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PROSODIC PROBLEMS IN A GENERATIVE PHONOLOGY OF SWEDISH

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The original aim of this paper**was to investigate rules for stress and tonal accent in Swedish, within the framework of generative phonology as it has been presented in the literature of the last decade, most comprehensively in The Sound Pattern of English (Chomsky and Halle, 1968, henceforth referred to as SPE). It was soon found that stress and tonal accent relate to other processes, like tenseness and laxness of vowels, and consonant-length, and it was unavoidable to investigate those processes to some extent. The data were based on my own intuition and the literature that was available to me. An effort was made to account for a "neutral" form of Swedish but it is quite possible that my own dialect had an influence (Southern Swedish: Lund). Dialectal variation was not systematically considered.

Nor was any attempt made to account for sentence intonation or anything outside the domain of the word. By "domain" is here meant a constituent string to which phonological rules and conventions are applicable (for a formal definition, see SPE, p. 391). The concept of "word" is intuitively simple but elusive to pin down formally. Here a tentative, formal working definition is adopted: a word is a string bounded by brackets that are labelled with symbols of lexical categories(N, A, V, Adv) in the surface structure.

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This is still a preliminary version. Comments will be much appreciated. From the 1st of September 1970 my address will be M. Lindau, Phonetics Labs, Dept of Linguistics, University of California, Los Angeles, California 90024, USA. Present address: Monash University, Clayton, Victoria 3168, Australia.

A summary of possible types of stress and tonal accents, together with some data will first be presented. We will discuss ways of dealing with these facts and their relationships, both in the earlier framework of generative phonology and then taking the theory of markedness into consideration.

STRESS

In the literature on the subject there are different assertions concerning the number of relevant stress levels in Swedish. The SAOB (Svenska Akademiens Ordbok, 'The Dictionary of the Swedish Academy') distinguishes four levels of stress apart from unstressed syllables, Noreen three levels as well as unstressed, and Elert two as well as unstressed (Elert 1964, p. 16).

As it has not yet been convincingly demonstrated that there is any empirical foundation to the claims for a "psychological reality" of multiple levels of stress, it would be preferable to deal with stress as a category that is either present as strong stress or not present over whatever linguistic unit we decide it belongs to. In fact, what empirical evidence there is seems rather to point to stress being perceptually a categorical property (Hadding-Koch 1961. See also for example Ohala 1970 pp. 104-117 for a summary of the arguments.).

However, as a tentative point of departure we accept Elert's system of transcribing stress and the existence of primary and secondary stress in the data.

Every lexical item has one primary stress (Malmberg, 1956, p. 101; Elert, 1964, p. 16). Monosyllabic lexical items have one strong stress. In polysyllabic words the primary stress may fall

1) on the first syllable of the word in

   a) nouns ending in vowels: kaka, kvinna, krona, lampa, remsa, yxa, glömska;

spöke, bjälke, bonde, fogde, äpple, furste, glädje; kvitto, jumbo, hambo, baby...

b) nouns ending in -el, -er, -en: fågel, snigel, prägel, pudel, gurgel, tvivel, gaffel, giffel; buller, fjäder, hamster, schnauzer, skvaller, seger, pilsner, kloster, klöver, order, ruter; fröken, fräken, braxen...

c) nouns ending in other vowel-consonant combinations: päron, plommon, helgon, morgon; bröllop, biskop, lakan, fänrik, härad, senap, sirap, minus, huvud, djävul, motor, tobak, konjak, haschisch, album, lektor, idrott, pajas...

d) verbs: hugga, kiva, leka, måla, skutta, hoppa, arbeta...

e) other lexical categories: gammal, kristen, möjlig, hövisk, nästan, aldrig, alltid, heller, annars, kanske...

f) nouns with more than two syllables: arbete, abborre, algebra, alibi, alkohol (sometimes alkohól), ebenholts, ekorre, embryo, händelse, kollektiv (sometimes kollektív)...

g) in words with certain prefixes, including bi-, an-, om-, in-, av-, upp-, ut-, vid-, till-, väl-, för-, perhaps själv-;

bilägga, antasta, omfamna, inbilla, avdunsta, uppvigla, vidskepelse, tillåta, välfärd, förgård; självmedveten;

Words beginning in er- are probably best accounted for in this group: erövra, erfara, erfarenhet...

2) on the syllable following certain other, unstressed, prefixed, including be-, ge-, ent-, i-, and there is a för- and a väl- in this group too:

berätta, betala, bekant, gemensam, gemensamhetsbad, entlediga, ihjäl, itu; förlåta, välsigna...

3) on the last syllable in a great number of words

a) ending in a vowel: ironi, kafé, diskrä, revy, miljö, ridå, berså, intervju, industri...

b) ending in consonant(s):

solid, konfys, kusin, problem, kines, kanel, mustasch, minut, nervös, apelsin, centrifug, korridor, mekanik, muhammedan...

produkt, fåtölj, familj, turist, abort, absurd, annons, sekund, modern, recept, tendens, adjunkt, elefant, konsonant, medaljong, muhammedanism, socialist, kontrovers...

adress, kuliss, affisch, galosch, kastrull, program, cigarr, cigarett, parasoll, konstitutionell, timotej...

4) on other syllables: mekaniker, madonna, ordentlig, september, manöver, sortera, plädera...

Secondary stress occurs in compounds "on one, and only one, of the syllables following that carrying main stress" (Elert, 1964, p. 15). More specifically, this secondary stress falls on the stressed vowel of the last word that makes up a compound: strå^{1}hatt^{2}, strå^{1}hattmå^{2}kare, sjuk-kå^{2}ssa, butel^{1}j-öppna^{2}re, öl^{1}butelj-öpp^{2}nare, vichyvattensbuteljsetikettspåklist^{2}rerska.

TONAL ACCENT

Swedish is characterized by an opposition of two tonal accents over the domain of the word: accent I and accent II, sometimes referred to as acute ´ and grave ` accents. As all monosyllabic lexical items carry accent I, the opposition is limited to lexical items of two and more syllables. A standard example is ánd-en ('the duck') with accent I versus ànde-n ('the spirit') with accent II. Accent II is a phenomenon peculiar to Swedish (and Danish and Norwegian). The actual fundamental frequency contour over the word for each accent shows considerable variation. In Danish the realization is not even entirally tonal but a matter of 'stød' versus 'non-stød'[1]. However, any Norwegian, Danish, or Swedish native speaker controls two different contours. The tonal accent is regarded as a phonological unit for Scandinavian languages, and Öhman (1967) hypothesized about a physiological basis for the common historical origin.

Accent I occurs generally

1) over monosyllabic words: tal, strå, hatt...
2) over words with ultimate stress, see 3) above.
3) over words with the prefixes of 2) above: betala, etc.
4) over nouns, verbs, and adjectives ending in -el, -er, -en, see 1b) on p. 3
5) over many polysyllabic words that originally were borrowed: pojke, kä^{2}nga; taxi, komma, baby; mekaniker, psykedelisk; tobak, konjak, album...
6) over the last stressed word in a compound: strå^{1}hattmå^{2}kare, sjuk^{1}kå^{2}ssa

Accent II occurs generally

1) over polysyllabic words (native and assimilated loanwords): flicka, flickorna, sommar, ande, flaska, bagare...

2) over the first word that makes up a compound: fågelbûr, stråhattmåkare, vichyvattensbuteljsetikettspåklistrerska.

Are stress and the tonal accent predictable by rule or do these features have to be specified lexically as idiosyncratic properties of each word? At the first glance it seems as if stress can fall at any syllable of a Swedish word. However, there are constant properties associated with some of the stress patterns. As a first approximation we assume that if a word ends in a "strong cluster"[3] and this strong cluster is not a neutral affix (p. 25), the primary stress falls on that last syllable, as in the case of the examples under 3) on p. 2 and 3. In the examples of 1) on p. 2 the last syllable constitutes a weak cluster, and the stress falls on any other but the last syllable. Stress thus seems to be at least partially conditioned by types of syllables in the word. The tonal accent is partially conditioned by the number of syllables in the word as accent II requires at least two syllables. What syllable types are there then in Swedish and where do tense, long vowels occur and where lax, short vowel?

LENGTH AND TENSENESS

An analysis of Swedish yields nine long vowels [i:, e:, ɛ:, y:, ø:, ʉ:, u:, o:, ɑ:] and eight short vowels [ɪ, ɛ, ʏ, œ, ɵ, ʊ, ɔ, a] (sometimes nine short vowels when short [e] is distinguished from short [ɛ]). A description within the framework of autonomous phonemics usually sets up nine vowel phonemes plus a length phoneme /:/ (Elert 1964, Sigurd 1965). This is a less desirable solution. It involves treating a property of a segment as an independent segment. To achieve the desired phonetic output an ad hoc rule is then required to desegment /:/ and assign it as a part of a segment. Alterna-

tively, the difference between the two vowel sets can be handled by adding one entity to the set of phonetic features for Swedish vowels and by regarding the difference as one of the presence versus absence of this feature. This is the more economic way of accounting for the distinction. But what feature should be chosen? An obvious choice is between [±long] and [±tense].

Elert (1964) demonstrated a consistent difference in the measured duration between the two sets of vowels. However, the length difference is always concomitant with a difference in vowel-quality as well: the short vowels sound more central than their long counterparts.[4] Over and above this the perceptual distance between the members of each long-short pair is greater the lower the vowels are. The vowels in våt and vått, and in hat and hatt are perceptually further from each other than the vowels in vit and vitt and in bot and bott. Moreover, the characteristic difference between the two sets of high vowels [i:, y:, ʉ:, u:] and [ɪ, ʏ, ʊ, u] is not so much the duration as the fact that the "long" ones are diphthongized to [i:j, y:j, ʉ:ʊ, u:ʊ] and the short ones are not (Hammarström & Norman 1957; Lindblom & Sundberg 1969).

Phonetic properties of a segment are important in the choice of features. The features and their values should be the same on the systematic phonemic level as on the systematic phonetic level, unless the statement of a general phonological process requires the positing of an abstract underlying form that differs in feature composition from its phonetic form (See Postal 1968, chapter 4; SPE, chapter 8). Moreover, if the segments on the systematic phonetic level are to be comparable in terms of their feature composition across languages in a meaningful way, it should be possible to relate the features to phonetic parameters (cf. Ladefoged 1967, chapter 2). Thus for any two segments with the same feature composition except that one segment has the feature $[+F_i]$ where the other has $[-F_i]$, the claim is that these two segments will differ along the same phonetic parameter. As there are languages where

the only difference between two sets of vowel-segments is one of duration (e.g. Estonian, Turkish, Danish [Rischel 1968]), the feature [±long] should be reserved for these cases. The phonetic interpretation of [±long] is along the parameter of duration of articulation. In other languages where the durational differences are concomitant with some other characteristic(s) like vowel-quality and diphthongizability as in Swedish and English we prefer another feature to account for it. Let us call this "other" feature [±tense] and although it has no obvious unique articulatory correlate, let us at least assign it a phonetic content on a parameter of perceptual distance. The distinction between the two vowel sets in Swedish will be accounted for by the feature [±tense] and length regarded as nondistinctive and predictable by a late rule that assigns length to all tense vowels:

LENGTH RULE: [+tense] ⟶ [+long]

As a tentative, and incomplete, working hypothesis we assume a Swedish underlying vowelsystem as below.

	[-back]	[+back]
[+high, -low]	i, y	ʉ, u
[-high, -low]	e, ø	o
[-high, +low]	ɛ	ɑ

Although [ʉ] is phonetically a front vowel it is posited as an underlying back vowel. In spite of the absence of alternation between [ʉ] and a back vowel in present-day Swedish (at least I could not find any) there is some other justification. In two rules [ʉ] behaves in the way of other back vowels and different from the front vowels.

1) /k/ and /g/ are fronted and softened to fricatives before front vowels, e.g. giva - ge and gav - gåva, kök and koka, kyla and kall. This rule does

not apply when the velar stops are in the context of before /ʉ/: gyllene and guld.

2) After high tense vowels a glide is inserted: a palatal /j/ after /ī, ȳ/, and a labial /β/ after /ʉ̄, ū/. We assume that Glide Insertion is a single process and will express it by one rule:

GLIDE INSERTION:

$$\emptyset \longrightarrow \begin{bmatrix} -\text{consonantal} \\ -\text{vocalic} \\ -\text{back} \\ \langle +\text{anterior} \rangle \\ \langle -\text{high} \rangle \end{bmatrix} \Big/ \begin{bmatrix} +\text{vocalic} \\ +\text{tense} \\ +\text{high} \\ \langle +\text{back} \rangle \end{bmatrix} \_\_\_$$

The rule is not entirely satisfactory. It does not describe the process in the most plausible way: as an agreement in place of articulation between the glide and the preceding vowel. /j/ and /ī, ȳ/ are palatal, and /β/ and /ʉ, u/ are labial (Lindblom 1969). The fact that this generalization is inexpressable in a simple way within the SPE feature system points to the need for revision of it, probably in the direction of Lindblom's features.

Later rules (not formulated here) lower the vowel-quality of the mid vowels and front the [+back, +low] vowels, when they are also [-tense].

TENSE AND LAX VOWELS IN SWEDISH

If stress is not taken into consideration, the only factor that tenseness and laxness could be predicted from is the syllable structure of the morpheme. Generally a vowel before two or more consonants is lax, but a vowel before a single or no consonant can be either tense or lax, e.g. banān, lākan, ironī, kafē, ansikte, lampa.[5] Therefore tenseness cannot be assigned by rule. As there are certain constraints on permissible sequences of tense/lax vowels and consonants within a Swedish morpheme, the set of morpheme structure conditions for Swedish includes specification on the redundancies that involve the feature [tense].[6]

Consider the following groups of words (cf. also pp 2-3):

1) ironī, ridā, revy, etuī, kafē; kälke, arbete, jumbo, baby, lampa, bāna

2) banān, pontōn, plakāt, granāt, kinēs, kontōr, fasān, parād...
lākan, mōtor, pāron, afton, kosmos, tobak, fordon...

3) cigarr, cigarett, parasoll, kuliss, adress, kastrull, terass, galopp...

4) hem, fem, stim, blom, dom ('verdict'), dom ('they'), dröm, skum...

BUT: dām - damm, tām - stam...

5) haj, svaja, skraj, koj, koja, speja, plöja, timotej...

6) ansikte, lampa, bjälke, pjäxa; produkt, familj, recept, bassäng, salong, talang, bjudning, adjunkt...

7) bārn, gārn, ārt, kārta; āln... BUT: salt, malt...
arm, alm, harpa, skalp, ark, skalk; örn, kärna, mård...

A. Vowel before a boundary (---V+)

In this position both tense and lax vowels occur (see examples under 1 above). Morpheme structure conditions (i) and (ii) limit the feature [±tense to vowels].

(i)
$$\begin{bmatrix} -\text{consonantal} \\ +\text{vocalic} \end{bmatrix} \Rightarrow [\alpha\,\text{tense}]$$

If a segment is a vowel, then it can be either tense or lax. Actually this involves misuse of alpha-variables as no correspondence (or lack thereof) is involved. It may be preferrable to delete (i) altogether and state only (ii) implying that the feature tense is used in Swedish and that all [-consonantal] segments can be either tense or lax.

(ii)
$$[+\text{consonantal}] \Rightarrow [-\text{tense}]$$

If a segment is consonantal, then it is also non-tense.

B. Vowel before a single consonant (---VC+)

In this position both tense and lax vowels occur, see 2) above. If the last vowel is tense it will be stressed by a phonological rule. Compare lākan, mōtor... with the words of 3), where the last vowel is lax and stressed. At this point the status of long consonants in Swedish will have to be considered.

It has been claimed that Swedish has two types of stressed syllables: a long vowel plus a single or no consonant, or a short vowel followed by two or more consonants. In 3) the stressed vowel is lax. In 6) the stressed vowel is also lax and followed by a cluster of different consonant. One conceivable way of accounting for the laxness of the stressed vowels in 3) is to represent the following consonant as a cluster where $C_1=C_2$, e.g. /sigarr/, /parasoll/... We could speculate that a native speaker certainly behaves in the same way with the last syllables of 3) as he does with the last syllables of the produkt, familj... group of 6), i.e. as if the last consonant were a cluster, a double consonant, even if he is not aware of any difference between the /r/-sound in cigarr and the /r/-sound in kär. Elert's measurements show that the so-called short consonants after a stressed vowel are 75-80 % of the duration of the long consonants after a stressed vowel (Elert 1964, p. 208). On the other hand, the perceptual reality of long consonants is questionable.[7]

Is there any other justification for this speculation? Double consonants cannot be eliminated altogether from Swedish phonology. Consider the alternation of vit-vitt, söt-sött, glad-glatt, röd-rött... where a suffix -t is added to adjectives when the adjective modifies a t-gender noun: en glad man-ett glatt grin, en röd stuga-ett rött band, en vit snögubbe-ett vitt sken... The underlying form of the adjective is assumed to be the same as the adjective before an indefinite n-gender noun: /glād/, /sø̄t/, /vīt/, /rø̄d/.

The suffix -t is added to this underlying form to derive glad+t, söt+t, vit+t, röd+t. A phonological rule devoices a voiced consonant before this -t to derive glat+t, röt+t. There is independent evidence for the devoicing rule, the formulation of which will be discussed later (p. 14).

Generally, where a double consonant arises in the derivational process a vowel laxing rule follows. The vowel thus behaves in the same way as before any other consonant cluster. After vowel laxing the crucial problem is however the succeeding rule: should the phonetic form be derived from a gemination rule, in which case the claim is that the consonant is long, or should it be derived from a deletion rule (of the second consonant), in which case the claim is that the consonant is short. Both rules are formally possible, but they make opposite claims about the "psychological reality" of long consonants. The lax vowel is not by itself an argument for a gemination rule. Before a consonant cluster a vowel is generally lax, but lax vowels also occur before single consonants. Until experimental evidence come forth on the "psychological reality" of geminated consonants in Swedish we will prefer the deletion rule and regard the final syllables of the examples above as a lax vowel followed by a short consonant. Nor do we consider that there is any evidence that would justify positing double consonants in the underlying forms of 3) on p. 3. Note that as the stress-rule is formulated (p. 24) it will not assign correct stress on the words of 3) unless the final consonant is represented as double. With a final lax vowel followed by a single consonant these words will constitute a class of exceptions, where stress is not assigned by rule but lexically marked. But the fact that an abstract underlying representation would make a rule work better is not considered to be an argument for that abstraction in itself.

Returning to the tenseness and laxness of vowels before single consonants we find that + and - must be lexically marked here. A lexical representation

of the words in 2) above (with the structure /CVCVC/) can have the first vowel tense and the second lax, as in lākan, or the first vowel lax and the second tense, as in banān. Furthermore, consider the words in 4) and 5) where a lax vowel is followed by a single consonant and that vowel will become stressed. This means that modern Swedish has at least three types of VC-clusters in stressed syllables: V̄C, VC, and VCC.

Perhaps a case could be made for the words in 4) to be represented as /CVmm/ if one regards both the base form of for example /hemm/ and a derived form, /hemm+a/, as having geminated nasals, but as there is no independent reason for the geminated nasals this would indeed be a case of making the underlying forms better fit the structural description of the rules. Nor is there any concevable reason for positing a double /jj/ for the words of 5), as /hajj/, /pløjj+a/ etc. in order to account for the lax vowel that always precedes /j/. The underlying representations of 4) and 5) will in this paper be posited with a single final consonant: /hem/, /stim/, /blum/... and /haj/, /koj/, /pløja/.

Morpheme structure condition /iii/ states that vowels are lax before /j/.

(iii) $$[+\text{vocalic}] \; j \Rightarrow [-\text{tense}]$$

C. Vowel before a consonant cluster (---VC(C)$_4$+)

Consider the words in 6). Note that words that phonetically contain a stressed vowel plus [ŋ] are grouped together with words that contain a lax stressed vowel followed by a consonant cluster. The phonetic segment [ŋ] is here derived from a systematic phonemic /Ng/.[8] The general constraint on morphemes is that within a Swedish morpheme vowels are lax before consonant clusters.

(iv) $$[+\text{vocalic}] \quad C(C)_1 \Rightarrow [-\text{tense}]$$

If a vowel is followed by two or more consonants, then that vowel is lax. The fact that a vowel before [ŋ] is always lax is then accounted for by the morpheme structure condition (iv).

What other evidence is there for an abstract representation of [ŋ]? It is possible to find minimal pairs like [rim], [rin], [riŋ], but even when we assume that [ŋ] is not a phoneme in Swedish, the representations on the systematic phonemic level of these three words will still be distinct from each other: /rim/, /rin/, /riNg/.

The place of articulation of a nasal before a consonant is conditioned by the place of articulation of the consonant, both within and across morphemes, e.g.

införliva [ɪɳfœ̄r'liva]	en bil [ɛm'bīl]
kamfer ['kaɳfər]	en fin bil [ɛɳfīm'bīl]
vänja ['vɛɲja]	en jojo [ɛɲ'jʊjʊ]
endast ['ɛndast]	en dam [ɛndām]
änka ['ɛŋka]	en kam [ɛŋkam]

The distribution of [ŋ] parallels the distribution of any other consonant cluster of nasal plus consonant. We find ring, romb, ränta, and rimb and rint, for example, are possible but non-occurring morphemes in Swedish, while none of the following is possible:

*ngir *mbir *ntir

Furthermore, /m/ and /n/ occur after liquids: arm, alm, orm; aln, tjärn. Sequences of the form *armb, *almp, *arnd, *alnd within a morpheme are ruled out as are *alŋ, *arŋ. The segments /m/ and /n/ occur in all positions of the morpheme. The sound [ŋ] never occurs initially.

A velar stop is sometimes realized phonetically, at least before voiceless stops: adjunkt [a'djʉŋkt], mångt [mɔŋkt], ungt [ʉŋkt], intressant [intrɛ'saŋkt]. With [ŋ] being derived from /Ng/ a devoicing rule is necessary:

$$g \rightarrow k \; / \; - \; t$$

Those /g/'s after a /N/ that do not undergo the above rule are deleted:

$$g \rightarrow \emptyset \; / \; [+\text{nasal}] \; ---$$

Those two rules must be ordered as above, and the feature [-next rule] added to the nasals of the morpheme that undergoes the devoicing rule to block deletion.

The devoicing of /g/ before a /t/ occurs in other environments also, for example in the alternation between säga-sagt, väga-vikt, lägga-lagt.[9] In fact, this rule is a subpart of a general rule that devoices all voiced plosives before -t: snabb-snabbt; glad-glatt (glad+t), superb-superbt,etc., where the -t is a neuter suffix. The devoicing also occurs when the -t is any other kind of suffix: späda-spätt (späd+t), leda-lett (led+t), äga-ägt, where the -t is a suffix forming the perfect participle.

DEVOICING RULE:

$$[+\text{voice}] \rightarrow [-\text{voice}] \; / \; \begin{bmatrix} --- \\ -\text{continuant} \\ -\text{nasal} \end{bmatrix} \; t$$

The rule can be generalized even further to include devoicing not only of plosives but also of fricatives: hava-haft (hav+t), klyva-klyfta, halv-hälft (halv+t→hälv+t by a vowel fronting rule), skriva-skrift (skriv+t). Furthermore, the devoicing occurs not only before /t/ but also before any voiceless consonant: arv-arvs, hav-havs, dag-dags, trivas-trivsel.

DEVOICING RULE:

$$[+\text{voice}] \rightarrow [-\text{voice}] \; / \; \begin{bmatrix} --- \\ -\text{vocalic} \\ -\text{nasal} \end{bmatrix} \; [-\text{voice}]$$

Notice that the environment for the class of plosives [-continuant, -nasal] takes as many features to specify in the rule as the class of all obstruents. With Halle's evaluation metric the first formulation of the Devoicing Rule would be given equal value to the latter formulation in spite of the fact that the latter rule is more general. This is just one other instance which

makes it clear that at least some features are hierarchically ordered, and in the evaluation of rules, the "top" feature [consonantal] and [vocalic] should "cost" less than other lower level features.

Consider the words of 7), where the stem morphemes contain a vowel followed by a liquid /r/ or /l/, which is followed by a consonant. The vowel is sometimes tense as in bärn, gärn; äln, ärt, färt sometimes lax as in arm, alm, harpa, ark, örn, tjärn, ärm, mård. Morpheme structure condition (iv) on p. 10 will have to be modified to account for this. First we want to state that in clusters of VLC, if the vowel V is /a/, then it is also tense; if the vowel is any other vowel than /a/, then it is lax. This distinguishes the tense vowels in bärn, ärtig, äln, ärla from the lax vowels in örn, tjärn, mård. However this is not restricted enough as even /a/ is lax in arm, arbete, harpa, ark, alm, balk, all of which end in a non-dental consonant. Instead of morpheme structure condition (iv) on page 10 we now have (iv) and (v) below.

(iv)
$$\begin{bmatrix} +\text{vocalic} \\ +\text{low} \\ +\text{back} \end{bmatrix} \begin{bmatrix} +\text{consonantal} \\ +\text{vocalic} \end{bmatrix} \begin{bmatrix} +\text{anterior} \\ +\text{coronal} \end{bmatrix} \Rightarrow [+\text{tense}]$$

If a low back vowel is followed by a liquid and a dental consonant, then it is tense.

Ulf Teleman points out (pers. com.) that this is still not restricted enough as there are pairs like Lärs:mars, färt:kvart. A still more restricted formulation of the condition is (iv).

(iv)
$$\begin{bmatrix} +\text{vocalic} \\ +\text{low} \\ +\text{back} \end{bmatrix} \begin{bmatrix} +\text{consonantal} \\ +\text{vocalic} \end{bmatrix} \begin{bmatrix} +\text{anterior} \\ +\text{coronal} \\ +\text{nasal} \end{bmatrix} \Rightarrow [+\text{tense}]$$

which applies only to clusters of LC where C is a nasal

(v)
$$[+\text{vocalic}] \quad [+\text{consonantal}] \; [+\text{consonantal}] \Rightarrow [-\text{tense}]$$

If a vowel is followed by any consonant (including liquids) which itself is followed by at least one other consonant, the vowel is lax.

Note that the MS conditions apply only within a morpheme. Clusters which arise from derivational processes and contain a boundary are not subject to MS conditions, e.g. trev-lig, trev-nad...

LAXING RULE

Other suffixes sometimes cause laxing of the stem vowel, for example the ones for forming the imperfect tense of verbs (-te, -de), the past participle (-t, -tt), the supine (-d, -dd) and the neuter (-t). Below are examples of alternation between tense and lax vowels, where the laxing occurs after the addition of a suffix of the form dental plosive (plus a vowel).

a) verbs: glō-glodde-glott, glädja-gladde-glatt, sy̆-sydde-sytt-sydd, se̊-(sāg-)sett-sedd, by̆ta-bytte-bytt, (kȫpa-köpte-köpt)

b) adjectives: glād-glatt, små-smått, ny̆-nytt, rȫd-rött, vīt-vitt.

Laxing does not occur in all instances where the above suffixes are added, for example not in the following verbs: lēva-lēvde-lēvt-lēvd, läsa-läste-läst, tåla-tålte-tålt, välja-vālde-vālt-vāld; nor in the following adjectives: fīn-fint, snäv-snävt, sēg-sēgt, kär-kärt, snål-snålt, rāk-rākt...

The regularity is that when the suffixes above are added to a base form containing a tense vowel, that tense vowel is laxed when 1) it is the final segment of the base form or 2) the base form ends in a consonant which agrees in place and manner of articulation with the initial consonant of the added suffix, i.e. the base ends in a -t or -d. We will consider these suffixes to be connected to the stem by a morpheme boundary /+/.

The laxing rule for case 1 is $[+\text{tense}] \longrightarrow [-\text{tense}] / \text{---} + \begin{bmatrix} +\text{anterior} \\ -\text{coronal} \\ -\text{nasal} \end{bmatrix} (V) \rrbracket$

Derivation: $_V[[\text{sy̆}]_V + \text{de}]$

# sy̆ # + de	Erase brackets
# sy + de	Convention
# sy + de	Laxing Rule above

When brackets are erased, a universal convention inserts a # -boundary "before and after each string belonging to a lexical category, that is, each string dominated by N, A, or V in the surface structure." (SPE p. 85). As this convention is supposed to be universal, we accept it as it stands. This, of course, means that when any affix is added to the lexical item with a morpheme boundary /+/, the wordboundary /#/ and the morpheme boundary /+/ collide. It has been suggested[10] that another convention be added to handle this: when /##/ and /+/ collide, the /+/ takes precedence over the /##/ which is deleted. In fact, this has to be assumed for the rules for English in SPE as well. We will adopt the same convention here.

The laxing rule for 2 is

$$[+\text{tense}] \longrightarrow [-\text{tense}] \;/\; \text{---} \begin{bmatrix} +\text{consonantal} \\ +\text{anterior} \\ -\text{coronal} \\ -\text{continuant} \\ -\text{nasal} \end{bmatrix} + \begin{bmatrix} +\text{consonantal} \\ +\text{anterior} \\ -\text{coronal} \\ -\text{continuant} \\ -\text{nasal} \end{bmatrix} (V) \rceil$$

Derivation: ${}_A[[gl\bar{a}d]_A \; +\bar{t}]$

# glād # +t	Erase brackets
# glād +t	Delete # by convention
# glāt +t	Devoicing Rule
# glat +t	Laxing Rule 2)
# # glatt #	

The two cases 1) and 2) of the laxing rule can be collapsed into one rule:

LAXING RULE:

$$[+\text{tense}] \longrightarrow [-\text{tense}] \;/\; \text{---} \left(\begin{bmatrix} +\text{consonantal} \\ +\text{anterior} \\ +\text{coronal} \\ -\text{continuant} \\ -\text{nasal} \end{bmatrix} \right) + \begin{bmatrix} +\text{consonantal} \\ +\text{anterior} \\ +\text{coronal} \\ -\text{continuant} \\ -\text{nasal} \end{bmatrix} (V) \rceil$$

The maximal expansion handles case 2) and the other expansion handles case 1). All the examples on p. 16 are accounted for except that the rule does not lax the vowel in köpte and köpt because /p/ and /t/ do not agree as regards place of articulation. The vowel is in fact still tense in middle Swedish dialects. In my own dialect (Scanian: Lund) the vowel is lax and in order to generate that, the lexical item /çøp/ is marked [+Laxing Rule].

STRESS

Stress is not predictable from the syllabic structure alone. A disyllabic formative of the form /CVCVC/ can have stress on the first or the last syllable:

'lākan	ba'nān
'pāron	ka'nōn
'sēnap	pon'tōn
'pajas	fa'tāl
⋮	⋮

However, if the tenseness of the vowels is also taken into consideration it is possible to predict stress by rule for the majority of Swedish words. There will still be a residue for which stress is lexically marked, but this is hardly surprising when one considers that Swedish has borrowed and assimilated words with stress-patterns from both Germanic and Romance languages. The data we will attempt to account for are the examples on pp. 2 and 3.

A. Stress on monosyllabic words and on the final syllable of polysyllabic words

Every lexical item has one, and only one, primary stress. Intuitively, stress is a property of the syllable unit, but as a formal way of defining the domain of a syllable is lacking, stress will be assigned on the syllable nucleus, the vowel.

If a lexical item contains only one vowel it is assigned [1 stress]. Consider the examples of 1b) on p. 3. Their base form is assumed to be monosyllabic, for example /fōgl/, /snīgl/, /tvīvl/, /fjɛ̄dr/, /skvalr/, /frø̄kn/... For the majority of words in this group, suffixes are added to the base form. The plural-forming /-ar/ is added to nouns: fåglar, sniglar, fjädrar, frökar, pudlar, schnauzrar... A few of the nouns take an Ø plural suffix: kloster,

pilsner, order, ruter. Verbforming suffixes -a (infinitive), -ar (present tense), -ade (past tense), -at (perf. part.), and -ad (supine) are added to the base form to derive the verbs from the nouns: prägla, tvivlade, gurglat, gaffla, bullrade, fjädrat, hamstra, skvallra, segra, beordrad... The fact that the base forms show up in alternation provides enough justification for them.

When no suffix is added in a derivation an epenthetic vowel is inserted by a late rule before the l, r, and n. This vowel-insertion rule is ordered after stress and tonal accent have been assigned. At the stage of accent assignment they are monosyllabic and will receive the acute accent.

Monosyllabic words can be regarded as similar to polysyllabic words with the last syllable stressed. A rule that assigns primary stress on the last syllable will of course also assign stress on all monosyllabic words. Consider the examples under 3), p. 3, all of which has primary stress on the last vowel. Two regularities appear: a) when the final vowel is tense, the vowel is stressed (3a and the first part of 3b), and b) when a final lax vowel is followed by two or more consonants, the vowel is stressed (second part of 3b). In SPE the concept of strong and weak clusters is introduced (SPE p. 29). For Swedish the rule is that a final strong cluster is assigned primary stress.

Positing double consonants in the underlying forms of adress, kuliss, kastrull, etc. would amount to a diacritic use of phonological features (cf. Kiparsky). The underlying representation is adjusted so that it fits the structural description of a rule environment. This "solution" is rejected, and this group of words will not be assigned stress according to the general rule. A lax vowel followed by a single consonant forms a weak cluster, so then the generalization that a final weak cluster is unstressed in Swedish will have precisely the group adress$^{\text{etc.}}_{V}$ as exceptions. If the underlying repre-

sentation contains a final weak cluster that phonetically is stressed two alternative ways are open. One is that stress is unpredictable in Swedish and has to be lexically marked for each lexical item. This would be missing the generalization that final strong clusters always are stressed, and that final weak clusters are unstressed in most cases. Another solution would be to claim that stress is predictable and treat this group of words as exception.

There is a number of ways to handle exceptions. The least arbitrary way is perhaps to formulate the phonological rule so that it applies everywhere "except in the context..." In the case under discussion this is not possible. I cannot see any possible formulation of context that would not assign stress on the final weak cluster in bröllop, biskop, tobak, konjak, djävul, senap..., but would assign stress on the final weak cluster in galopp, fagott, barack, bivack, kastrull, attrapp...

Another conceivable, but more arbitrary way would be to mark the problematic words lexically with a morphological feature, e.g. [+foreign] and to include [+Foreign] as part of the context where stress is assigned. This is rejected because it would involve a phonological use of diacritic features (cf. Kiparsky) in allowing phonological rules to operate on diacritic features in the same way as on phonological features. Moreover, it would amount to an unfounded claim that these words sound "foreign" to a native speaker. Adress, kastrull, program, galopp, cigarett... are among the more "familiar" Swedish words. There is no reason for claiming that konstitutionell, attrapp, fagott..., even if they do sound foreign, are any more foreign than konfys, centrifug, produkt, absurd, all of which would be assigned stress by rule on the final strong cluster. Furthermore, the feature [+Foreign] implies that a native speaker has internalized a knowledge of the etymology of lexical items, a notion that we find unacceptable.

Thirdly, we could exempt those words that are stressed on a final weak cluster from the general stress rule by marking them with a rule feature [-stress rule] and assign stress lexically.

If the underlying representation contained a double consonant after the lax vowel, e.g. /adress/, /sigarr/, /kastrull/... thus forming a final strong cluster, stress would be assigned by the general rule correctly and these words would not constitute a class of exceptions. As there have not appeared any independent reasons for the double consonant representation here, it is considered unjustified and abandoned with some regret (cf. p. 10).

To account for the stress in these words we prefer the third solution above, and we will mark stress lexically together with a feature [-stress rule]. This is not a satisfactory solution but it is the least arbitrary of the ones which are available at this stage.

B. Stress on a syllable that is not final

A final weak cluster is generally unstressed. The majority of Swedish simple (i.e. not derived by affixing or compounding) words are disyllabic, so when the stress falls on the penultimate syllable, this is the same as the first syllable of the word. For examples, see la-le on pp. 2 and 3. As a first approximation the stress rule assigns [1 stress] on a final strong cluster, and if the final cluster is weak, it assigns the [1 stress] on the penultimate syllable.

STRESS RULE:

$$V \longrightarrow [1\ \text{stress}] \Big/ \left\{ \begin{array}{l} \left[\begin{array}{c}\text{---}\\ \text{+ tense}\end{array}\right] \; C_o^1 \\ \text{--- } C_2 \\ \text{--- } C_o \left[\begin{array}{c}\text{-tense}\\ V\end{array}\right] C_o^1 \end{array} \right\} \; \Big] \; \begin{array}{l} a \\ b \\ c \end{array}$$

Cases a and b can be regarded as an "elsewhere" case, and the rule simplified into

$$V \rightarrow [1\ \text{stress}] \Big/ \text{---} \left\{ \begin{matrix} C_0 \begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_0^1 \\ C_0 \end{matrix} \right\} \rceil_L \begin{matrix} a \\ b \end{matrix}$$

When the string under consideration contains more than one vowel, and the final vowel is followed by no more than one consonant, assign [1 stress] on the penultimate vowel. Case b assigns [1 stress] elsewhere.

The same rule, case b, then assigns stress on both monosyllabic words and words with final strong clusters. As will be seen later these two word-types work together as regards the tonal accent as well, in that they both take accent I.

Cases a and b are disjunctively ordered with respect to each other and can be further abbreviated by use of parentheses:

STRESS RULE:

$$V \rightarrow [1\ \text{stress}] \ / \ \text{---}\ C_0 \left(\begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_0^1 \right) \rceil_L$$

where L stands for any symbol of a lexical category (N, A, V, Adv...)

Words containing more than two syllables

(i)	(ii)	(iii)
Abessinien	abborre	algebra
Amerika	ekorre	elände
Portugal	arbete	ebenholts
Brasilien	alibi	
Afrika	alkohol	
Europa	amfibie	
Andalusien	aluminium	
Indien	ammoniak	
Mesopotamien	ansjovis	
Argentina	embryo	
⋮	gymnasium	
	⋮	

It is rather surprising how few simple words there are in Swedish that are of more than two syllables. One large group is made up of names of countries and continents. The primary stress in (i) and (ii) are subject to the same condition. The final cluster is weak, and the penultimate cluster is either weak or strong. The stress falls on a penultimate strong cluster. When the

penultimate is weak, the stress falls on the syllable before, the antepenultimate. In other words, it looks as if it is the Romance Stress Rule which is the productive stress rule in Swedish. Halle and Keyser (1966) find that the Romance Stress Rule is predominant in English, too, and that it has, in fact, subsumed the Germanic Stress Rule as a subpart.

If the same rule applies to (iii) the output is *al'gebra, (*)e'lände, e'benholts. For some Swedish speakers e'lände is the correct phonetic form. I have not yet been able to formulate a stress rule for simple words that assigns stress correctly to both (i) and (ii) on the one hand, and (iii) on the other as the penultimate cluster of (iii) is strong and unstressed. Therefore, the small group of words that falls under (iii) is lexically marked for stress. We would rather regard them as exceptions than adjust the underlying forms to fit the structural description of the stress rule. We also reject a "solution" that would redefine "weak" cluster so that it includes sequences of lax vowel followed by a consonant which in turn is followed by a liquid (algebra), and sequences where the lax vowel is followed by /nh/ (ebenholts). In order to cover most polysyllabic words the context of the stress rule is extended to include the following:

(i) $\_\_\_\; C_o \begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_o^1 \begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_o^1 \rangle_L$ Portugal, Amerika, ālibi, abborre...

(ii) $\begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_2 \begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_o^1 \rangle_L$ bjälke, furste, glömska, konjak...

(iii) $\begin{bmatrix} +\text{tense} \\ V \end{bmatrix} C_o^1 \begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_o^1 \rangle_L$ Argentīna, ansjōvis, lākan, pāron...

(iv) $\begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_2 \rangle_L$ familj, produkt, abort, annons, elefant, muhammedanism...

(v) $\begin{bmatrix} +\text{tense} \\ V \end{bmatrix} C_o^1 \rangle_L$ ironī, kafē, solīd, kusīn, korridōr, muhammedān, mekanīk...

These five contexts can be abbreviated to three:

(i) = (i) above

(ii) $\_\_ C_o \begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_o^1 \rrbracket_L$ (covers (ii) and (iii) above)

(iii) $\_\_ C_o \rrbracket_L$ (covers (iv) and (v) above)

If the stress rule is formulated with a double environment, case (ai) of the stress rule = (i) above, cases (aii) and (bi) = (ii) above and case (bii) = (iii).

STRESS RULE:

$$V \longrightarrow [1 \text{ stress}] \Big/ \_\_ \begin{cases} C_o \begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_o^1 & \text{(i)} \\ C_o & \text{(ii)} \end{cases}$$

$$\Big/ \_\_ \begin{cases} \begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_o^1 \rrbracket & \text{(a)} \\ \rrbracket & \text{(b)} \end{cases}$$

The fully abbreviated formulation is

$$V \longrightarrow [1 \text{ stress}] \,/\, \_\_ C_o \left(\begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_o^1 \right) / \_\_ \left(\begin{bmatrix} -\text{tense} \\ V \end{bmatrix} C_o^1 \rrbracket_L \right.$$

The different cases of the stress rule apply in the order (ai), (aii)-(bi), (bii). They are disjunctively ordered. Examples of stress assignment to base forms:

$[\overset{1}{k}\bar{a}ka]_N$	by aii	$[bj\overset{1}{\ddot{a}}lke]_N$	aii
$[\overset{1}{b}iskop]_N$	aii	$[\overset{1}{p}ajas]_N$	aii
$[\overset{1}{i}ron\bar{i}]_N$	bii	$[mekan\overset{1}{i}k]_N$	bii
$[\overset{1}{k}us\bar{i}n]_N$	bii	$[prod\overset{1}{u}kt]_N$	bii
$[\overset{1}{p}ortugal]_N$	ai	$[argent\overset{1}{i}na]_N$	bi
$[\overset{1}{\ddot{a}}bore]_N$	ai	$[ansj\overset{1}{\ddot{o}}vis]_N$	aii
$[\overset{1}{f}\bar{o}gl]_N$	bii	$[fr\overset{1}{\emptyset}kn]_N$	bii
$[\overset{1}{\ddot{a}}lkohol]_N$	ai, and if the underlying form has a final tense vowel		
$[alkoh\overset{1}{\bar{o}}l]_N$			

C. Derivational affixes

Stress on words that are derived by means of affixation will be dealt with only sketchily. Some affixes affect the stress placement and the tonal accent in the word, other do not. The latter are called neutral affixes, and they are represented in the transcription as being affixed to a form with a word-boundary /#/. Non-neutral affixes are surrounded by morpheme boundaries /+/. A word-boundary, /#/, is introduced by a convention that places a # before and after each string which is dominated by a lexical category N, A, V, Adv in the surface structure. There is a convention for rule application to strings containing boundary symbols: "that #, as opposed to +, must be mentioned in a rule if that rule is to apply to a string containing #." (SPE p. 85). This implies that rules cannot apply across word-boundaries #, so an affix that is combined to the base form by # will be excluded from consideration in the application of a rule to that string.

Rules apply across morpheme boundaries, so a string which contains an affix that is surrounded by morpheme boundaris, +'s, will include the affix as part of the context rules. If a rule specifically mentions + in the context, it applies only to strings which contain a +. If a rule does not mention +, it applies to strings both with and without +'s. (Cf. for example SPE p. 84.) On p. 16 we adopted another convention for rule application to strings containing boundary symbols in collision.

Suffixes

(i) Nounforming neutral suffixes include -(a)n, -re, -(n)ing, -het, -dom, -else, -(a)nde, and (e)nde.

Examples: tävla#n, måla#re, mål#ning, tävla#ing, kristen#het, kristen#dom, för+älska#else, för+tro#ende, cykla#ande

(ii) Adjective- and adverb-forming neutral suffixes include -d, -aktig, -bar, -(l)ig, -(i)sk; -ligen, -vis, -värd.

Examples: måla#d, för+föra#d, för+del#aktig, kontrollēra#bar, sāk#lig, för+stånd#ig, för+föra#isk; säker#ligen, anständigt#vis.

(iii) Non-neutral nounforming suffixes include the nounforming -erī, -(i)st, -(i)sm, -inna.

Examples: mål+erī, sōl+ist, mejeri+st, sociāl+ist, sociāl+ism, målar+inna; the verbforming -era: stud#era; and the adjective-forming -abel: present#abel.

When two unstressed non-high vowels are adjacent, one of them, usually the first one, is deleted (Teleman 1969, p. 186). The rule derives for example cyklande from the intermediate cykla#ande.

We assume that the lexical stress rule applies at the level of the word. When a word is derived from another word with the addition of a suffix, as in målare, tävling, förälskelse (nouns derived from verbs), kristendom (noun derived from adjective), förförisk, inbilsk (adjectives derived from verbs), and saklig, förståndig (adjectives derived from nouns)[11] stress could be assigned by allowing cyclical application of the stress rule (for the principle of the transformational cycle in phonology, see SPE p. 20). For example,

$[[m\bar{o}la]_V re]_N$

1	Stress Rule aii
# #	Erase brackets and introduce #'s by convention, as V is a lexical category
1	The suffix is preceded by # , and it is not taken into consideration in the second cycle. Case aii reassigns stress on the noun.
1 [mōlare]	

The principle works, but it involves putting into action the whole powerful machinery of cyclical rule application. Alternatively, a solution could

be considered where we retain the cyclical erasing of brackets but not cyclical rules, and alter the domain of the application of the stress rule from strings within the innermost lexical category[12] to strings within the outermostlexical category brackets. The derivation of målare is then as followa.

$[[m\bar{o}la]_V \ re]_N$

# #	As the lexical category V is not the outermost one but is in turn dominated by another lexical category, the stress rule does not apply now. Erase brackets.
1	The Stress Rule aii applies as the N here is the outermost lexical category.
##$\overset{1}{m\bar{o}}$la#re#	Erase brackets.

No empirical foundation for the stress cycles has yet been established (Ohala 1970). From a formal point of view the cycle involves such a powerful machinery of rules that it will have to be heavily constrained in any case. Without any convincing justification for cyclical rules in phonology, non-cyclical rules will be preferred whenever it is possible to formulate a rule both as cyclical and as non-cyclical.

Examples of derivations with non-neutral suffixes:

$[[m\bar{o}la]_V + eri]_N$

# #	Erase brackets. Insert # 's.
∅	Delete # when it is followed by a +-boundary.
1	Stress Rule bii. The +-boundary makes the suffix part of the string under consideration.
∅	Delete the first of the two unstressed non-high vowels (p. 26)
##$m\bar{o}\overset{1}{l}eri$ #	Erase brackets.

$[[sosi\bar{a}l]_A + ism]_N$

# #	Erase brackets. Insert # 's.
∅	Delete # when it is followed by a +-boundary.

1 Stress Rule bii.

ă Laxing Rule 2 (see below).

##sosiăl+$\overset{1}{i}$sm# Erase brackets.

Another laxing rule applies to a tense vowel when it is followed by one consonant that is followed by a stressed, non-neutral suffix.

LAXING RULE 2:

$$[+\text{tense}] \longrightarrow [-\text{tense}] \;/\; \text{---}\; C + \ldots \begin{bmatrix} +\text{stress} \\ V \end{bmatrix} \ldots]_{\text{affix}}$$

The rule is optional in a few words, e.g. gjuteri, säteri that phonetically are either [jʉ:t$\overset{1}{\text{ə}}$ri:j], [sɛ:t$\overset{1}{\text{ə}}$ri:j] or [jɛt$\overset{1}{\text{ə}}$ri:j], [sɛt$\overset{1}{\text{ə}}$ri:j]. Incidentally, this provides a further argument for regarding tenseness as lexically marked.

Prefixes (Examples on p. 3)

On class of prefixed words are stressed on the first vowel after the prefix (see for example 2) on p. 3). The other class (see 1g) on p. 3) has primary stress on the prefix itself.

To account for the former case, another stress rule is formulated, Stress Rule (1) which is ordered before the stress rule on p.24. The stress rule on p.24 will be referred to as Stress Rule (2). We prefer to formulate a separate stress rule to integrating a special case of a context after certain prefixes into the stress rule on p. 24, as there is no obvious non-arbitrary relationship between the context which assigns stress after certain prefixes and the contexts of Stress Rule (2). The prefixes of 2) on p. 3 are connected to the base stem with a +-boundary, and Stress Rule (1) assigns a primary stress on the first vowel after prefix that is followed by a + :

STRESS RULE 1:

$$V \text{ ---} \begin{bmatrix} 1 \text{ stress} \\ -\text{next rule} \end{bmatrix} / \underset{\text{NAV}}{\quad} [C_o V C_o + C_o \text{ ---}$$

STRESS RULE 2: see p. 24.

A string can only be assigned primary stress once. If a string is assigned primary stress by Stress Rule (1), it is also assigned [-next rule] to block reassignment by Stress Rule (2). When a string under consideration does not fit the structural description of Stress Rule (1), the next rule automatically applies.

Derivations: [be+[tāla]]
V V

# #	This is not the outermost lexical category. Erase brackets. Insert # 's.
∅	Delete # / + –––
1	Stress Rule (1)
# be+tā^{1}la# #	Erase brackets. Insert # 's.
[vɛ̄l+[siNgna]] V V	
# #	Erase brackets. Insert # 's.
∅	Delete # / + –––
1	Stress Rule (1)
ŋ	Nasal assimilation
∅	g-deletion, p. 14
# #	Erase brackets. Insert # 's.
# vɛ̄l+si^{1}ŋna # #	

The stress in words with primary stress on the prefix (as in 1g on p. 3) is still unaccounted for.

Most of the prefixes of 1g) occur independently as prepositions and adverbs. One exception is er-. Often there is alternation between the preposition used as a prefix in a "fixed combination" ('fast sammansättning') and as a separate category in a "loose combination" ('lös sammansättning'): 'uthållig -hålla 'ut, 'omfamna-famna 'om, 'avdunsta-dunsta 'av, 'omtala-tala 'om. There are evidently restrictions on this alternation as there is no *tasta 'an,

*låta 'till, *billa 'in for example, but these are outside the scope of this paper. The "loose combination" of verb plus preposition has a more concrete meaning than the corresponding "fixed combination" (Wellander p. 305):

Han avbröt samtalet - Han bröt av spadskaftet.

Det tillkommer honom att meddela chefen. - När det kom till kritan...

*När det tillkom kritan (Wellander, p. 617).

Note also that in the alternation between "fixed" and "loose combinations" the stress stays on the preposition.

Here we assume that the "fixed combination" is the basic, and the "loose" one derived by a transformational permutation rule which does not change the stress. We regard the words which are built up of a preposition or an adverb, and a noun, adjective, or verb as compounds, and the stress and the tonal accent will be assigned by the same rules as for compound nouns. The surface structure bracketing for the examples in 1g) is thus similar to the bracketing of compound nouns: both consist of strings which are labelled with a lexical category and the internal bracketing of which is also labelled with lexical categories. Cf.

$[\ [bi\bar{}]_{PREP}[st\bar{o}]_V]_V$ $\qquad\qquad$ $[\ [str\bar{o}]_N\ [hat]_N]_N$

The same conventions that apply to erasing of brackets labelled N, A, and V apply to brackets labelled PREP or Adv.

Phonetically all compounds (including 1g) have a primary stress and the grave tonal accent in the first word and a secondary stress and the acute tonal accent in the last word. Here the grave tonal accent, accent II, is transcribed with a ` over the stressed vowel, and the acute accent, accent I, with a ´ over the stressed vowel. Compare the stress and accent patterns below:

`1 2´
bistå

`1 2´
undkomma

`1 2´
bilaga

`1 2´
stråhatt

`1 2´
sjuk-kassa

`1 2´
bikupa

It is possible to account for the stress pattern i Swedish compounds with rules similar to the rules for compounds in English in SPE. This involves assignment of lexical stress, and a cyclical Compound Stress Rule, and a convention that weakens all other stresses by one when a primary stress is reassigned in the string under consideration. Let us see how this would work for Swedish. Stress Rule (2) assigns one primary stress to the string inside the innermost brackets.

$[\ [bi]_{PREP}[stå]_V]_V$ $\qquad$ $[\ [strå]_N[hat]_N]_N$

1 1

\# \# \# \# $\qquad$ \# \# \# \# $\qquad$ Stress Rule bii

Erase innermost brackets.

To this string a Compound Stress Rule reassigns primary stress to the left-most primary stressed vowel. All other stresses are weakened by one.

COMPOUND STRESS RULE:

$$V \longrightarrow [1\ \text{stress}]\ /\ \# \ X \left[\begin{array}{c}\text{---}\\ 1\ \text{stress}\end{array}\right] Y\ (\# \# Z)\ \#\ ]_{\text{NAVPREP Adv}}$$

where X does not contain any [1 stress]; (\# \# Z) = any number of words.

The Compound Stress Rule is followed by another rule that deletes all stresses except the first and the last ones.

STRESS DELETION RULE:

$$[+\text{stress}] \longrightarrow [-\text{stress}]\ /\ \# X\ [1\ \text{stress}]\ \ldots\ \text{---}\ldots\ [2\ \text{stress}]\ Y\ \#\ ]_{\text{NAV}}$$

The continuation of the derivation of bistå and stråhatt is thus:

1 1

$[\# bi\# \# stå\#]_V$ $\qquad$ $[\# strå\# \# hat\#]_N$

1 1

2 2 Compound Stress Rule

Stress weakening convention

1 2 1 2

bistå $\qquad$ stråhat

Derivation of <u>stråhattmakare</u>

$[\ [\text{strō}]_N\ [\text{hat}]_N\ [\text{mākare}]_N\ ]_N$

1 1 1 # # # # # stråhattmākare	Stress Rule (2) bii, bii; ai Erase innermost brackets
1 2 2 Ø # #	Compound Stress Rule Stress weakening convention Stress deletion rule Erase brackets

Although the rules work, there is too much machinery in operation. Firstly, we would like to eliminate the convention which weakens all stresses by one as soon as a primary stress is reassigned, as this implies the existence of an indefinite number of levels of stress which we rejected in the first place. With only primary and secondary stresses to be assigned, we substitute that convention with a Stress Weakening Rule which weakens the last primary stress to a secondary when it is preceded by any other stress. It applies before the Stress Deletion Rule. Note that it is needed only because we assumed the existence of both primary and secondary stresses. This assumption may not be correct, and we will modify it later on (p. 35).

STRESS WEAKENING RULE:

$$[1\ \text{stress}] \longrightarrow [2\ \text{stress}]\ /\ [1\ \text{stress}]\ \ldots \left[\begin{smallmatrix}---\\ V\end{smallmatrix}\right]\ (C_oVC_o)\ \#\#$$

Secondly, we find that the cyclical Compound Stress Rule now in fact does not change any stress at all since the convention for weakening stress after the application of the compound stress rule was substituted with a rule. As the compound stress rule does not accomplish anything, it is deleted and we will return to assignment of stress in compounds on p.43 onw.

*

Up to now we have not taken into consideration the theory of markedness that is outlined in chapter IX of SPE and in Postal (1968). It was proposed to overcome certain inadequacies of the earlier framework, mainly concerning

the statements of lexical redundancy, and the evaluation metric. Earlier phonological statements were evaluated on purely formal grounds (Halle 1962). The modified theory proposes an evaluation metric that is based on formal, and more crucially, on empirical grounds, the "intrinsic content of features" by which I presume is meant some physical correlate of each phonological feature. One value of a feature is posited as the "expected" or "natural" state of the phonetic parameter. This is the unmarked value, [uF]. All other values of the same feature are less expected and marked, [mF]. A universal set of marking conventions interpret the u's and m's into + and −. The unmarked value of a feature may be both + and −, depending on the context.

The notion of "cost", or complexity of a grammar, or parts of a grammar, is introduced in the sense that the universal marking conventions assign the unmarked feature values at no cost for the grammar. They are part of general linguistic theory. The marked, unexpected values on the other hand, are assigned at the cost of phonological rules in the grammar.

Chomsky and Halle propose a tentative set of marking conventions for some features. They argued elsewhere (e.g. SPE pp 24-26) that the feature stress cannot be correlated to any acoustic parameter and thus presumably not to any physiological parameter either as articulatory events usually show up in some way in the acoustic signal. Perception of stress is attributed to the listener's hypothesizing about the syntactic structure of the utterance and his "internalized rules" for predicting stress contours, and this backs up their justification for the transformational cycle in phonology. Thus they deny that stress has any intrinsic phonetic content. It is not surprising that no marking convention is suggested in SPE for the feature stress, in spite of the fact that a sizeable portion of the book is devoted to just that feature. The point of the theory of markedness is to make the intrinsic content of features the decisive factor in determining which value is the unmarked one.

However, judging by the pre-SPE bulk of literature on the subject of stress it seems quite reasonable to assume some physical corelate, or combination of correlates to the phenomenon. Here I will not go into a discussion of what the nature of them may be but I do assume they exist. Furthermore, and this is more tentative, I assume that the activity that results in a percept of stress is more complex than it is not active to produce this effect. In other words, taking the phonetic content of stress as a basis it is hypothesized that the unmarked value is [-stress], and the marked value [+stress].

Physical correlates are not the only criteria that can be used in positing values as marked or unmarked. The claim is that markedness should be based on empirical evidence, but it is left obscure just what evidence is to be considered crucial, except for the intrinsic content. Postal (1968) points out that (among others) relative frequency of a segment of a feature is an argument for markedness. If a feature is contrastive in a language, the unmarked value is the more frequent. In languages with a stress contrast there are more unstressed vowels than stressed vowels. Moreover, unmarked values tend to be in the lexicon and marked values tend to be derived by rule. Languages have stress rules, not de-stress rules.

On the above grounds we adopt a marking convention for stress:

[u stress] ---> [-stress]

At the input to the phonological component all segments are then marked [-stress]. This means that the stress rules are no longer rules that add a feature but rules that change a feature value, and the stress rules on pp 24 and 29 will be modified accordingly.

The marked value, [+stress], is taken to denote any strong stress that gives a syllable thus marked a certain prominence in relation to the other syllables if the string under consideration. As there are no well-grounded

empirical facts that indicate a "psychological reality" of the notion of multiple stress levels, i.e. that the degree of this prominence would be consistently perceived by listeners, the stress feature should preferably be assigned in a way that reflects this, as [+stress], not as [1 stress] or [2 stress] or any other [n stress].

We assumed two degrees of stress in Swedish. The Stress Weakening Rule (p. 32) assigns the [2 stress]. However, [2 stress] co-occurs with accent I and only when another strong stress and accent II vowel precedes. If we instead posit only one strong stress, the rather ad hoc Stress Weakening Rule can be done away with altogether, and there will be a better correspondence to the evidence there is (not much, admittedly) on the perception of stress. If it is true that the second strongly stressed element in a compound is different from the first one, the explanation could be sought in other factors, mainly the different tonal accents, but also in the overall intonation and rhythm of the utterance.

Taking into account the marking conventions for stress and only one strong stress, the lexical stress rules and the stress deletion rule are reformulated.

STRESS RULE 1: (cf. p. 28)

$$[\text{-stress}] \longrightarrow \begin{bmatrix}\text{+stress}\\ \text{-next rule}\end{bmatrix} \Big/ \text{NAVAdv} \begin{bmatrix} C_o V C_o + C_o \begin{bmatrix}\text{-consonantal}\\ \text{+vocalic}\end{bmatrix}\end{bmatrix}$$

STRESS RULE 2: (cf. p. 29)

$$[\text{-stress}] \longrightarrow [\text{+stress}] \Big/ \begin{bmatrix}\text{-cons}\\ \text{+voc}\end{bmatrix} C_o \left(\begin{bmatrix}\text{-tense}\\ V\end{bmatrix} C_o^1 \right) \Big/ \begin{bmatrix}\text{-tense}\\ V\end{bmatrix} C_o^1 \rrbracket_{\text{NAVAdv}}$$

Condition: The string under consideration does not contain any internal ##

STRESS DELETION RULE:

$$[\text{+stress}] \longrightarrow [\text{-stress}] \;/\; [\text{+stress}] \text{ ---- } [\text{+stress}]$$

TONAL ACCENT

As demonstrated above the tenseness of vowels and the syllabic structure are related to stress, and not directly to the tonal accent. The opposition between the tonal accents is, however, connected to the number of syllables in the word, and which of the two tonal accents a word has is dependent on the stress-pattern of the word. The examples on p. 4 show that polysyllabic words with the primary stress on any other than the first vowel of the word take accent I. Polysyllabic words with a stress-patterns resembling a number of "upbeats" before the primary stress thus behave like monosyllabic words with respect to the tonal accent. Monosyllabic words are also assigned stress by the same case (bii) of the Stress Rule (2) as finally stressed polysyllabic words.

This relationship between stress patterns and the tonal accent is best characterized if stress is assigned before the tonal accent. If the tonal accent were assigned before stress, the environment of that rule would look much like the environment of the stress rules.[13] This would amount to an incorrect claim about a dependency relationship between syllabic structure type and the tonal accent, and the genuine dependency between syllable structures and stress would not be revealed by the rules. Furthermore, if the tonal accent assignment were ordered before stress assignment, the generalization that the tonal accent is partially dependent on stress would be lost.

The order of relationships is thus

1) tenseness and laxness of vowels: lexically marked or stated by morpheme structure conditions
2) stress: assignment by rule
3) tonal accent: assignment by rule

The examples in 5 on p. 4 have accent I in spite of the words being polysyllabic and having stress on the first vowel. They could be handled either by lexical marking of the tonal accent, or by marking them with a morphological feature [+Foreign]. If the latter way is chosen the context for the rule of accent I assignment specifically mentions this morphological feature. A feature [+Foreign] would, however, amount to a counterintuitive claim. In spite of the accent I in words like pojke, känga, serie, ångest, taxi, komma, baby they are not "felt" to be foreign. There is nothing un-Swedish about pojke, känga, ångest, serie. Other words in this group behave idiosyncratically in other respects than the tonal accent, e.g. taxi, baby, jockey, gimmick, where a native speaker mostly hesitates about plural-endings. Here the accent I will be regarded as an idiosyncratic feature and marked in the lexicon, thus claiming that the accent is an unpredictable property and learnt with the word. They will also be marked [-tonal accent rule] to block assignment of accent II. We could speculate that if the group taxi, baby etc. is also lexically marked for plural, together with a [-plural rule]-feature, what we have is then a formal means of capturing a degree of "foreign-ness" of the word: the more [-Rule n] features a lexical item contains, the more foreign it is for the native speaker (cf. Kiparsky 1968). Taxi, baby etc. are considered as less Swedish than pojke, känga etc. which is also what the grammar would predict.

A $^{\text{first}}_{V}$ approximation of a tonal accent rule assigns accent I on the last stressed vowel of a word if it is preceded by any number of vowels. The "any number" includes "zero" to subsume monosyllabic words under the same rule, and a condition is added that when "any number" "zero", then no vowels can follow.

TONAL ACCENT RULE 1:

$V \longrightarrow$ [accent I] / ...V... [$\overline{+\text{stress}}$] ...V... #

... may contain # 's. Condition: if the first V=0, then the second V=0.

Accent II is associated with the first and stressed vowel in a word, when more vowels follow.

TONAL ACCENT RULE 2:

$V \rightarrow$ [accent II] / $\#\, C_0$ [+stress] ...V...

... may contain # 's.

There are several objections to the above formulations. A formal objection is that two features were used. One feature is enough for stating a binary opposition. As we assume that phonetically the two accents are variations along one parameter, they should be stated as different values of the same feature. Furthermore, the two tonal accents apply to complementary sets of environments. It suffices to assign one accent with a rule that mentions its whole context, and assign the other accent "elsewhere" on stressed vowels. Which accent is then the "elsewhere" case? Generally the more specific case is mentioned explicitly and the general case assigned as elsewhere. If the earlier evaluation metric of counting features and symbols is used, the rule for accent II contains less symbols and would be selected as the more general case.

Over and above this the existence of an opposition between tonal accents is conditioned by the existence of an opposition of stressed and unstressed. Stress ought then to be a higher level feature than a feature for tonal accent. In the earlier framework of generative phonology there was no provision for stating a hierarchy of features.

The theory of markedness claims to overcome difficulties of the above types. The unmarked value of the feature for tonal accent is the more general, the expected accent, the assignment of which does not add to the complexity of the grammar of the particular language.

No feature in the SPE system has an intrinsic phonetic content that could be associated with the accent I - accent II distinction, so we add a new

feature, [tonal accent]. The feature has two values, + and −. It seems that there is no language that contrasts more than two values on the single parameter of tonal accent. It has been claimed that Lithuanian has three tonal accents, but the so called grave accent in Lithuanian is opposed to the circumflex by length only (Jernudd 1968).[14] [−tonal accent] will be associated with accent I and [+tonal accent] with accent II.

It is generally considered as an obvious fact that accent II [+tonal accent], is marked and accent I, [−tonal accent] is unmarked. There is some empirical basis for this assumption:

Physiologically the different tonal contours are mainly an effect of the rates of vocal cord vibration. That fact does not in itself help choosing one tonal contour over another as less marked. Öhman (1967), however, has a more interesting hypothesis: "...that all Scandinavian accents should be understood as variously timed glottal stops, only softer than the Danish one." (p. 29). This underlying mechanism manifests itself overtly in Danish and the case where the glottal stop, the "stød", occurs in Danish is the accent I case. There seems then to be some physiological justification for regarding accent I as the more basic, and accent II as containing an added mechanism.

From the point of view of frequency one would expect the unmarked case to occur more frequently than the marked case. The opposition between tonal accents is rare in the languages of the world, and the use of the feature [tonal accent] in a language is a marked phenomenon.

The marked case of an opposition tends to be derived by rule (cf. p. 28). The tonal accent is predictable, and moreover, [+stress] is a prerequisite for tonal accent to be assigned on a segment. [+stress] is in itself marked. A phonology of Swedish should state this hierarchy of markedness in an explicit way.

In cases of neutralization accent I is realized. An example is when an epithet is de-stressed in a sentence like "Vi'mötte anden'Donald" (We met the duck Donald or We met the ghost Donald).

The marking convention for tonal accent applies after the one for stress, as [+stress] is part of the context.

MARKING CONVENTION FOR STRESS (p. 34):

$$[u \text{ stress}] \longrightarrow [-\text{stress}]$$

MARKING CONVENTION FOR TONAL ACCENT:

$$[u \text{ tonal accent}] \longrightarrow [-\text{tonal accent}] \; / \; \left[\overline{\quad}_{+\text{stress}}\right]$$

Marking conventions that are context-sensitive and whose context contain features with only +'s and -'s can relate to phonological rules as linking rules. Formally, the linking relationship between a phonological rule and a marking convention is stated in the schema below:

Phonological rule: $X \longrightarrow [\alpha F] \; / \; Y \left[\overline{Q}\right] Z$

Marking convention: $[uG] \longrightarrow [\beta G] \; / \left[\overline{\begin{matrix}\alpha F \\ W\end{matrix}}\right]$

where α, β = + or -; Y, Z, Q, W may be null, and the feature G is distinct from the feature F.

The marking convention for tonal accent fulfills the conditions for applying as a linking rule. The output of the phonological stress rules is the feature [+stress] in certain columns of features, or segments. The [+stress] is part of the environment of the marking convention for tonal accent, and this marking convention relates to the stress rules by automatically interpreting the tonal accent feature as well. Once a segment has been assigned [+stress], it is also assigned [-tonal accent] at no cost for the grammar. We thus need only one rule of tonal accent assignment that changes the - to a + in the context where the stressed segment is the first stressed segment in the string under consideration and more vowels follow.

TONAL ACCENT RULE:

$$[\text{-tonal accent}] \longrightarrow [\text{+tonal accent}] \;/\; \underset{\text{NAVAdv}}{\#}\; C_0 \left[\overline{\text{+stress}}\right] \ldots V \ldots$$

The [-tonal accent] is assigned at no cost in the grammar. The marked case, [+tonal accent] is assigned at the cost of a phonological rule. By use of the marking convention for tonal accent as a linking rule the dependency relationship is naturally stated. Accent II is assigned to the first stressed vowel of the examples on the bottom of page 5. Although the examples ending in -el, -er, -en (2b and 4 on p. 3) phonetically contain more than one vowel they are not assigned accent II as their base forms are monosyllabic and we order the rules so that stress- and tonal accentassignment apply before the epenthetic vowel-insertion (cf. p 19).

EPENTHETIC VOWEL INSERTION:

$$\emptyset \longrightarrow [\text{ə}] \;/\; C_0VC_1 \text{ --- } \left[\begin{matrix}\text{+consonantal}\\ \text{+sonorant}\end{matrix}\right] \underset{\text{NAVAdv}}{\#}$$

The [+sonorant] feature includes liquids and nasals as a class. The [+consonantal] excludes vowels.

The above rule operates also where the sonorant is a suffix and preceded by a +-boundary. Some nouns have a surface structure plural with [-ər], and yet they are accent I: lånd - länder, stád - städer, bók - böcker, gét - gétter. Although it does violate an alternation condition (Kiparsky 1968), the plural suffix of these nouns will be posited as /-r/. The plural suffix /-r/ is needed in any case for some nouns that end in a vowel: mö - mör, sko - skor tå - tår, ko - kor.

Swedish has another plural suffix that phonetically also is [-ər] that also derives plurals of monosyllabic accent I words. In this case the plural noun becomes an accent II word: párk - pàrker, té - tèer, smêd - smèder, vín - vîner, lärft - lärfter, märk - màrker. The plural suffix for this group will be assumed to be underlying /-er/, so although the suffix is the same phonetically for länder and parker, it will be derived from two different

sources. The /-r/ and the /-er/ have different effects with respect to accent on the word.

Similarly, the present tense suffixes for Swedish will be assumed to be only two: /-ar/ and /-r/. The phonetic form of the first one is [ar] as in hòppar, skùttar, kàllar ... The phonetic form of /-r/ is [r] when the verb stem ends in a vowel: ser, bor, når, syr..., and [ər] by later epenthetic vowel insertion when the verbstem ends in a consonant: lêker, sítter, fînner, följer... Verbs in the present tense of the latter category are thus monosyllabic at the stage when tonal accent is assigned and receive accent I. Verbs in the present tense of the former group are disyllabic and are assigned accent II. (Cf. Öhman 1965.)

Examples of derivations are given below. /1/ is to be taken as a shorthand transcription for [+stress].

$[flika]_N$

1	Stress Rule 2 aii (p. 35)
´	Linking with the marking convention for tonal accent
`	Tonal Accent Rule (p. 41)

$[portugal]_N$

1	Stress Rule 2 ai
´	Linking with the marking convention for tonal accent
`	Tonal Accent Rule

$[abore]_N$

1	Stress Rule 2 ai
´	Linking with the marking convention for tonal accent
`	Tonal Accent Rule

$[an\widebar{ʃ}vis]_N$

1	Stress Rule 2 aii
´	Linking with the marking convention for tonal accent

$[be+t\bar{a}la]_V$

1	Stress Rule 1
´	Linking with the marking convention for tonal accent

$[f\bar{o}gl]_N$

1 Stress Rule 2 bii
Linking with the marking convention for tonal accent

$[f\bar{o}gl+ar]_N$

1 Stress Rule 2 aii
Linking with the marking convention for tonal accent
Tonal Accent Rule

$[prod\text{ɛ}kt]_N$

1 Stress Rule 2 bii
Linking with the marking convention for tonal accent

COMPOUNDS

In Swedish an indefinite number of words can be strung together to form compounds and this process is quite productive. Only the first and the last words of the compound contain a strong stress which is placed on the same vowel as when the word does not form part of compound. The first stressed vowel takes accent II, and the last stressed vowel accent I.

To derive stress and tonal accent in compounds no new rules are needed, but the rules formulated so far need restrictions or modification. The transformational cycle was rejected earlier (pp. 27, 32). It would have involved first assigning stress (and accent I by linking) to all the words in the compound and then deleting them all again except the first and last ones.

Instead of deletion of all previously assigned stresses and accents the application of the stress rules can be restricted so that stress assignment is prevented for the cases where the deletions would occur. Thus there is no longer any use for a Stress Deletion Rule (p. 35). The following condition limits the application of the stress rules (p. 35):

Condition on Stress Rules 1 and 2: When a lexical category string contains other lexical category strings within itself (i.e. a compound), apply the

the rules to the first and last inner lexical category strings only.

Only the first and last stressed vowels will then be marked [-tonal accent].

The next step erases all inner lexical brackets. It is followed by a tonal accent rule that changes the first accent I to accent II. We assume that this reflects the same process as accent II in simplex words but then the condition of the tonal accent rule on p. 35 is insufficient. It handles those compounds where the stressed vowel of the first word also is the first vowel of the word, as in stråhattmakare, flickjägare, mordkommissionsutlåtande, antikärnvapenkommitté*, vichyvattensbuteljsetikettspåklistrerska, etc. It does not handle cases where the first stressed vowel is preceded by other unstressed vowels, as in buteljsetikett, hotellspersonaldirektör, parkeringsplatsproblem, etc.

The first words of the latter group are accent I in isolation. The accent II is conditioned by the following stressed vowel that occurs in the string in compounds. Only compounds may contain two stressed vowels. The condition for accent II in simplex words is still as on p. 38: the stressed vowel is the first vowel and more unstressed vowels follow. The reformulated version of the tonal accent rule below involves a generalization that incorporates accent II assignment in compounds.

TONAL ACCENT RULE:

$$[\text{-tonal accent}] \longrightarrow [\text{+tonal accent}] \;/\; {}_{L}[\![\langle C_0 V\rangle\; C_0 \left[\overline{\overline{\text{+stress}}}\right] \ldots \left[\langle {}^{\text{+stress}}_{V}\rangle\right]$$

where ... may contain # # 's. L = any lexical category.

The rule expands into conditions a and b. The use of angled brackets permits the expression of discontinuous dependency (SPE pp 76-77). It is an if- then condition and abbreviates two expressions - "one in which all angled elements appear and another in which none of these elements appear."

$$\ldots \quad / \; {}_{L}[\![C_0 V C_0 \left[\overline{\overline{\text{+stress}}}\right] \ldots \left[{}^{\text{+stress}}_{V}\right] \qquad \text{cond. a}$$

$$\ldots \quad / \; {}_{L}[\![C_0 \left[\overline{\overline{\text{+stress}}}\right] \ldots \; V \qquad \text{cond. b}$$

* This word is actually pronounced with stress on the second syllable (Ed.).

To sum up, we now have the following rules:

1) Stress Rule 1 and Stress Rule 2 (p. 35) with a condition on application (p. 43)

2) The marking convention for tonal accent applied as a linking rule (p. 40)

3) Erase inner brackets of a string that is labelled with a lexical category.

4) Tonal Accent Rule (p. 44)

5) Laxing Rules, Epenthetic Vowel Insertion (p. 41), and other phonological rules.

Examples of derivations:

[[strō]$_N$ [hat]$_N$ [mākare]$_N$]$_N$

1 1 Stress Rule 2 bii; ai
Linking
Erase brackets

Tonal Accent Rule, cond. b

1 1
[strōhatmākare]$_N$

([[anti]$_{Prep}$ [çɛrn]$_N$ [vāpn]$_N$ [kɔmitē]$_N$]$_N$

1 1 Stress Rule 2 bi; bii
Linking
Erase brackets...
Tonal Accent Rule cond. b
ə Epenthetic Vowel Insertion

1 1
[antiçɛrnvapŋkɔmitē]$_N$) *

[[parkēriNg]$_N$ s[plats]$_N$ [prublēm]$_N$]$_N$

1 1 Stress Rule 2 bi; bii
Linking
Erase brackets...
Tonal Accent Rule cond. a

The linking s is probably inserted by rule but this will not be dealt with here. By nasal assimilation and g-deletion (above) the phonetic output is

1 1
[parkēriŋsplatsprublēm]$_N$

---

* See footnote on p. 44 (Ed.).

FOOTNOTES

1) The Swedish spoken in Finland has no opposition between tonal accents.

2) Some disyllabic words here can have either accent, for example pojke, tobak; skyffel.

3) For a definition of strong and weak clusters, see SPE p. 29: "A weak cluster is a string consisting of a simple vocalic nucleus followed by no more than one consonant; a strong cluster is a string consisting of either a vocalic nucleus followed by two or more consonants or a complex vocalic nucleus followed by any number of consonants."

4) It is still an open question for Swedish whether this auditory impression has any unique articulatory correlate in the tongue positions always being closer to the [ə]-position for lax vowels than for tense vowels.

5) Tense vowels will be transcribed as $\bar{V}$, lax vowels as V.

6) In the model we are using redundancies are stated by a set of morpheme structure conditions that state generalizations about the internal structure of the morpheme by defining the subset of possible Swedish morphemes out of a set of all possible morphemes. (Stanley 1967.)

7) More than two hundred students were asked which last consonant of minimal pairs of the type hat - hatt they perceived as the longer one, if any. The results showed that the students' performance in this task was not consistent. (Prof. G. Hammarström, personal communication.)

8) /N/ stands for a nasal archi-phoneme whose only lexical specification is the feature [+nasal].

9) The vowel alternations will not be handled in this paper.

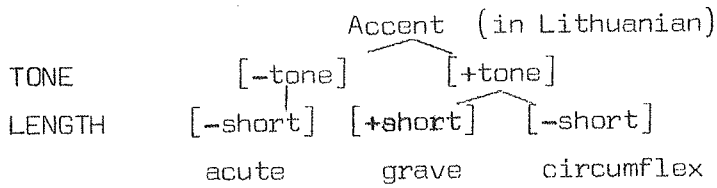
10) By Prof. Vicki Fromkin in lectures 1969 at University of California, Los Angeles.

11) These derivational processes in Swedish are an interesting study in themselves but will not be treated any further here.

12) For the concept of lexical and major categories, see Aspects p. 74.

13) Accent I would for example be assigned on the final syllable of those polysyllabic words covered by case bii of the stress rule.

14) If there is a tonal command it is concomitant with [+short] or [-short]. If there is no tonal command it implies [-short]. (Björn Jernudd, ref. 1968, and personal communication):



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