REVIEW ARTICLE

CV Phonology: A generative theory of the syllable. By GEORGE N. CLEMENTS and SAMUEL JAY KEYSER. (Linguistic Inquiry monograph 9.) Cambridge, MA: MIT Press, 1983. Pp. 191. $13.95.

Reviewed by DONCA STERIADE, *MIT**

This book fulfills a double function. For the beginning phonologist, it is an introduction to syllable theory: an illustration of the uses of syllable structure in understanding the functioning of phonological processes, and an introduction to the central issues of syllabic phonology. For the specialist, it is primarily an argument for a particular view of syllable structure: syllables as structures without internal constituents, defined over timing units inherently specified as peaks (V's) or non-peaks (C's). It is also a systematic illustration of the phonological uses of the timing tier.

The heart of the book begins with Chap. 2, 'A three-tiered theory of the syllable', which introduces C&K's assumptions on syllable structure. Chap. 3, 'Evidence for the theory', presents a number of short case studies, each of which illustrates some of the assumptions made in Chap. 2. In Chap. 4, 'Extrasyllabicity and vowel epenthesis in Klamath', and Chap. 5, 'Syllable theory and global rules', C&K provide an extensive fragment of the phonological grammar of Klamath, analysed in terms of the notions introduced earlier in the book. The structure of *CV Phonology* fits the needs of the student—who, in reading the book, will become gradually acquainted with major topics of research and debate in syllabic phonology; will be introduced to some basic arguments for the syllable and its component units; and, finally, will learn to use syllable structure in unraveling the complexities of rule systems. The book is organized less efficiently from the point of view of the more advanced reader, who is trying to follow the thread of C&K's argument for flat syllables defined on C's and V's: this argument begins on pp. 5–8, continues on 11–24, is pursued implicitly in the discussion of Turkish VC vowels (pp. 67–73) and French liaison (96–113), and resurfaces in the analysis of Klamath glide vocalization (139–77).

CV Phonology builds on the results of two immediate antecedents: one is Kahn 1976, an argument for syllabic constituents within generative phonology; the other is McCarthy 1979, which introduced the distinction between timing units (C/V) and segments. C&K were the first to react to the fact that there is considerable functional overlap between McCarthy's C/V distinction and the traditional syllable-internal division between onset, nucleus and coda. One notes that the analysis of many syllable-sensitive phenomena can be done in terms either of flat syllables defined on C's and V's, as in Figure 1a—or of syllables with a more elaborate constituent structure, as in Figure 1b, defined on undifferentiated timing slots. As C&K point out, there is no need for a

* Thanks to Nick Clements, Jay Keyser, David Nash, and Jane Simpson for discussion of an earlier draft of this review.

representation like Figure 2, which would combine the constituent structure of Fig. 1b with the C/V distinction of Fig. 1a.

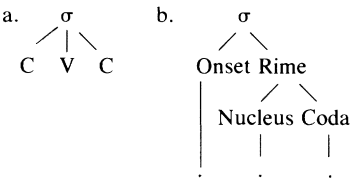

FIGURE 1.

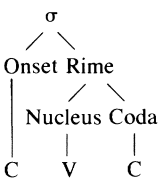

FIGURE 2.

The redundancy in Fig. 2 can be eliminated by opting for either Fig. 1a or Fig. 1b. In many respects, these two representations are equivalent, even when we remove the (redundant) labels on the syllable-internal constituents of Fig. 1b, as in Figure 3.

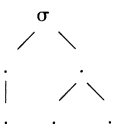

FIGURE 3.

The equivalence between Fig. 1a and Fig. 3 can be defined as follows: a V corresponds to the leftmost position in the right-hand constituent of Fig. 3; a C is any other position. Notations like Fig. 3 (cf. Selkirk 1984, Levin 1985, Kaye & Lowenstamm 1984) are not and could not have been explicitly considered by C&K: such notations were developed simultaneously with or shortly after the first versions of *CV Phonology* were circulated, in part as a reaction to the book. But, with the benefit of hindsight, it seems clear that the redundant representation in Fig. 2 (C&K's Fig. 2, p. 5—or their notationally equivalent Figs. 3–4, p. 7) is not the real contender: for this reason, I will try to reconstruct C&K's argument by referring consistently to Fig. 3 as the only serious alternative to flat C/V structures.

To reject Fig. 3 in favor of Fig. 1a, one can show: (i) that the constituent structure in Fig. 3 is not needed for any purpose other than that of distinguishing nuclear (V) from non-nuclear (C) elements; and (ii) that the C/V distinction is in fact needed independently of the syllable structure. C&K provide, at different points in the book, evidence bearing on both points.

The argument against the constituent structure of Fig. 3 comes early (5–24), and is based on considerations of restrictiveness. C&K provide a list of the traditional uses of the onset/rime distinction, and reject all but one: the need to distinguish moraic from non-moraic segments. Indeed, the major reason for grouping the nucleus of a syllable with its right branch, the rime—rather than its left branch, the onset—is the fact that moras (tone- and stress-bearing elements) occur only in the nuclear and postnuclear section of the syllable. The existence or internal structure of the prenuclear section is, with marginal exceptions, irrelevant in determining whether a syllable is light or heavy, or

whether it has one or more tone-bearing elements. C&K note that, by itself, this fact does not justify the right-branching structure in Fig. 3: they point out that equivalent notations, which make different or no constituency claims, are available. One such notation is the Nucleus: 'a prosodic category consisting of any and all tautosyllabic sequences of the form V(X), where X ranges over C and V' (12). Although defined on tautosyllabic segments, the Nucleus stands in no direct structural relation to the syllable: unlike the traditional notion of nucleus, C&K's Nucleus is not dominated by the syllable node—see Figure 4.

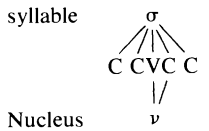

FIGURE 4.

Some details of the structure in Fig. 4 are left without explicit justification. Why is the Nucleus limited to only two slots? Because, one guesses, weight distinctions are strictly binary; because, in general, there are no more than two tone-bearers per syllable; and, finally, because operations like Compensatory Lengthening, which function to preserve mora count within the syllable, distinguish in general between mono-moraic and bi-moraic syllables, not between 'tri-moraic' CVCC and bi-moraic CVC. Why is the Nucleus an independent tier, then, rather than a subconstituent dominated by the syllable node, as in Figure 5? The answer to this question remains more difficult to reconstruct.

FIGURE 5.

These details aside, one must agree with C&K on the central issue: the fact that moras are found only in the postnuclear section of the syllable is not an argument for the onset/rime distinction in Fig. 3. Their points against other uses of constituency are also well taken: co-occurrence constraints within the syllable are not restricted to the prenuclear or post-nuclear section, but frequently span the boundary between them (20–21); poetic rhyme does not involve plain identity of rimes in languages like English, but rather identity of the stress feet, beginning with the stressed vowel (24); the evidence for rime/onset constituency from language games and speech errors remains ambiguous (22–3).

My impression is, however, that the argument from tautosyllabic co-occurrence constraints, rejected by C&K,[1] is incompletely formulated: it is more

[1] 'Certain Peaks do not co-occur with certain Codas ... while there is no such constraint between Onset and Peak' (Fudge 1969:272–3, cited on p. 19.)

difficult to dismiss it when the appropriate distinctions are made. One notes that languages frequently impose sonority distance restrictions (Harris 1983, Selkirk 1984, Steriade 1982) between members of their pre- and post-nuclear sections: Greenberg's (1964) typological observations on initial clusters suggest that, if a language allows C_iC_j as a pre-nuclear (onset) cluster, where there are n intervals on the sonority scale between C_i and C_j, then it will also allow C_iC_k as an onset cluster—where there are m sonority intervals between C_i and C_k, and $m>n$. Thus the presence of /pn/ onsets implies that of /pr/ onsets. Greenberg's observations on final clusters can be turned into a similar suggestion about sonority distance in codas. It is possible, then, that the major parameter distinguishing tautosyllabic cluster inventories is the minimal number of sonority intervals between their adjacent members: in English, for instance, this number is sufficiently large to exclude /pn/ onset clusters, while allowing /pr/ clusters. The critical point is that co-occurrence constraints based on sonority distance are found exclusively WITHIN the pre- or post-nuclear section, and never between the nucleus and the pre-nuclear section. Thus no language is known to me in which the immediately pre-nuclear segment is barred from being 'too close' in sonority to the nuclear segment: most languages disallow liquid–glide onsets, but none disallows syllables like /ri/ or /lu/ on the grounds that the liquid is only one sonority interval apart from the vowel. This rather striking fact suggests strongly that sonority-based co-occurrence constraints—which correspond roughly to C&K's Positive Syllable Structure Conditions (31, 42)—cannot cross the onset/rime boundary. In contrast, the constraints against homorganic tautosyllabic sequences (corresponding roughly to C&K's Negative Syllable Structure Conditions, pp. 20–21, 31) hold, in general, regardless of constituency: one of the most frequently encountered constraints of this sort is that against a labial onset followed by a rounded vowel (Yip 1982). The fact that such restrictions exist does not diminish the strength of the argument for constituency based on sonority distance constraints.

Two other types of phenomena support the traditional onset/rime division. One is a relatively rare but revealing type of assimilation, which applies within a domain describable as a MINIMAL SYLLABIC CONSTITUENT—i.e. within the rime if it branches, and between a non-branching rime and the onset, but not between the nucleus of a branching rime and the onset. These contexts are outlined in Figure 6.

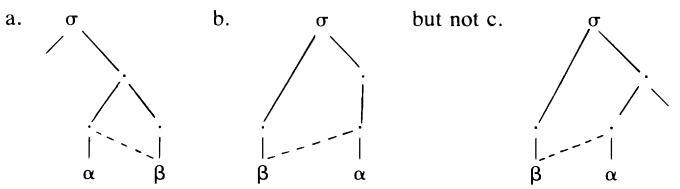

FIGURE 6.

An instance of such assimilation is found in Chinese (Chen 1984, Battistella 1984): /ə/ assimilates in backness to a glide in the configurations of Figs. 6a–

b, but not in Fig. 6c: the resulting structures are /Cei/ from /Cəi/, /Cou/ from /Cəu/, /(C)ye/ from /(C)yə/ and /(C)wo/ from /(C)wə/. In contrast, the /ə/ of closed syllables does not assimilate to a preceding glide: we get /(C)yəC/ not */(C)yeC/, and /(C)wəC/ not */(C)woC/.

This pattern is simply describable within a theory that recognizes the traditional rime/onset division as bidirectional assimilation within the minimal syllabic unit, rime, or CV syllable—or, borrowing a syntactic relation, bidirectional assimilation between a glide and a vowel that c-commands it. We assume, following Levin 1985, that complex onset clusters do not form constituents, but rather that each of their members is directly dominated by the syllable node. In this way, the minimal syllabic constituent in a syllable like /Cwə/ is not the onset cluster /Cw/, but the entire syllable.[2]

The assimilation type described above is not frequently encountered; but other, better attested, segmental phenomena provide equally strong evidence for the onset/rime division. Numerous processes are traditionally described as affecting a rime segment: they frequently involve the neutralization of place or laryngeal specifications. In languages with relatively simple syllable structures, such processes can be described in C&K's framework as targeting segments belonging to the Nucleus (in the sense of Fig. 4). Thus the context in which French nasal consonants are lost, with nasalization of the preceding vowel (Dell 1973), can be described as IN THE RIME—or, in C&K's terms, IN THE NUCLEUS. The two descriptions are equivalent in this case because, for independent reasons, the only context where a post-nuclear nasal may occur in the French syllable is right after the vowel. But when the syllable structure becomes more complex, C&K's Nucleus turns out to be insufficient as a substitute for the rime. Thus, in many dialects of English, the *l* in strings like *pill, peal, elm, curl,* and *boil* is dark, in contrast to the prenuclear *l* in, say, *leg* or *lawn* (Jones 1967, Simpson 1979). If we recognize the onset/rime division, the context where *l* becomes dark is the same as that where French /n/ is lost: in the rime. But within C&K's format, no equivalent description is available: the *l*'s of *pill* and *elm* can be said to belong to the Nucleus, but those of *peal, curl,* and *boil* cannot, because they do not directly follow the first V of the syllable. One may think that the problem raised by the derivation of dark *l*'s could be obviated by reversing the direction of the rule: we could start with underlying dark *l*, and derive its light allophone in prevocalic position. Such a statement would, however, run into comparable difficulties: the prevocalic position is itself insufficient to distinguish the dark (nuclear) *l* of *cycling* from the light *l* of *cyclic*. Nor is it possible to restate the rule by reference to syllable-initial position: the non-initial *l* of syllables such as *play* is as light as the initial one in *lay*. What we need, no matter what allophone we choose to derive by rule, is the ability to refer to the onset/rime distinction: onset *l* is light, rime *l* is dark.

[2] The position of prevocalic glides as part of the onset, rather than of the nucleus, is established independently by the rhyming patterns of Chinese studied by Chen 1984: two syllables count as forming a rhyming pair if their nuclear and postnuclear sections (i.e. rimes) are identical. Prevocalic glides do not count in this computation of identity, which shows that they are not part of the nucleus.

Equivalent problems arise in the analysis of German devoicing, a process that affects rime obstruents. This rule cannot be restated as affecting the Nucleus, because it applies to syllables like *Bund* (surface [bunt]), *lieb* (surface [li:p]), in which the target obstruent follows a VC or VV sequence. Nor can this rule be said to target a syllable-final obstruent, because it affects all obstruents in syllables such as *Magd* (surface [makt]—cf. *Magdeburg*, surface [mak.də.burk]): a restatement of German devoicing as a syllable-final rule would predict that voiced obstruents could surface preconsonantally in forms like *[magt].

This is not to say that such facts cannot be described by C&K: the context of the English dark *l* rule need not be a prosodic category such as Nucleus. It could be a condition, such as: *l* is tautosyllabic with and preceded by (though not necessarily adjacent to) the vowel. Such a condition, which combines precedence with tautosyllabicity, can replace any reference to Onset or Rime. But it does so at considerable cost. Numerous rules affect consonants 'tautosyllabic with and preceded by a vowel', but there are none whose target must be described as a consonant 'tautosyllabic with and preceded by a consonant' or 'tautosyllabic with and preceded by a nasal'. Similarly, no rules affect vowels just in case they are 'tautosyllabic with and preceded by a consonant/vowel' or by any other segmental class. Obviously, some assimilation and dissimilation rules apply exclusively between tautosyllabic segments; but these involve simply the requirement that the syllable is the prosodic domain of the process, not a direct appeal to the relation 'tautosyllabic with x and preceded/followed by x'.

A related point arises in connection with phenomena which affect all rime segments equally, including the vowels. Kingston 1985 has shown that Klamath has a deglottalization process affecting all rime segments: vocoids (as in /wenwy'tk/ 'widow' → /wenwitk/), consonantal sonorants (as in /lodgn'aksga/ 'almost put a round object into someone's mouth' → /lotganksga/; /sill's/ 'sickness' → /silals/) as well as obstruents (/gatdk's/ 'cold' → /gatdaks/). Taking into account that preconsonantal /ʔ/ is also eliminated by this process (cf. C&K's discussion, 159–61), one can state deglottalization as a rule which removes the specification [+constricted glottis] anywhere in the rime.[3] This is, again, a statement that cannot be translated into the notation offered by C&K.

A phenomenon which C&K discuss at some length is Chicano Spanish vowel sandhi (85–95); this can be used to demonstrate how subsyllabic constituents help explain certain common facts about contraction rules. The central fact in Chicano sandhi is that CV.V sequences become tautosyllabic. Further, if the first V is non-low, it surfaces as [+high]; otherwise it disappears. Of the surfacing vocoid sequences which are created in this way, the first is significantly shorter than it would be in isolation. In fact the total duration of the resulting syllable is the same as that of an underlying (C)CV syllable. The final aspect of vowel sandhi is that, if either of the participating syllables was stressed in the input, the syllable resulting from sandhi will be stressed; otherwise, vowel sandhi will yield a stressless syllable.

Within a theory which posits an onset/rime distinction, vowel sandhi can be analysed as the operation whereby a sequence like /mi.u/ becomes tautosyllabic while maintaining its internal constituency: [mi[u]]. This is a syllable with an onset /mi/ followed by a rime /u/. On such an analysis, the raising of the first vowel in /mo.e/ → /mue/ is understandable, since Spanish (like other languages) does not allow non-high vocoids in its onset: raising ensures that the onset /mu/ of the newly formed constituent [mu[e]] is well-formed. The difference in surface duration between /u/, /i/ in isolation and /u/, /i/ in /mue/, /miu/ is also predicted on this analysis: onset segments are shorter than nuclear ones. Phenomena like Chicano vowel sandhi are not isolated: e.g., the late Latin change from /mu.lí.e.rem/ 'woman-ACC' to /mu.lyé.rem/, and from /há.be.at/ 'have-SUBJ-3sg.' to /há.bya/, shows the same pattern of contraction, raising, and stress preservation.

Interestingly, C&K come as close to this analysis as is allowed by their theory of syllable structure: they do in fact posit a prosodic constituent for strings like [[mi][u]], [[mo][e]]. But this important insight cannot be easily incorporated into their theory. The prosodic constituent [[mi][u]] has no status in C&K's theory: it cannot be a stress foot, in the normal sense of the term, because

[3] While the deglottalization of rime vocoids and obstruents seems exceptionless, that of consonantal sonorants admits exceptions before the word-final strident /s/ and /c/. Word-medially, however, all three segment classes behave identically.

either one, or none, of its syllables may bear stress; and it cannot be a syllable because, ex hypothesi, syllables do not have internal constituents. To turn structures like [[mi][u]] into surface syllables, C&K have to posit a certain number of further operations, the necessity of which does not follow from anything: there is no principle dictating that the two vocoids of [mi[u]] must become tautosyllabic, or that the first vowel must raise (rather than, say, lower or front), or that the same vowel must shorten. One can obviously formulate rules to derive these results, and C&K do this quite elegantly, given the constraints under which they operate. However, a syllable theory that recognizes an onset/rime distinction has no need for some of these rules, and can explain why the others must apply. On such a theory, C&K's mysterious prosodic constituent [mi[u]] can be directly identified as a syllable. This makes rule 40 unnecessary (p. 91): the shortening effect of this rule follows from the fact that the first vocoid is no longer in the rime of the syllable. Raising (whereby /me.o/ becomes /mio/) and Low Vowel Deletion (/ma.e → /me/) will still have to be explicitly formulated; but they will now have the predictable status of processes meant to bring a deviant structure in line with certain independent conditions of well-formedness, such as the requirement that onset vocoids be [+high]. Thus even these rules are weakly predicted by the onset/rime theory: the theory explains why the first vocoid in the contracted sequence undergoes these particular changes rather than any conceivable others, such as fronting or rounding or devoicing. We see, then, that the constituent structure in Fig. 3 continues to remain necessary and, in fact, central to the analysis of many segmental phenomena.

A different line of argument pursued in *CV Phonology* involves the nature of the skeletal units over which syllables are defined. If one eliminates subsyllabic constituents, one must re-assign their major function—that of distinguishing the syllable peak from other segments. This function can be taken over by a timing tier enriched with the distinction between peaks (V's) and non-peaks (C's). C&K provide a number of arguments for the C/V distinction, which I will divide here into two classes: those for the distinction between VC and VV long vowels, and those for underlying, segmentally empty C's and V's. Both classes of arguments point to phenomena that cannot be straightforwardly analysed without a structural distinction analogous to that between C's and V's.

The distinction between VC and VV vowels is established at length in the analysis of the Klamath glide vocalization rules (139–76). Klamath contains both underlying and derived strings in which a glide cannot be incorporated into an existing syllable: these involve interconsonantal glides and word-final postconsonantal glides. In such contexts, the glides surface as vowels, long if the preceding syllable is light, short otherwise.[4] The problem is how to analyse the distribution of the long and short vowels derived by glide vocalization: one cannot vocalize all glides as long vowels, and then apply a general shortening rule after heavy syllables, because UNDERLYING long vowels remain long in all contexts. C&K solve this problem by formulating the rule of glide vocalization as an epenthesis rule which inserts a V before an unsyllabified glide—following in this Kean's 1974 analysis. In a form like /delwga/, surface /delo:ga/ (p. 135), pre-glide epenthesis applies as in Figure 7.

Because C&K's pre-glide epenthesis creates VC long vowels, as in Fig. 7, its output structure is distinguishable from that of underlying long vowels, which are always associated to VV sequences. Shortening can now be stated without global conditions: it is a rule that affects VC vowels, not VV vowels.

This conclusion, however, conflicts with the other major result of C&K's analysis of Klamath: their statement of Vowel Reduction and Vowel Deletion. The facts covered by these rules are the

[4] This generalization about the distribution of long and short vowels derived by glide vocalization comes from Levin 1985, who has shown that the somewhat more complex statement provided by C&K (p. 169, Fig. 51) can be simplified.

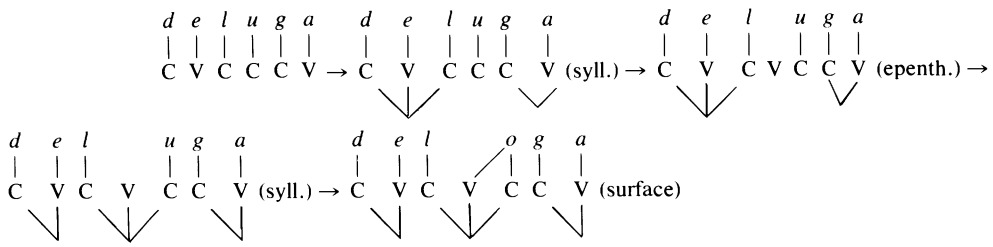

FIGURE 7.

following: all vowels are deleted when contained in an open stem syllable which immediately follows a prefix; and all vowels are reduced to /ə/ in a closed syllable immediately following a prefix. C&K point out that the context of the reduction process overlaps greatly with the context of deletion; they show further that lexical exceptions to reduction are also exceptions to deletion. From this they conclude that the context 'in a stem syllable immediately preceded by a prefix' conditions only the Vowel Reduction rule. The rule of Vowel Deletion can then be simplified: it applies to all reduced vowels in open syllables. The feeding relation between Vowel Reduction and Vowel Deletion explains why they share the same set of exceptions. This represents significant progress in the analysis of Klamath phonology. Problems arise, however, when one considers the effect of Vowel Reduction on syllables closed by glides. Here Vowel Reduction creates tautosyllabic sequences /əy əw/ which surface as long vowels /ii oo/: the outcome of Vowel Reduction is identical in this case to that of glide vocalization—a fact which could be accounted for quite simply by identifying /ə/ with the empty V inserted by epenthesis. In fact, the results of both Vowel Reduction and epenthesis surface in the unmarked case as /ə/.[5] C&K cannot, unfortunately, identify /ə/ as V, because the two elements react differently to Vowel Shortening: the long vowels resulting from the /Vy Vw/ sequences created by epenthesis undergo Vowel Shortening, whereas the long vowels resulting from /əy əw/ sequences created by Vowel Reduction do not. In order to avoid shortening the results of Vowel Reduction, C&K must therefore maintain that /ə/ and V are distinct elements.

Recall now that Vowel Shortening was the cornerstone of the argument for distinguishing VC from VV long vowels. The discussion of Vowel Reduction has revealed, however, that this argument rests on the doubtful distinction between two homophonous elements, V and /ə/. Starting from this observation, Levin 1985 suggests that Vowel Shortening be eliminated altogether in favor of a different approach to glide vocalization.

The remaining class of arguments for the CV tier involves demonstrating the need for underlying, segmentally empty C's. C&K identify such C's by noting that they enforce certain unexpected syllabifications of the surfacing segments. Thus, in Turkish (67–73), the empty C explains certain unpredictable vowel length alternations: we observe long vowels in preconsonantal and final position of words like /da:/, i.e. /daC/ 'mountain' (cf. /da:lar/, i.e. /daC.lar/ 'mountains'), but short vowels in prevocalic position (/da.a/, i.e. /da.Ca/ 'to the mountain').

[5] Two further arguments for equating /ə/ with V can be formulated if one adopts C&K's analysis. First, by claiming that /ə/ is the surface realization of V, one can simplify Vowel Reduction considerably: this rule will not turn a vowel segment into a different one, /ə/, but will simply delink the matrix of any vowel, leaving behind a bare V. Second, the analysis of forms with two unsyllabified glides, such as /wenwy'tk/ 'widow' (surface /wenwitk/) requires that Vowel Deletion—a rule which deletes /ə/ according to C&K, must also apply to bare V's. In the derivation of /wenwy̆tk/, Pre-Glide Epenthesis will apply twice, before each stray glide, yielding intermediate /we.nV.wVy'tk/. Now we need to eliminate the first of these V's: Vowel Deletion can do this, but only if it applies to V, not just to /ə/. The problem is automatically solved if /ə/ and V are in fact one and the same element.

In Finnish (73–7), the empty C accounts for the fact that seemingly open syllables behave like closed ones for the purposes of Consonant Gradation. The force of these arguments lies in the fact that the syllabification emerges as perfectly regular once the empty C is postulated: Finnish /ot.teC/ (with a second closed syllable triggering Consonant Gradation, hence surface /ote/) alternates with /ot.te.Cen/ (with a second open syllable, hence surface /otteen/, without gradation). It is perhaps not impossible to explain such facts within a theory of syllabification that lacks the skeletal distinction between C's and V's (cf. Levin 1985 for an extensive discussion of the Turkish data within such a framework); but the CV framework clearly provides, in these cases, the simplest analysis.

What seems, however, to argue against the underlying distinction between C's and V's as skeletal positions is the phenomenon of context-dependent syllabicity. In many languages, a class of segments of intermediate sonority (typically the high vowels) does not behave like either V's or C's, but rather takes on a nuclear or non-nuclear position depending on the context. Examples of this sort occur in Suriname Arawak (Pet 1979), Latin and Rumanian (Steriade 1984), or Mokilese (Levin 1985); Dell & Elmedlawi 1986 show that practically all segments of Tachelhiyt Berber have their syllabicity determined by context, rather than specified underlyingly. To take a simple illustrative case, consider the distribution between /u/ and /w/ in Latin: /w/ occurs initially before a vowel and medially between vowels, while /u/ occurs elsewhere. For C&K, /u/ is /u/ linked to V, while /w/ is /u/ linked to C. But there is no basis for deciding whether any token of the Latin segment underlying /u/ and /w/ should be linked to C or a V: its C or V status will depend, in any given string, on which segments precede and follow. In fact, as demonstrated in the references above, a very simple explanation can be given for the distribution between /u/ and /w/, if one assumes that the element underlying them has no specifications for syllabicity on either the segmental or the skeletal tier. One can interpret such facts by introducing a third class of skeletal items, unspecified as to nuclear status, in addition to C and V. But Levin 1984, 1985 has suggested that even segments which do not alternate in syllabicity, such as low vowels or obstruents in most languages, are in fact assigned to nuclear or non-nuclear position PREDICTABLY—because their segmental class (or, equivalently, their position on the sonority scale) determines whether they will be invariably nuclear or invariably non-nuclear. If Levin is on the right track, there will be no independent need for any segment class to be underlyingly linked to a C or a V. The set of underlying C's and V's will then shrink to the rather limited cases of segmentally empty positions, and to the cases in which contrasts of syllabicity exist underlyingly within the same segmental class.[6]

Aside from the internal structure of the syllable, a second topic that receives extensive treatment in *CV Phonology* is the process by which syllable structure is assigned and re-assigned in the course of the derivation. I would like to

[6] See, however, Guerssel 1986 and Levin 1985 for a possible approach to such cases within a framework lacking C's or V's.

examine here an aspect of C&K's discussion which distinguishes their position from that of other researchers on syllabification.

C&K assume a process of syllabification essentially equivalent to that of Kahn: syllables are associated to V's, then a pre-nuclear cluster of C's is incorporated into the syllable, followed by a post-nuclear cluster (38). Incorporation into a syllable is subject to various positive and negative conditions on permissible tautosyllabic clusters (31). C&K show that these conditions involve only pairs of adjacent segments: this makes it possible to predict whether $C_iC_jC_k$ is a possible cluster, in general, from the local well-formedness of the subsequences of C_iC_j and C_jC_k (48). The next question is what happens to segments whose incorporation into existing syllables is forbidden by the positive or negative conditions. There are two possibilities here: one is that, on a language-specific basis, a subset of the remaining stray segments will be syllabically incorporated at a later stage. This possibility is realized in C&K's analysis of Klamath (128–9).[7] The other possibility is that no further segment will be incorporated: the string of segments will, in that case, contain surface elements not belonging to any syllable (39).

This last point constitutes a new proposal. The assumption made in previous research (Cairns & Feinstein 1982, Harris 1983, Steriade 1982) was that unsyllabified segments are deleted by a convention, which I have called Stray Erasure. This convention makes radically different predictions about surface cluster inventories from those made by C&K's views on stray segments. If the surfacing clusters are derived in their entirety by specific rules of syllabic affiliation, then their composition will reflect certain regularities: those enforced by the conditions on syllabic affiliation. Moreover, if only syllabified segments surface, there should always exist lawful relations between initial, final, and medial clusters. In the typical case, the sum of final and initial clusters defines the maximal possible medial clusters; but even in languages where this is not the case (cf. Steriade 1982), a predictable, if more complex, relation exists between initial, final, and medial clusters. In contrast, if C&K are right and surfacing clusters may contain stray segments, there should be no regularities stateable about their composition: there should be no reason why a language with the syllabification rules of English should lack words like Klamath /gankənktktdamna/, syllabified /gan.kən.(ktkt).dam.na/, with a medial /ktkt/ stray sequence.

I believe that C&K implicitly reject Stray Erasure entirely on the strength of their analysis of Klamath syllabification: in this language, sequences of obstruent and sonorant consonants appear to surface in any order. The assumption is that the basic syllabification rules derive first CV(V)C syllables, then CCV(V)CC syllables—subject to certain constraints—after which epenthesis rules pick up some of the remaining stray consonants. But, as C&K note, the epenthesis rules do not suffice to syllabify ALL surfacing consonants into CCV(V)CC syllables. For instance, interconsonantal sonorants trigger epenthesis only at a morpheme boundary: the morpheme-internal interconsonantal /l/ in /waGlwis/ 'shinbone awl' (from /waGlw-y-s/) remains on the surface. The choice is then to analyse surface /waGlwis/ as /waG.(l).wis/, with a stray /l/, or to posit a further process of syllabification. The obvious possibility is to have /wa.Gl.wis/ with a syllabic /l/: such an analysis is supported by Barker's direct statement (1964:26–7) that these segments are syllabic, as well as by several further details. Like all rime segments of Klamath, the interconsonantal sonorants are subject to deglottalization: /ʔeywll'Gbga/ 'is sticking the head up' becomes surface /ʔeywllpga/ (Barker, 60). Moreover, obstruents preceding such a sonorant do not deglottalize: /ga:yak'lgi/ 'comes to search for' (Barker, 59). This indicates that the glottalized /k'/ is the onset of the syllabic /l/, rather than the coda of the preceding syllable—and thus supports the surface division /ga:.ya.k'l.gi/. Finally, there are no interconsonantal voiceless sonorants, although such segments do occur postvocalically in Klamath codas; this gap is surely related to the fact that Klamath has no voiceless nuclei, and it can be interpreted as a further indication that intercon-

[7] The argument for two-stage syllabification in Klamath remains, however, unclear. According to C&K, CV(V)C syllables are formed first, after which further affiliation rules create CCV(V)CC syllables, after which epenthesis rules apply. One wonders why the CCV(V)CC syllables which must exist in the input to epenthesis are not formed in one stage, rather than two. There is no level of representation discussed by C&K which must have exclusively CV(C) syllables, without tautosyllabic clusters.

sonantal sonorants are nuclear. The fact that they are not counted as stress-bearing elements need not reflect their syllabic or non-syllabic status, but merely the language-specific choice made by Klamath as to what types of nuclei will count for stress. If we assume that interconsonantal sonorants are syllabic, then it becomes possible to gain a better understanding of the regularities governing surface consonant clusters in Klamath: coda clusters appear to consist of a sequence of sonorants preceding a sequence of obstruents. Onsets, at least at the late stage where deglottalization applies (cf. Kingston 1985), consist of an obstruent preceding a plain sonorant.[8] This removes, as far as I can see, all obstacles for the view that surface segments are exhaustively syllabified.

Since its publication, *CV Phonology* has been more influential as a treatment of syllabification than any other published or unpublished work within the generative tradition. At the time a first version of the book was circulated, this was the first extensive demonstration of the uses of the skeletal tier in phonology. Many of the reservations expressed here are based on work which this study stimulated, in both its published and preliminary versions. Five years ago, the issues on which my conclusions differ from C&K's were neither as clearly defined nor as well documented. This indicates the current rate of progress in syllabic phonology, progress to which *CV Phonology* has clearly contributed.

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[8] Levin 1985 presents a different view of syllabic composition in Klamath; but she assumes, like Kingston, that all surface segments are syllabified.

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