11.

Which syllable receives stress in the Swahili data in [9.27]?

[9. 27]	pɪga	'hit'
	pigána	'fight',
	piganíʃa	'cause to fight'.
	tutawapíga	'we shall hit them'
	tutawapiganíʃa	'we shall make them fight'

The answer is that stress falls on the penultimate syllable. The relative position of stress remains the same even when the word grows longer with the addition of affixes.

Swahili has another rule which determines whether the noun class 9 nasal prefix is syllabic. This rule also takes the number of syllables in a word into account: if attached to MONOSYLLABIC roots, the nasal prefix is syllabic but if attached to longer roots, it is non-syllabic:

[9.28] (a)	n̩ta	point	(b)	mbuzi	goat
	ntʃi	country		ŋguruwe	pig

The next example is from Luganda. It involves CLITICS. But before we examine the Luganda data we need to digress and clarify the notion of 'clitic'. Typically a clitic is an unstressed particle which is attached to a HOST (i.e. main) word and is incapable of standing on its own.

Often clitics affect the stress pattern of the host word. A clitic attached to the beginning of a word is called a PROCLITIC and a clitic attached to the end of a word is called an ENCLITIC. Some clitics are derived from self-standing words. For example, the French first person pronoun form *je* (as in *je le vois* 'I see him') is an independent word. But in *j'ai* (from *je ai*) 'I have' it is a PROCLITIC. In English *not* is a separate word in *she is not* but it is an ENCLITIC in *she isn't.* Other clitics are not derived from independent words e.g. Latin *-que* 'and' as in *mensamque* 'and the table' (accusative case). The process of adding clitics is called CLITICISATION.

We can now return to Luganda after the digression. In this language there is a vowel length rule which is sensitive to the number of syllables. Some words of more than one syllable end in a long vowel and others in a short vowel. The difference between these two word types shows up when an enclitic (a grammatical particle attached to the end of a word) like the interrogative marker *-ki* is present. A word like *mutawa:na* 'trouble' which underlyingly ends in a long vowel becomes [mutawa:*na*:ki] 'what trouble'. But a word like *mukozi* 'worker' which underlyingly ends in a short vowel, when cliticised (e.g. when the enclitic interrogative particle *-ki* is attached to it), becomes [mukoz*i*ki] 'which worker' not *[mukoz*i*:ki].

Interestingly, in Luganda all monosyllabic roots end in a long vowel in the underlying representation. That long vowel is shortened in most contexts in the phonetic representation. But it is protected and shows up before enclitics like the interrogative marker as you can see:

[9.29] Monosyllabic length

Underlying Representation	*Cliticised Form Phonetic Representation*	*Non-cliticised Form Phonetic Representation*
ki-taa 'calabash'	kita: ki 'which calabash'	kita 'calabash'
ki-loo 'night'	ki-lo: ki 'which might'	ki-lo 'night'
ma-taa 'milk'	ma-ta: ki 'which milk'	ma-ta 'milk'

mu-tii	mu-ti: ki	mu-ti
'tree'	'which tree'	'tree'

Swahili and Luganda are not extraordinary in requiring a count of the number of syllables before deciding whether or not a rule applies. Some other languages, for example Spanish, do the same. Jaeggli (1980) has shown that there are Spanish dialects where the form that a diminutive suffix takes depends simply on the number of syllables in the noun to which the diminutive suffix is added: *-sita/-sito* is added after disyllabic words and *-ita/-ito* after trisyllabic ones.

[9.30]	(a)	*-sita (fem.)/ -sito (masc.)*		
		Noun		*Diminutive*
		madre	'mother'	madre-sita
		cruz	'cross'	cruze-sita
		buey	'bull'	bueye-sito
	(b)	*-ita*		
		comadre	'midwife'	comadr-ita
		dinosauryo	'dinosaur'	dinosaur-ito

Semantically, the addition of a diminutive suffix to a noun has the effect of changing its meaning so that it can be paraphrased in English as 'a little or insignificant somebody or something'.

9.5 Syllable weight

Traditionally the major distinction drawn between syllable types found in languages has been between OPEN SYLLABLES and CLOSED SYLLABLES. An open syllable ends in a vowel while a closed syllable ends in a consonant. In some languages syllables typically end in a vowel, that is to say, they are open. That is the situation in languages like Japanese and Luganda (if syllabic nasals are disregarded). In other languages, like French and English, syllables can end in a consonant. But, even in those languages which allow closed syllables, there is often a clear preference for open syllables. In French, for instance, syllable final consonants suffer a considerable degree of attrition. There is a rule which deletes word final consonants in words like *petit* [pə ti] ‘little’ and preconsonantal consonants as in *enfant* [ɑ̃fɑ̃] ‘child’. The effect of this deletion rule is to to turn what would be a closed syllable into an open syllable.

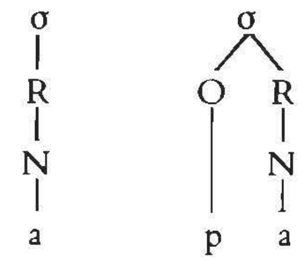
The consensus today is that more important than the traditional classification of phonological systems in terms of open and closed syllables is their classification in terms of SYLLABLE WEIGHT. In numerous languages a factor that determines the applicability of certain phonological rules is the WEIGHT of the rhyme. Essentially, a syllable is LIGHT if it contains a nonbranching rhyme as in [9.31]. But a syllable is HEAVY if it contains a **branching rhyme** as in [9.32]. The onset seems never to play any role in the computation of syllable weight. Consequently, its internal structure is irrelevant.

Generally, languages in which a distinction between light and heavy syllables is drawn fall into two camps which are shown as type A and type B below. To begin with, for convenience, I assume that the syllables have the structure given in [9.1] at the beginning of this chapter.

Type A Languages

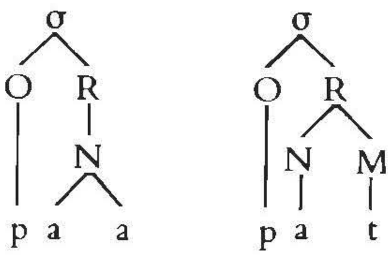
(a) In a light syllable the rhyme contains a short vowel as in [9.31]:

[9.31]



(b) In a heavy syllable the rhyme contains
either
(i) a long vowel or diphthong optionally followed by one or more consonants;
or
(ii) a short vowel followed by at least one consonant as in (9.32)

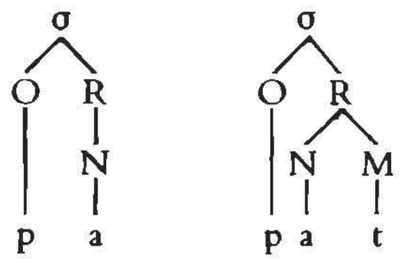
[9.32]



Type B Languages

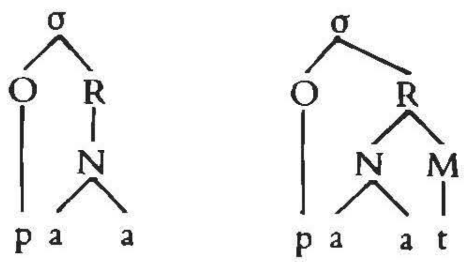
(a) In a light syllable the rhyme contains a short vowel. As always, the presence or absence of a consonant in the onset is irrelevant. But in this case so is the presence of a consonant in the margin, following the nucleus:

[9.33]



(b) In a heavy syllable the rhyme contains a long vowel or diphthong. The presence or absence of any consonant in the margin being again irrelevant.

[9.34]



Probably Latin is the best known example of a type A language. Stress placement in Latin was governed by a rule which was sensitive to syllable weight:

[9.35] *Latin Stress Rule*

(i) In disyllabic words, stress the first syllable, as in [ré-go:] *rēgo* 'I rule'

(ii) In a word of more than two syllables, stress a heavy penultimate syllable (the second syllable from the end of the word). A syllable is heavy if it contains a long vowel as in [i-ni-mí:-kus] *inimīcus* 'enemy' or, alternatively, if in the margin, following the vowel there is a consonant as in [re:-ksís-tis] *rēxistis* 'you (plural) ruled'.

(iii) If the penultimate syllable is short and has no consonant in the margin, it is regarded as light and stress in that case is placed on the antepenultimate syllable, as in [ı-nsu-la] *insula* 'island'

Syllable weight is at the heart of Latin METRE. Traditional Latin primers, like Kennedy (1948:203) on whom the account here is based, have taught generations of students that a VERSE (i.e. line of Latin poetry) consists of a certain number of FEET. Each foot is made up of two or more syllables. One of the syllables in the foot, usually the heavy one dominates the other(s). Usually the metrically dominant part of the foot is called the RISE (¯) and the weaker part is called the FALL (˘). The principal feet in Latin poetry are listed in [9.36]

[9.36]	IAMBUS:	one light syllable followed by a heavy one e.g. *carō* 'flesh' (˘ Fall, ¯ Rise)
	TROCHEE:	one heavy syllable followed by a light one e.g. *mēnsa* 'table' (¯ Rise, ˘ Fall)
	ANAPAEST:	two light syllables followed by a heavy one e.g. *patulae* 'broad' (˘˘ Fall, ¯Rise)
	DACTYL:	one heavy followed by two light ones e.g. *litora* 'shore' (¯Rise, ˘˘ Fall)
	SPONDEE:	two heavy syllables e.g. *hērōs* 'hero' (˘Fall ¯ Rise; or ¯ Rise ¯ Fall)
	TRIBRACH:	three light syllables e.g. *temere* 'to fear' (˘Fall, ¯Rise; or ¯ ¯Rise, ˘Fall)

The spondee and tribrach are rare. The common feet all share the characteristic of having strong, dominant syllables which alternate with weak ones.

Let us leave Latin and turn to an example of a type B language. We have borrowed Larsen and Pike's (1949) data from the Mexican language Huasteco for our illustration.

Work out the placement of stress in this language, showing the interaction between stress and syllable weight. Vowel length is phonemic and it is indicated by a colon in the usual way. An apostrophe after a consonant shows that it is glottalised. The accent marks stress.

[9.37] *Disyllabic words*

/ʔát'em/	'salt'	/cálam/	'shade'
/bú:c'iʔ/	'coward'	/ʔé:jal/	'boss'
/cijó:k/	'chin'	/ʔamú:l/	'rubbish'
/ʔi:lá: b	'seed'	/ya:ní:l/	'many times'

[9.38] *Trisyllabic words*

/hílk'oma/	'leftovers'
/ʔá: u lom/	'field of garlic'
/k^{w}'ahí:lom/	'window'
/hu: u:k' ik/	'blisters'
/ʔalabé:l/	'pretty'
/bí:nomac/	'one who gave'
/ʔuba:t'lá:b/	'game, plaything'
/ʔe:la: wá:j/	'(they) surely find each other'

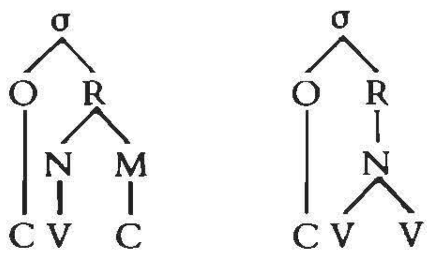
I hope you have worked out a statement along these lines for predicting stress placement in Huasteco:

[9.39] (i) If a word contains one or more long vowels, stress falls on the syllable with the last long vowel.
(ii) If a word contains no long vowels, stress falls on the first syllable.

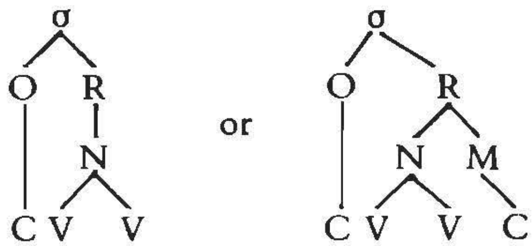
The upshot of this discussion is that while the rhyme plays a role in determining the applicability of stress rules, the onset does not. As a rule, in order to apply rules, it is necessary to know the constituent structure of the rhyme but not that of the onset. The crucial characteristic of rhymes has been formally stated in the literature in terms of the BRANCHING RHYME HYPOTHESIS: a syllable with a nonbranching rhyme, is light while a syllable with a branching rhyme is heavy. The difference between type A languages like Latin and type B languages like Huasteco is accounted for by assuming the tree geometry in [9.40] and [9.41] respectively for these languages.

The metaphor of PROJECTION[4] has been used to express the principle at stake: in quantity-sensitive stress systems, where syllable weight plays a key role, we could say that as far as the stress rules are concerned, the syllable onset is not relevant, it is not 'seen'. What is projected (on

[9.40] *Type A Heavy Syllables*



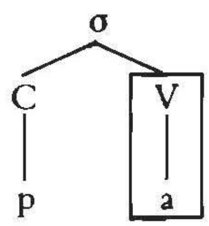
[9.41] *Type B Heavy Syllables*



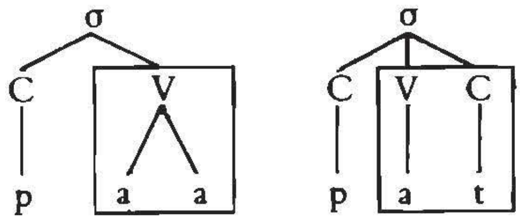
an imaginary screen, as it were) and 'seen' by the stress rules is the rhyme. In type A languages what is watched out for is branching anywhere in the rhyme, be it at the level of the nucleus and margin, or within the nucleus itself. In type B languages, on the other hand, only the nucleus is projected. The question whether branching occurs is only asked about the nucleus.

Let us now return to the CV-tier model and restate syllable weight within that framework. In CV-tier phonology the differences between type A and type B languages can be accounted for by assuming that only V (and the segments it dominates) and any C following the V element is projected. The situation in the two types of language is shown in [9.42] and [9.43] respectively. (I have boxed off the elements that are projected.)

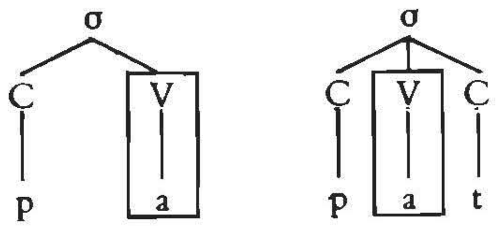
[9.42] *Type A Language*
(a) *light syllables*



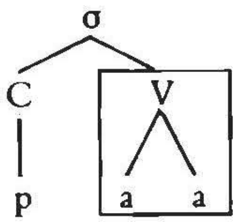
(b) *heavy syllables*



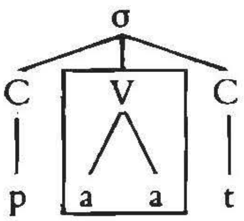
[9.43] *Type B Language*
(a) *light syllables*



(b) *heavy syllables*



or



9.6 Abstract segments

The theory of the syllable outlined here also succeeds in throwing some light on one of the most recalcitrant problems in phonology: the problem of *abstract segments*. In many languages phonologists have discovered that 'ghost segments' which do not appear in the phonetic representation may affect the way in which phonological rules apply (see Chapter 8, section 3, pages 145–146).

Consider the facts of French which are shown in [9.44] and [9.45]:

[9. 44]	[labe]	l(e) abbé	'the abbot'
	[lane]	l(a) année	'the year'
	[leta]	l(e) état	'the state'
	[lidãntite]	l(a) identité	'the identity'

A rule deletes the vowel of the definite article when the next word begins with a vowel:

[9.45] Vowel truncation
[-cons] → ø/ __# V

The consonant-commencing nouns in [9.46] are unaffected:

[9. 46]	[lə bwa]	le bois	'the forest'
	[la karaf]	la carafe	'carafe, water-bottle'
	[lə pa]	le pas	'step, pace'
	[la maladi]	la maladie	'illness'

In the light of the solution provided above, how should words below commencing with the so-called 'H ASPIRÉ' be represented in underlying lexical representations? Justify the rule which you propose. (You might find it useful to review first the discussion in section 3 of Chapter 8.)

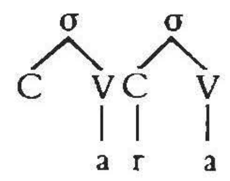
[9.47] [le ara] *[lez ara] les haras 'the stud farms'
[le arpist] *[lez arpist] les harpistes 'the harpists'
[le erɔ̃] *[lez erɔ̃] les hérons 'the herons'
[le ɔrd] *[lez ɔrd] les hordes 'the hordes'
[le up] *[lez up] les houppes 'the bunches'

The problem is this: although phonetically they start with a vowel, these words behave phonologically as though they started with a consonant. This raises questions about the nature of that consonant as we saw on page 146.

The solution which the theory of the syllable outlined here enables us to come up with is simple. The theory allows C and V elements to exist at the CV-tier without being linked to consonant or vowel segments. In that event, they do not surface in the phonetic representation – they are not pronounced. But phonological rules affecting the CV-tier would have access to them.

In the case of h-aspiré words, there is an unattached C which inhibits the application of the vowel truncation (deletion) rule although it is not linked to any concrete sound on the segmental tier. The situation can be represented in this way:

[9.48]



haras 'stud farm'

9.7 Extrasyllabicity

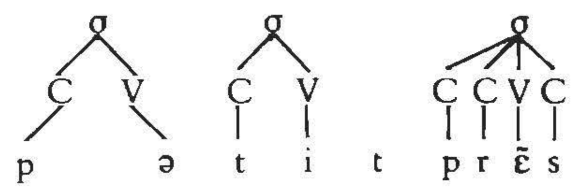
The reverse situation also occurs. A segment can be phonetically fully specified without being linked by association lines to a C or V. Such a 'floating' segment is not part of any syllable: it is EXTRASYLLABIC.

Another French example illustrates this. Instead of using the familiar consonant truncation rule (see [7.4] and [9.16]) which deletes syllable-final consonants unless they are followed by a vowel, we can simply attribute the failure of such consonants to surface in the phonetic representation to their being extrasyllabic.
Compare these data:

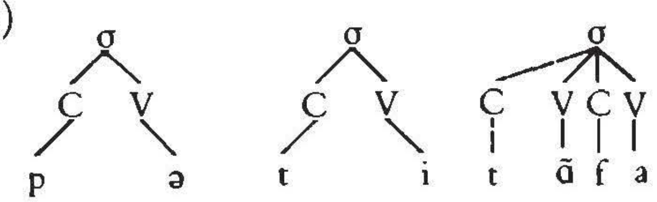
[9.49] (a) [pəti prɛ̃s] petit prince 'petty prince'
(b) [pəti tɑ̃fɑ̃] petit enfant 'little child'

Where the next word begins with a consonant as in *petit prince* [9.50a], the floating underlying final /t/ of *petit* remains unattached at the end of the derivation and consequently fails to surface. But where the next word begins with a vowel as in *petit enfant* [9.50b], a C-element is inserted at the CV-tier and the floating underlying /t/ is attached to it. The Onset First Principle [9.9] ensures that the inserted C (and the segment it dominates) is attached as a syllable onset. The /t/ is then able to surface phonetically.

[9.50] (a)



(b)



This analysis implies that French prefers open syllables both in underlying and surface representations.

Syllable-based rules are not extraordinary in ignoring peripheral elements. As we shall see presently, in many languages stress rules also tend to disregard peripheral elements in words (see section 11.2.3).

9.8 Summary

To summarize, the syllable has the following functions:

(i) Phonotactic regulation: constraining the combination of consonants and vowels of a language.
(ii) Regulation of subsegmental structure through the CV-tier.
(iii) Serving as the unit of the phonological hierarchy in terms of which the behaviour of higher units of the prosodic hierarchy such as stress, tone, and duration is stated.

Exercises

1.(a) Make a broad transcription of the data below.
(b) Divide the words into syllables using the syllabification convention in [9.10].

met	fright	sphere
strict	laughed	scratched
juxtapose	Knesset	Gdańsk

(c) Comment on any problematic cases. Does [9.10] need to be modified to accommodate them?

2.(a) Study the following data and suggest an informal rule to account for the distribution of lax and tense vowels in English:

column A	column B	column C	column D
lax	*tense*	*tense*	*lax*
bit [bɪt]	beat [bit]	bee [bi]	sing [sɪŋ]
get [get]	weight [weɪt]	way [weɪ]	long [lɒŋ]
ban [bæn]	barn [bɑn]	bar [bɑ]	banging [bæŋɪŋ]
pot [pɒt]	port [pɔt]	paw [pɔ]	fungus [fʌŋgəs]
soot [sʊt]	suit [sut]	sue [su]	tongue [tʌŋ]

Hint: The lax vowels are /ɪ e æ ʌ ɒ ʊ ə/ All other vowels are tense. Syllable structure affects the distribution of lax vowels.

3.(a) The data below exemplify the process known as LIAISON in French. Using the approach to the syllable proposed in this chapter, formulate a rule to account for liaison. Specifically, state how the segmental tier, the CV-tier and the syllable tier are linked.

[le dam]	les dames	'the ladies'
[le fose]	les fossés	'the ditches'
[le primat]	les primates	'the primates'
[le mwa]	les mois	'the months'
[lez animo]	les animaux	'the animals'
[lez ebenist]	les ébénistes	'the cabinet-makers'
[lez idjo]	les idiots	'the idiots'
[lez ordinatœ:r]	les ordinateurs	'the computers'
[lez urs]	les ours	'the bears'
[lez ɑ̃fɑ̃]	les enfants	'the children'

Notes

1. For a good discussion of the functions of the syllable also see Fudge (1969).
2. The term AORIST means simple past tense, e.g. *went*, or *walked* as opposed to *had walked* or *had been walking*.
3. We shall return to this point in the next chapter when we consider suprasegmental phonological phenomena like vowel harmony.
4. The account I have presented is not universally accepted. It has been argued by Hyman (1985) that the notions of branching rhymes and projection of the rhyme only offer a partial explanation of the nature of the syllable. This is because they fail to show that the units which contribute to syllable weight are also the same units which can carry tone, stress and quantity. There is nothing in the projection approach that shows that this is not mere coincidence. Hyman argues that a more illuminating account would be one which incorporated the notion of MORA (timing unit or weight unit). Nonbranching rhymes contain one mora while branching rhymes contain two.