PHONOLOGICAL STRENGTH AND PREFERRED SYLLABLE STRUCTURE*

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Recent approaches in the area of syllable structure and markedness suffer from a number of inadequacies. In particular, inadequate consideration is given to the role that markedness theory can play in accounting for language specific characteristics of syllable structure. By contrast, a new approach based on the gradient nature of linguistic preferences, provides insight into both synchronic aspects of language specific syllabication and diachronic aspects of syllable structure change.

1. Introduction

Although Zwicky (1972) argued for the incorporation of a strength hierarchy in transformational-generative phonology, it is only more recently that this proposal has received a significant amount of attention from linguists working within the various off-shoots of the approach developed in Chomsky and Halle (1968). In particular, the sonority hierarchy has played a central role in recent treatments of syllable structure and markedness. In the following sections, I would like to discuss some inadequacies of recent approaches to this area and consider an alternative approach. Since many of the issues to be discussed here were already treated in a pristine form by Sievers (1901), the presentation begins with a brief discussion of Sievers' approach to phonological strength and syllable structure.

2. Sievers' Treatment of Phonological Strength and Syllable Structure

The hierarchical organization of phonological elements in terms of their relative strength or resonance has long played a role in linguistic studies. On the basis of a consideration of both inherent characteristics of individual phones and the way in which phones are distributed within the speech chain, and particularly within the syllable, Sievers (§517 ff.) proposed a classification of phones in terms of their relative strength or resonance (*Schallfülle*). Inherent characteristics considered by Sievers include the voiced/voiceless contrast and the degree of constriction involved in the production of the particular phone

* For a more comprehensive treatment of these and related issues, the reader is referred to Murray (forthcoming), to appear in *Studies in Theoretical Linguistics* , ed. by Theo Vennemann. I would like to thank Theo Vennemann for much help and countless suggestions in the preparation of this work and for providing me with a written version of Vennemann (1985).

(§517). According to Sievers, voiced phones are more resonant than voiceless ones and the greater the degree of constriction, the less the resonance. Accordingly, continuants were considered more resonant than non-continuants, nasals and liquids more resonant than voiced fricatives, and vowels the most resonant of the sonorants.

In order to further refine his classification, Sievers (§530) considered aspects of syllable structure. He proposed that, most generally, the resonance of the phones within the syllable increases as the nucleus is approached. Consequently, he argued that the existence of such monosyllables as *mla, alm,* and *arm* but the apparent absence of monosyllables of the type *lma, rma, aml,* and *amr* attests to the greater resonance of the liquids relative to the nasals.

Sievers was thus able to propose an extremely refined classification of phones; a classification which has frequently resurfaced in the linguistic literature. Sievers' classification is presented in (1) in a way that has become common practice in recent studies, viz. as a sonority hierarchy:

(1) voiceless stops < { voiceless fricatives / voiced stops }[1] < voiced fricatives < nasals < *l* < *r* →

Returning to Sievers' approach to syllable structure, it is clear that he considers the degree of resonance of the individual phones to be the central factor in the construction of a syllable. He proposes the following two general principles of syllable structure:

(2) a. The resonance of the phones within a syllable increases as the nucleus is approached (§527).
b. The phone having the greatest resonance forms the nucleus of the syllable (§526).

Syllables constructed in accordance with these principles are labelled resonant syllables (*Schallsilben*), e.g. *tra, art, klar,* etc.

Sievers recognized that not all syllables are congruous with his principles. For example, there exist diphthongs of the types in (3a) and (3b):

(3) a. *i̯e* b. *i̯e*

Only the diphthong in (3b), however, conforms to principle (2b).[2] Sievers accounts for such violations in terms of the expiratory strength (*Druckstärke*) of phones. Expiratory strength, corresponding in essence to the amount of air pressure (*Luftdruck*) involved in the production of a phone, may be varied at will (§179). Thus, this type of strength plays a central role in accounting for

[1] Sievers' criteria provide no basis for an evaluation of the resonance of voiceless fricatives relative to voiced stops. On the one hand, voiced phones are classified as more resonant than voiceless ones. On the other, fricatives, being less constricted, would be classified as more resonant than stops.

[2] *i*, of course, is considered more constricted (i.e. less resonant) than *e*.

language specific variation of syllable structure. For example, a sequence *a-i-a* may receive at least three different manifestations depending on the placement of expiratory strength:

(4) a. trisyllabic: *a.i.a*[3]
b. dissyllabic: *ai̯.a, a.i̯a*

Variations in expiratory strength also account for language specific syllabications such as *a.tra* vs. *at.ra*.

Other apparent exceptions to the general principles governing syllable structure are cases such as *pta, spa atst*. Sievers proposed to treat the underscored segments in these examples as secondary syllables (*Nebensilben*).[4] The existence of these secondary syllables is not readily perceived since the resonance of the underscored obstruents is overwhelmed by that of the main syllable (§534).

Although Sievers recognized the above-mentioned exceptions, he clearly believed the principles in (2) to be the central ones governing syllable structure. The primordial role given these principles is seen in his treatment of some historical developments. For example, in the case of the diphthongs in (3), he considers (3a) to be impure (*unecht*), whereas (3b) is considered pure (*echt*). He observes that historically the change in (5) often occurs; a change from an impure to a pure diphthong:[5]

(5) *i̯e* > *i̯e*

Sievers thus presents a sophisticated treatment of the interrelationship of phonological strength and syllable structure. He considered resonant syllables (i.e. syllables constructed in accordance with the principles in (2)) to be pure and accounted for deviant syllables on the basis of expiratory strength and the introduction of the concept of secondary syllables. Let us now turn to some recent approaches to this area.

3. Some Recent Approaches

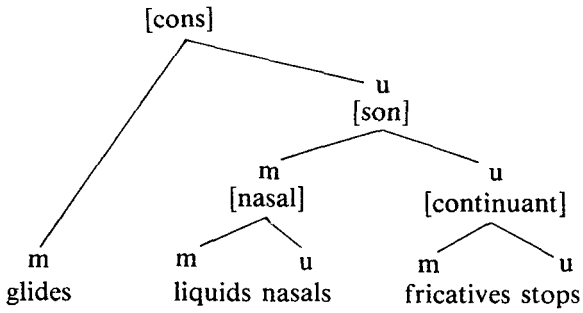
Kiparsky (1981) presents some discussion of phonological strength and syllable structure. For example, interpreting a broader version of the sonority hierarchy in terms of markedness values, Kiparsky (p. 248) states that "the degree of markedness of the major segment types corresponds exactly to the empirically postulated sonority hierarchy:"

[3] In this study, both (.) and ($) denote a syllable boundary.

[4] Cf. Vennemann (1982: 296 ff.) for a recent discussion of secondary syllables.

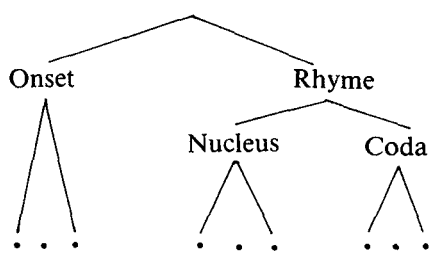
[5] For a discussion of similar ideas in Saussure (1916) and Grammont (1950), cf. Murray (forthcoming).

(6)



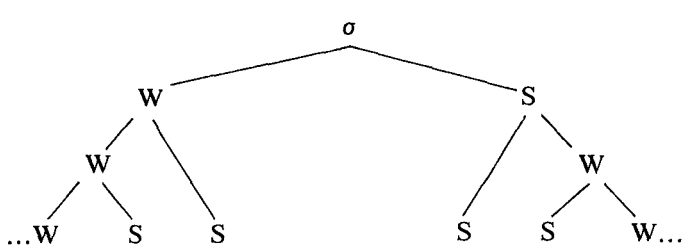
His main concern, however, is to argue that the tree representations which have been applied in metrical analyses of stress (e.g. Liberman and Prince 1977) should also play a role in syllable structure analyses. Indeed, assuming a "hierarchy of prosodic levels" for phonological theory including the phonological phrase, the word, the foot, the syllable, and the segment, Kiparsky (p. 245) proposes that structure at each level be "represented in a formally parallel fashion, by means of binary trees, each non-terminal node branching into S(trong) and W(eak)." Observing that in studies such as Kuryłowicz (1960), Pike and Pike (1948), and Hockett (1955), the internal structure of the syllable in (7) has been assumed:

(7)



Kiparsky (p. 249) proposes to interpret this "universal syllable template" as a relational structure and to represent it by means of a metrical tree:

(8)



In an attempt to support his position on the appropriateness of a relational representation of syllable structure in terms of binary branching "metrical" trees, he states (p. 250):

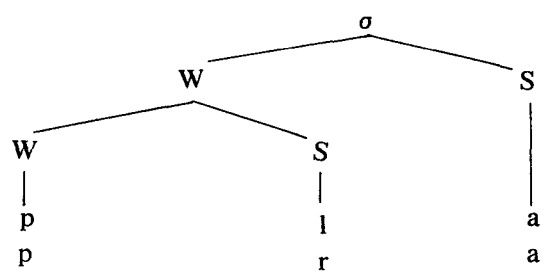
> "The relational representation brings out an *inherent* connection between the constituent structure of the syllable and its sonority profile. The asending sonority in the onset and the descending sonority in the coda can *only* be represented by a left-branching and right-branching constituent structure, respectively."

In his discussion of metrical phonology, Vennemann (1985) raised a number of points in his critique of Kiparsky's approach. I would like to briefly mention three of these here:

(a) Vennemann argued that the relational tree representation is redundant in representing the interrelationship between syllable structure and sonority. The sonority profile can be directly represented in terms of a syllable template and a strength scale or by Kiparsky's own strength classification tree (cf. (6) above).

(b) Kiparsky's tree representation is not refined enough. Although some markedness relations can be expressed (e.g. *tra* is expected, *rta* unexpected), more refined markedness relations cannot be. Vennemann observed that even though *pra* is clearly less marked than *pla* (cf. the common sound change *Cla>Cra*), these structures receive the same structural tree:

(9)



(c) Finally, Vennemann pointed out that the sonority profile and syllable structure may differ: The nucleus of the syllable need not be the segment of the greatest resonance. On Kiparsky's approach, however, *kl̥n* and *kln̥* would receive the same tree representation. In other words, Kiparsky's approach is ill-equipped to deal with language specific variations in syllable structure.

Although the charges of redundancy and lack of refinement certainly are not sufficient to undermine the entire framework, the third charge levelled by Vennemann is crucial, for, unlike Sievers, recent approaches have tended to skirt the issue of language specific syllabication. The approaches are inevitably ex-

emplified with examples conforming to Sievers' principles (cf. (2) above), or to some variant of them, with little or no attention paid to examples which do not.

A case in point is Lowenstamm (1981). Here again segments are ranked as in (10a) and the Universal Syllable is defined as in (10b):

(10) a. vowel
glide
sonorant
fricative
stop

b. "In a string of segments, a *syllable* is a maximal substring such that:
a. (i) no segment is lower on the hierarchy than both its immediate neighbors
(ii) no two segments of equal ranking on the hierarchy are adjacent
b. the onset is maximal within the limits of (a)" (p. 592).

To exemplify the approach taken, let us consider the treatment of OE epenthesis. Relevant here is the following paradigm of OE *micel* 'great':

(11) *micel* (masc. sg. nom.)
micelne (masc. sg. acc.)
micles (masc. sg. gen.)
micle (masc. pl. nom.)
micelre (fem. sg. dat.)
micelra (masc. pl. gen.)

On the basis of the proposed principle (10b), syllable structures are assigned to the underlying representations provided by Lowenstamm as in (12):

(12) *mi.cl*
mi.cl.ne
mi.cles
mi.cle
mi.cl.re
mi.cl.ra

The surface forms can then be derived from the underlying representations by means of the following rule:

(13) $\emptyset \rightarrow V \; / \; .C \_\_\_ \begin{bmatrix} +\text{sonorant} \\ -\text{vocalic} \end{bmatrix}$

This approach works neatly provided that cases in accordance with Sievers' principles are treated. The question, however, arises as to whether the Old Icelandic examples in (14a) would also receive dissyllabic underlying representations as in (14b):

(14) a.	*fjǫðr*	'feather, wing'	(sg. nom.)
	fjǫðr		(sg. acc.)
	fjaðrar		(sg. gen.)
	fjǫðr		(sg. dat.)
	fjaðrar		(pl. nom.)
	fjaðrar		(pl. acc.)
	fjaðra		(pl. gen.)
	fjǫðrum		(pl. dat.)
b.	*fjǫ.ðr*		
	fjǫ.ðr		
	fja.ðrar		
	fjǫ.ðr		
	fja.ðrar		
	fja.ðrar		
	fja.ðra		
	fjǫ.ðrum		

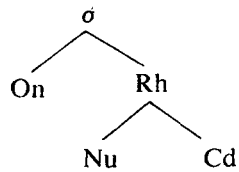
The difficulty here is that OI *fjǫðr* is monosyllabic. (cf. Sievers 1893: 39) Thus the monosyllabic surface forms would have to be derived from dissyllabic underlying representations. Presumably, the derivation of the surface forms would involve a "readjustment" (p. 599) of the syllable structure. It is important here to note that Lowenstamm distinguishes two types of syllables; the "theoretical syllable" and the "intuitive syllable" (p. 576). The former is the syllable as defined within linguistic theory and the latter as related to "performance acts such as the parsing of an utterance or the placement of a hyphen in the end-of-line division of a word" (p. 576). These two types of syllables may or may not coincide: "This will depend on whether or not particular grammars contain statements readjusting syllable structure" (p. 576).

Lowenstamm, however, fails to provide any detailed discussion of the interrelationship between the theoretical syllable and the intuitive syllable. Indeed, although Lowenstamm states that "I do not think that readjustments are a bad feature of a grammar, provided that they receive an interpretation within linguistic theory" (p. 599), no such interpretation is offered. Thus, many central questions are not raised; there is, for example, no discussion of why the distinction between the two types of proposed syllables exists, nor of the way or extent to which the intuitive syllable can differ from the theoretical syllable. Such issues should be central to any approach making allusions to syllable structure "readjustments." I would claim that until the nature of the interrelationship between the two types of proposed syllables is treated more comprehensively, syllable structure "readjustments" should play no serious role in phonological theory.

An approach which does consider the extent to which syllable structures of particular languages may deviate from the "theoretical" or unmarked syllable structure is found in Cairns and Feinstein (1982) where an attempt is made "to

explicate and defend a conception of syllable theory in phonology that is explicitly rooted in the general theory of markedness" (p. 224). Central to their approach are the "universal syllable template" in (15) and the marking conventions in (16a) and (16b):

(15)



where σ = syllable
On = onset
Rh = rhyme
Nu = nucleus
Cd = coda

(16) a. σ → On Rh *U*nmarked
σ → Rh *M*arked
b. Rh → Nu *U*nmarked
Rh → Nu Cd *M*arked

In accordance with (16a), a syllable of the type *CV* is unmarked, whereas a syllable consisting of a nucleus alone is marked. In accordance with (16b), a syllable of the type *(C)V* is unmarked whereas *(C)VC* is marked.

They also provide a marking convention for onsets (p. 198). Listing the following onsets

(17) a. *C*
b. *CL*
c. *CN*
d. *ST*
e. *ND*

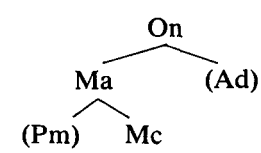
where *C* = obstruent
L = liquid
S = fricative
T = stop
N = nasal
D = voiced stop

they claim that (17a) represents the maximally unmarked onset, whereas the other onsets represent "a chain of increasing markedness" (p. 198). Drawing essentially on Greenberg (1966) and Cairns (1969), they provide the following argumentation for their claim:

(a) Complex onsets imply simple onsets in a given language
(b) Onsets of the type (17c) imply those of (17b)
(c) Types (17d) and (17e), however, are not implicationally related to one another, nor to (17b) and (17c).

Consequently, they conclude (200 ff.) that onsets of the type *CL* and *CN* are of a different category than *ST* or *ND*. Accordingly, they set up the structure in (18) for the onset of a syllable and propose the marking conventions in (19):

(18)



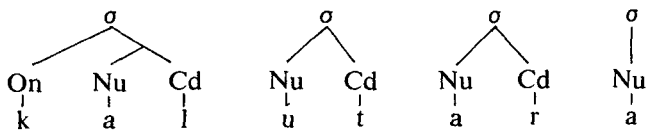
where Ad = adjunct, e.g. *L, N*
Pm = pre-margin, *N, S*
Mc = margin core

(19) a. On → Ma *Unmarked*
On → Ma Ad *Marked*
b. Ma → Mc *Unmarked*
Ma → Pm Mc *Marked*

A structure and marking conventions for rhyme are also proposed (cf. 204 ff.).

Of particular interest, is their approach to providing markedness values for the syllable structures of a particular language. First of all, a language specific syllable template is established. On the basis of this template, a "candidate set" (p. 213) of syllabications for any given word of the language is obtained. For example, the Sinhala word *kalutara* (a Sri Lankan city) may receive eight potential syllabications.[6] Only a full representation for (20a) is provided here:

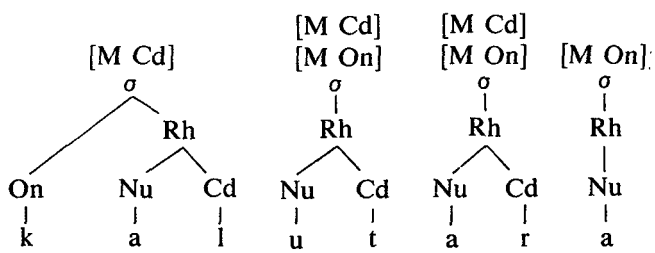
(20) a. *kal.ut.a.ra.*



b. *kal.ut.a.ra*
c. *ka.lut.ar.a*
d. *kal.u.tar.a*
e. *ka.lut.a.ra*
f. *ka.lu.tar.a*
g. *kal.u.ta.ra*
h. *ka.lu.ta.ra*

A "composite markedness value" (p. 214) for each of these structures can, however, be determined on the basis of the markedness conventions in (16) and (19) above. For example, the full evaluation of (20a) is provided in (21):

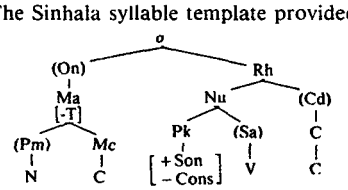
(21)



Markedness Value: 1 2 2 1

Composite Markedness Value: 6

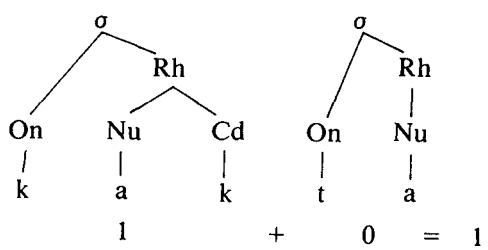
[6] The Sinhala syllable template provided by Cairns and Feinstein (p. 213) is:



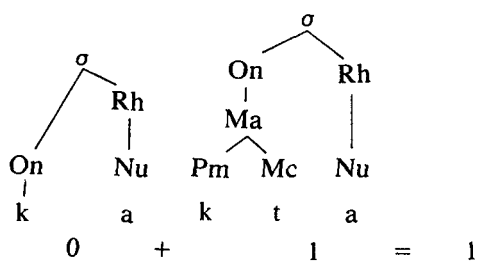
A particular structure is chosen for the language in accordance with the Composite Markedness Value Principle which states: "Select the candidate syllabification with the lowest (most highly valued) C[omposite] M[arkedness] V[alue]" (p. 214). Accordingly, (20h) is chosen as the most appropriate syllabication for the word *kalutara*, with Composite Markedness Value ø.

Again, it is evident that the approach works neatly on the given example, *kalutara*, selecting the *CV.CV.CV.CV* structure and, in this case at least, the selection appears to coincide with the appropriate syllabication for Sinhalese. As presented, however, there is one major failing of Cairns and Feinstein's approach: The Composite Markedness Value principle fails to provide adequate evaluations of syllable structures. For example, in a *CCVC* language having word initial *ktV* sequences, structures of the type *kak.ta* and *ka.kta* would presumably receive the same Composite Markedness Value, even though *kak.ta* is clearly the unmarked form:

(22) a.

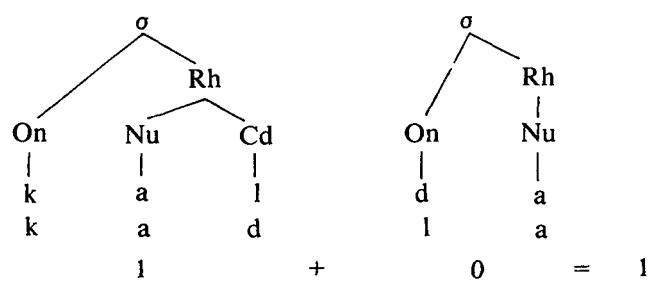


b.



Furthermore, dissyllabic sequences such as *kal.da* and *kad.la* receive the same Composite Markedness Values:

(23)

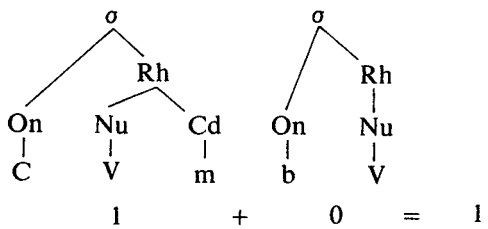


The structure *kal.da*, however, is clearly the unmarked form of the two, a fact which is attested to by the process of metathesis. Whereas the metathesis in (24a) is expected, that in (24b) is not:

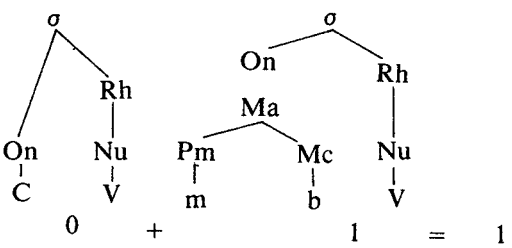
(24) a. *kad.la* > *kal.da*
(cf. Spa. *molde* (<*mŏdulu*) 'mould')
b. *kal.da* > *kad.la*

The markedness theory envisioned by Cairns and Feinstein would thus appear to be of an extremely limited nature, for it essentially has nothing to say about the syllable structure of *-VCCV-* sequences. This limited view of markedness theory would, however, seem entirely unacceptable. Just as markedness theory should characterize *CV* as the ideal syllable, so too should e.g. *Vl.dV* and *Vk.tV* be characterized as less marked than *Vd.lV* and *V.ktV* respectively. Cairns and Feinstein (214 ff.) themselves note that the selection process does not always result in a single possibility; e.g., on the basis of the marking conventions in (16) and (19) both *Vm.bV* and *V.mbV* receive the same evaluation:

(25) a.



b.



Here, the appropriate syllabication can only be determined on the basis of a consideration of other language specific factors. In the case of Sinhalese, the syllabication *V.mbV* must be assumed since "the output form *kolə^{m}bə* contains a reduced vowel preceding the nasal and stop; hence, the syllable in which it is contained must be open. Native speaker intuitions and Sinhala orthography agree that the nasal-stop sequence is an onset" (p. 216). Accordingly, Cairns and Feinstein (p. 216) state:

> "This result [i.e. the appropriate syllabication, RWM] must be accomplished by language-specific stipulation. Thus, we must state in Sinhala grammar that, in cases of ambiguity involving *ND*, the analysis into a complex (Pm) onset is always chosen. This stipulation

> of course does not follow from markedness theory. Nor should it. Languages approach the analysis of ambiguous clusters differently."

Again, a rather narrow view of markedness theory is espoused by Cairns and Feinstein. While it is true that the syllabication of "ambiguous" cases is dependent on language specific factors, it does not follow that markedness theory should play no role in the **evaluation** of these cases, for invariably one of the potential syllabications will be less marked than the other. It is not enough to simply state that certain cases of language specific syllable structure follow from "stipulations," rather markedness theory should yield some insight into the relative values of all linguistically possible structures.

The approaches to syllable structure and markedness treated in this section are clearly inadequate. Although the notion of unmarked or "theoretical" syllable structure has played a central role in these studies, many crucial areas have been neglected. In particular, insufficient attention is paid to the interrelationship between unmarked and marked syllable structure and no comprehensive means for determining the relative degree of markedness for syllable structure is provided. Let us now turn to another approach to this area.

4. Theories of Linguistic Preferences

Vennemann (1983) discusses the role of principles of preferred syllable structure, as well as principles of preferred linguistic structure in general, within linguistic theory. Two types of linguistic theories are treated. The first type, which may be labelled "descriptive" (p. 11), has the goal of describing what constitutes a possible human language; i.e., "put metaphorically, a general linguistic theory of this sort delimits an empirical subspace Q of the space of all logically possible languages such that all real languages are situated in Q" (p. 10).

Vennemann (10 ff.) goes on to observe that "a general linguistic theory of this sort is by its very nature incapable of telling us what is usual and what is rare in the languages of the world; it can only tell us what is possible and what is impossible. I think it is this insight, combined with the knowledge that languages are not distributed evenly in Q, which has prompted ideas of markedness, naturalness, and so on." These linguistic theories of the second type, viz. theories which are concerned with what is rare or natural in human language, are labelled "theories of linguistic preference" (p. 11). Such preference theories differ from descriptive theories in that they contain a "concept of rank order on a scale of preference relative to a specified parameter" (p. 11). Regarding the explanatory role of this type of theory, Vennemann (13 ff.) states:

> "Theories of linguistic preferences may in turn serve to explain properties of individual languages, not in a deductive sense, of course, because the non-universal properties of a given language cannot possibly be logically derived from anything except themselves, but in a weak sense which we may call 'elucidation.' That Latin has only place-assimilated

> nasals in front of other consonants cannot be explained by deduction. It follows from nothing; it could be otherwise. Yet we do not look upon this fact as 'inexplicable.' We do not stand in the dark vis-à-vis this fact, as would be the case if we had no conception of preferred sound structure: The similarity-adjustment preference law does shed light on this fact, does elucidate it."

Vennemann (18 ff.) also discusses the interrelationship between preference theories and theories proposed to account for diachronic change. He proposes that linguistic preference theory can play a central role in the explanation of diachronic change, for "every individual language change is a local improvement in a sense specifiable by means of preference theories" (p. 21).

To exemplify, let us consider two language states, L_1 and an historically later state of this language L_2. Let us say that between states L_1 and L_2 a particular change occurred affecting one aspect of this language. A theory of linguistic preference which characterizes the output of this change (as reflected in L_2) as being more preferred than the input to this change, can be considered an explanation of this change. The motivation will be found in a particular preference relation (cf. Vennemann 1983: 21).[7]

Consequently, an important goal of the linguist is to propose universal laws of linguistic preference.[8] Let us consider two such preference laws; the Syllable Contact Law and the Syllable Initial Margin Law. The Syllable Contact Law has been formulated as in (26):

(26) The Syllable Contact Law

> "The preference for a syllabic structure $A^{\$}B$ where A and B are marginal segments and where a and b are the Consonantal Strength values of A and B respectively, increases with the value of b minus a" (Murray and Vennemann 1983: 520).

The Syllable Contact Law makes reference to the Consonantal Strength scale, essentially the converse of the Sonority hierarchy:

(27)

							S	
i̯	*u̯*	*r*	*l*	*N*	*Đ*	*D*	*T*[9]	→
1	2	3	4	5	6	7	8	

[7] One characteristic of preference laws must be noted; viz. they apply locally. The necessity of the locality condition is clearly evident when one considers the effect that sound change may have on the morphology of a language (cf. Vennemann 1983: 12).

[8] Cf. Vennemann (1982) for a discussion of a variety of preference laws and their role in Standard German.

[9] The following abbreviations are used here:

V vowel	*D* voiced stop
C consonant	*Đ* voiced fricative
T voiceless stop	*L* liquid
S voiceless fricative	*G* glide

Referring to the strength scale in (27), evaluations of linguistically possible syllable structures can be provided on the basis of the Syllable Contact Law:

(28) Structure	Evaluation
r.k	5
k.t	0
k.r	−5

The syllable contact *r.k* is thus characterized as the most preferred, *k.t* as less preferred, and *k.r* as the least preferred.

The Syllable Initial Margin Law has been formulated as in (29):

(29) The Syllable Initial Margin Law

> "The preference for a syllable structure $\$_{AB}$, where *a and b* are the Consonantal Strength values of *A* and *B* respectively, increases with the value of *a-b*" (Murray and Vennemann 1982: 323).

On the basis of this law, the relative preference of dyadic clusters forming syllable initial margins may be evaluated. Again, the higher the evaluation, the more preferred the structure:

(30) Structure	Evaluation
.kṷ	6
.kr	5
.kn	3

This approach thus provides a basis for capturing the gradient nature of markedness relations.

I would like now to consider some synchronic and diachronic implications of the proposed preference laws, for it is to be expected that preference laws will manifest themselves both synchronically and diachronically.

On the synchronic plane, these laws yield insight into the nature of differential syllabication often found in languages; e.g., although an intervocalic sequence *kṷ* may form a syllable initial margin, *kt* is most commonly, if not always, heterosyllabified. Considering a language with the word internal intervocalic dyadic sequences in (31):

(31) *kṷ*
kr
kl
kn
kt

two extreme situations may be imagined; one in which all the phones are heterosyllabified, the other where the phones form tautosyllabic syllable initial margins. Both these sets of structures may be evaluated by the two preference laws:

(32)

Syllable Contact		Syllable Initial Margin	
Structure	Evaluation	Structure	Evaluation
a. *k.u̯*	−6	*.ku̯*	6
b. *k.r*	−5	*.kr*	5
c. *k.l*	−4	*.kl*	4
d. *k.n*	−3	*.kn*	3
e. *k.t*	0	*.kt*	0

It is clear that a *ku̯* sequence forms, at the same time, the worst syllable contact but the best syllable initial margin (cf. (32a)), whereas a *kt* sequence forms the best contact but the worst syllable initial margin (cf. (32e)). It seems unlikely then that, in a given language, the *kt* sequence would form a syllable initial margin and *ku* would, at the same time, be heterosyllabified. Thus the differential syllabication in (33a) is not in accordance with the two preference laws, whereas (33b) is:

(33) a. *Vk.u̯V* **but** *V.ktV*
b. *V.ku̯V* **but** *Vk.tV*

Indeed, we may present even more refined statements and hypothesize that only cases of differential syllabication in accordance with the two preference laws are linguistically possible whereas other conceivable or logically possible cases are not:

(34) Expected differential syllabications (V__V)

a. *.Tu̯*
but
T.r
T.l
T.N
T.T

b. *.Tu̯*
.Tr
but
T.l
T.N
T.T

c. *.Tu̯*
.Tr
.Tl
but
T.N
T.T

etc.

(35) Unexpected differential syllabications (V__V)

a. *T.u̯*
but
.Tr
.Tl
.TN
.TT

b. *T.u̯*
T.r
but
.Tl
.TN
.TT

c. $T.\underset{\frown}{u}$
$T.\hat{r}$
$T.\hat{l}$
but etc.
$.TN$
$.TT$

Let us now consider some diachronic implications of the proposed preference laws. These laws can play a very important role in the study of diachronic change, for they provide a basis upon which hypotheses regarding the differential application of phonological processes may be proposed. Indeed, on the assumption that poor syllable structures are the most likely targets of processes resulting in improved syllable structures, the following general corollary for any preference law may be proposed:

(36) The probability of a syllable structure undergoing a syllable structure process increases as its evaluation decreases.

Let us consider the Syllable Contact Law once again, and attempt to make the most explicit statements possible regarding the differential application of phonological processes aimed at syllable structure improvement. As stated above, syllable contact structures can be evaluated in terms of this law (cf. (28) above). Accordingly, linguistically expected applications of phonological processes may be distinguished from linguistically unexpected applications. For example, given the syllable contacts $T.\underset{\frown}{i}$, $T.\underset{\frown}{u}$, $T.r$, $T.l$, and $T.N$, it may be predicted that the application of a syllable structure process in a given language, L, will reflect one of the following linguistic possibilities (where "✓" denotes the application of the process and "—" the non-application of the process):

(37) Expected differential applications

Structure	Evaluation	L_1	L_2	L_3	L_4	L_5
$T.\underset{\frown}{i}$	−7	✓	✓	✓	✓	✓
$T.\underset{\frown}{u}$	−6	—	✓	✓	✓	✓
$T.r$	−5	—	—	✓	✓	✓
$T.l$	−4	—	—	—	✓	✓
$T.N$	−3	—	—	—	—	✓

For example, given the process of metathesis, the following configurations are expected:

(38) a. L_1
$T.\hat{\underset{\frown}{i}} > \underset{\frown}{i}.T$
but
$T.\underset{\frown}{u} >$ idem
$T.r >$ idem
$T.l >$ idem
$T.N >$ idem

b. L_2
$T.\hat{\underset{\frown}{i}} > \underset{\frown}{i}.T$
$T.\hat{\underset{\frown}{u}} > \underset{\frown}{u}.T$
but
$T.r >$ idem
$T.l >$ idem
$T.N >$ idem

c. L_3
$T.\hat{\underset{\frown}{i}} > \underset{\frown}{i}.T$
$T.\hat{\underset{\frown}{u}} > \underset{\frown}{u}.T$
$T.r > r.T$
but
$T.l >$ idem
$T.N >$ idem

d. L_4	e. L_5
$T.\underset{\frown}{i} > \underset{\frown}{i}.T$	$T.\underset{\frown}{i} > \underset{\frown}{i}.T$
$T.\underset{\frown}{u} > \underset{\frown}{u}.T$	$T.\underset{\frown}{u} > \underset{\frown}{u}.T$
$T.r > r.T$	$T.r > r.T$
$T.l > l.T$	$T.l > l.T$
but	$T.N > N.T$
$T.N >$ idem	

By contrast, linguistically unexpected applications include the following:

(39) Unexpected differential applications

Structure	Evaluation	L_1	L_2	L_3	L_4	L_5
$T.\underset{\frown}{i}$	−7	—	—	—		
$T.\underset{\frown}{u}$	−6	—	—	✓		
$T.r$	−5	✓	—	—	etc.	
$T.l$	−4	✓	—	✓		
$T.N$	−3	—	✓	—		

Thus the following configurations are **not** expected:

(40)

a. L_1	b. L_2	c. L_3
$T.\underset{\frown}{i} >$ idem	$T.\underset{\frown}{i} >$ idem	$T.\underset{\frown}{i} >$ idem
$T.\underset{\frown}{u} >$ idem	$T.\underset{\frown}{u} >$ idem	$T.\underset{\frown}{u} > \underset{\frown}{u}.T$
$T.r > r.T$	$T.r >$ idem	$T.r >$ idem
$T.l > l.T$	$T.l >$ idem	$T.l > l.T$
$T.N >$ idem	$T.N > N.T$	$T.N >$ idem
etc.		

We have seen above that the proposed preference laws have both synchronic and diachronic implications. Synchronically, a certain pattern of differential syllabication is expected whereas diachronically, a certain differential application of phonological processes aimed at syllable structure improvement is expected, given the relevant preference relation based on the appropriate preference law. In the following sections, an attempt is made to determine whether these theoretical predictions are reflected in real language cases.

4.1. Differential Syllabication

In this section, three cases of differential syllabication are treated. For ease of exposition, attention will be restricted to -$\breve{V}CCV$- sequences. The first case is found in Latin where, as Allen (1973: 138) observes, a $\breve{V}C_1C_2V$ sequence is syllabified $\breve{V}C_1.C_2V$ except where C_1 is a plosive or f and C_2 is a liquid:

> "For the evidence of early Latin verse and of accent placement is quite clear that a syllable containing a short vowel followed by such a sequence [i.e. plosive or f + liquid, RWM] was regularly *light* in quantity. These sequences must therefore have functioned as complex releases of the following syllable: thus *tenĕ.brae, pă.tris, po.plus.*"

Accordingly, the configurations in (41) can be assumed for Latin:

(41) a. *.Tr*
.Tl
but
T.N
T.T

b. *.Dr*
.Dl
but
D.N
D.D

On the basis of the Syllable Contact Law and the Syllable Initial Margin Law, the relevant *V̆CCV* sequences can be ranked from top to bottom in order of decreasing preference:

(42) a. Contact	Evaluation	b. Margin	Evaluation
T.T	0	*.Tr*	5
T.N	−3	*.Tl*	4
T.l	−4	*.TN*	3
T.r	−5	*.TT*	0
c. *D.D*	0	d. *.Dr*	4
D.N	−2	*.Dl*	3
D.l	−3	*.DN*	2
D.r	−4	*.DD*	0

Comparing (41) and (42), we see that it is precisely the least preferred contacts which are avoided in Latin, viz. *T.r, T.l, D.r,* and *D.l.* Rather, in these cases, the dyadic marginal sequence forms a tautosyllabic syllable initial, cluster, *.TL* and *.DL*, the most preferred of the syllable initial margins. This case of differential syllabication is directly in accordance with our proposed theoretical framework, as evident in (43) where the relevant structures are once again ranked from top to bottom in decreasing order of preference:

(43) a. Contacts

T.T, *T.N* — acceptable

T.l, *T.r* — unacceptable

b. Margins

.Tr, *.Tl* — acceptable

.TN, *.TT* — unacceptable

c. *D.D*, *D.N* — acceptable

D.l, *D.r* — unacceptable

d. *.Dr*, *.Dl* — acceptable

.DN, *.DD* — unacceptable

In ancient Greek a rather complex situation prevailed, as many dialect specific characteristics are evident.[10] Let us consider the differential syllabication found

[10] Cf. Murray and Vennemann (1982: §1.2) for a comprehensive treatment of the early Greek dialects.

in one of these dialects; viz. Attic. Lejeune (1972: 331) writes:

> "La prosodie attique traite comme brève ... une syllabe dont la voyelle est brève et se trouve suivie d'occlusive + liquide ou d'occlusive (sourde ou 'aspirée') + nasale."

In other words, a $\check{V}C_1C_2V$ sequence was syllabified $\check{V}.C_1C_2V$, where C_1 represents a stop and C_2 a liquid, or where C_1 represents a voiceless stop and C_2 a nasal. Otherwise, the marginal sequence was heterosyllabified. Thus, the following configurations are evident:

(44) a. *.Tr*
.Tl
.TN
but
T.T

b. *.Dr*
.Dl
but
D.N
D.D

This case of differential syllabication is once again directly in accordance with our theoretical predictions, as evident in (45):

(45) a. Contacts

T.T	acceptable
T.N	
T.l	unacceptable
T.r	

b. Margins

.Tr	
.Tl	acceptable
.TN	
.TT	unacceptable

c.

D.D	acceptable
D.N	
D.l	unacceptable
D.r	

d.

.Dr	acceptable
.Dl	
.DN	unacceptable
.DD	

Let us now consider modern Icelandic where the consonantal pair in a *VCCV* sequence is heterosyllabified, except in the case of the following pairs where a syllable initial margin is formed (cf. Vennemann 1972: 4 ff.):

(46) $\left\{\begin{matrix} p \\ t \\ k \\ s \end{matrix}\right\} + \left\{\begin{matrix} r \\ j \\ k \end{matrix}\right\}$

E.g.

vit.ni	'witness'	*vī.trir*	'wise'
ep.li	'apple'	*skō.pra*	'role'
vis.na	'wither'	*lau.sra*	'loose' (gen. pl.)

Comparing the relevant *VCCV* sequences as evaluated by the two proposed preference laws, it is evident again that the worst contacts are avoided, and the most preferred syllable initial margins favoured:[11]

[11] A parallel situation is found in Faroese (cf. Murray and Vennemann (1983: 523) for discussion).

(47) a. Contacts

T.T	
T.N	acceptable
T.l	
T.r	
T.w	unacceptable
T.j	

b. Margins

.Tj	
.Tw	acceptable
.Tr	
.Tl	
.TN	unacceptable
.TT	

c.

s.T	
s.N	acceptable
s.l	
s.r	
s.w	unacceptable
s.j	

d.

.sj	
.sw	acceptable
.sr	
.sl	
.sN	unacceptable
.sT [12]	

These three cases of differential syllabication thus attest to the relevance of the proposed preference laws, the Syllable Contact Law and the Syllable Initial Margin Law, to the explanation of the nature of differential syllabication. The discussed cases of differential syllabication are in direct accordance with the theoretical framework outlined in Section **4**.

4.2. The Differential Application of Phonological Processes

I would now like to turn to a phonological development indicating the relevance of the proposed preference laws to diachronic change, viz. West Germanic gemination. A comprehensive interpretation of this development in terms of preference laws has been presented in Murray and Vennemann (1983), where a non-differential *V̆C.CV* syllabication was reconstructed for Proto-Germanic on the basis of a variety of evidence.[13] It is evident that many of the resulting contacts are undesirable:

(48)

Contact	Evaluation
T.l	−4
T.r	−3
T.u̯	−2
T.i̯	−1

[12] It is possible that modern Icelandic represents a counterexample to the approach discussed here, for the reflexes of the Old Icelandic glides, *i̯* and *u̯*, have been slightly strengthened. Vennemann (1972: 6), however, still classifies modern Icelandic *j* and *v* as weaker than other marginal segments on a variety of evidence. If, however, it cannot be maintained that modern Icelandic *j* and *v* are relatively weaker than the liquids (i.e., that they have joined the ~~Đ~~ class), the hypothesis presented here will have to be somewhat weakened; viz., the unexpected differential syllabication in (35) above are linguistically possible but less preferred than the expected syllabications (34).

[13] This syllabication was reconstructed on the basis of evidence from Gothic word division, early Germanic verse construction, and phonological developments (cf. Murray and Vennemann (1983: §2) for discussion).

In (49) are listed representative cases of West Germanic gemination:

(49)	Go.	*satjan*	OS *settian*	'to set'
	Go.	*naqaþs*	OHG *nackot*	'nacked'
	Go.	*akrs*	OS *akkar*	'field'
	ON	*eple*	OE *æppel*	'apple'
	Go.	*hlahjan*	OE *hliehhan*	'to laugh'
	Go.	*bidjan*	OS *biddian*	'to ask'
	Go.	*kunjis*	OS *kunnies*	'race' (gen.)
	Go.	*halja*	OS *hellia*	'hell'

Two facts regarding gemination should be noted here. First of all, gemination was most extensive before the glide *j*, affecting not only stops but also nasals and the liquid *l* but not *r* (cf. Go. *nasjan,* OS *nerian* 'to save'). Secondly, the gemination of $T^{\$}j$ structures was most extensive whereas the gemination of $T^{\$}r$ and $T^{\$}l$ structures was less extensive or 'incomplete' (cf. OE *snotter* ∿ *snotor* 'wise'). Ranking the relevant syllable contacts from top to bottom in order of decreasing preference, it is clear that the gemination process had the effect of eliminating the worst syllable contacts, for subsequent to gemination the contact would consist of two segments of equal strength:[14]

(50) a. Contacts

r.j	no gemination
l.j	
N.j	
S.j	gemination
T.j	

b. Contacts

N.L	
D.L	no gemination
S.L	
T.L	gemination

Once again, this differential application of gemination is in accordance with the theoretical framework outlined in Section **4.**

5. Conclusion

The approaches to syllable structure and markedness discussed in Section 3 failed to yield insight not only into language specific characteristics of syllable structure but also into the nature of the interrelationship holding between unmarked syllable structure and the syllable structures actually existing in particular languages. By contrast, the approach outlined in Section **4,** based on the gradient nature of linguistic preferences, addressed these issues directly. It not only provides a basis for evaluating existing language specific syllable structure but also yields insight into the nature of differential syllabication and the differential application of phonological processes.

[14] Cf. Murray (1982) for treatment of a parallel situation in Pāli.

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