STRESS IN ENGLISH WORDS

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Summary

This study of *Stress in English Words* seeks to demonstrate that the categories of English word-stress, which are best determined by reference to the Rhythm Patterns of English words, exhibit a high degree of correlation with vowel quality and that their distributional relationships in words can be stated in terms of a few, relatively simple, general principles. In this first half of the study the general thesis is discussed (Chapters I, II and III) and the data, supporting this thesis, are given in respect of Pre-Tonic Rhythmic Stress Patterns (Chapter IV). In the concluding half, which is to appear in LINGUA, Volume VI, 4, the data in respect of Post-Tonic Rhythmic Stress Patterns are set forward (Chapter V), the status of each Rhythmic Stress Pattern is determined (Chapter VI) and the Distributional Relationships of Stress Categories, implicit in the data given in Chapters IV and V, are summarized (Chapter VII).

I. INTRODUCTION

1. In recent years increasing attention has been devoted to that complex linguistic problem of stress in English words. Such investigations as have so far been carried out, and especially in America, are usually concerned with the establishment of stress phonemes which are then handled in one of two different ways. For some linguists the stress phonemes are an essential prerequisite for the production of a restricted vowel phoneme inventory. Thus Trager and Bloch, in their *Syllabic Phonemes of English* [1]), set up, with respect to their own speech, four stress phonemes, loud, reduced loud, medial and weak, in order subsequently to be able to classify all the vowel qualities found in their speech into six vowel phonemes. In so far as stress is concerned the fundamental aim of an approach such as this is to demonstrate the high degree of correlation which undoubtedly exists between stress and vowel quality in English words. For other linguists the setting-up of stress phonemes is a prelude to the study of their distributional relationships. Stanley S. Newman, for example, in his paper entitled *On the Stress System of English* [2]), distinguishes three stress phonemes, heavy, middle and weak, each having two sub-categories; his concern thereafter is to set forward the relations in distribution between his

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[1]) *Language*, Vol. 17, III, pp. 223–246.
[2]) *Word*, Vol. 2, No. 3, Dec. 1946, pp. 171–187.

three phonemes and between the two sub-categories of each phoneme.

2.   So far as we are aware, no analysis of stress in English words has yet been carried out in which both these attitudes are given equal importance. Trager and Bloch, it is true, envisage the possibility of stating the distributional relationships between stress phonemes, but no attempt is made by them to investigate the matter beyond stating that "medial stress.... is often distributed in relation to the loud stress in a fairly regular way; but there are many exceptions to this regularity" [3]). Newman on the other hand does not undertake the task of correlating vowel quality with his stress phonemes; indeed the question of vowel quality only arises for him in the differentiation of his two varieties of weak stress. It would therefore seem opportune to present a study of stress in English words in a way that allows both these aspects of stress to be given their due importance. We feel furthermore that such a study is not only opportune but indeed essential if we are to arrive at a balanced view of this subject. It seems to us that, if we can combine both aspects of English word stress into a single analysis, many of the irregularities in distribution referred to by Trager and Bloch will turn out to be not so irregular after all; and certainly with some reference to the undoubted correlation between stress and vowel quality, Newman's exposition of the distributional relationships between his heavy and middle stresses could be considerably simplified. Indeed the interplay of vowel quality and distribution features in determining strong stress placement in English words is such that only an exhaustive and simultaneous analysis of both will yield the simplest complete statement of English word stress. It is the aim of this work to attempt such an analysis.

II. STRESS AND RHYTHM

3.   Stress in English is regarded by most authorities as the force of articulation with which a syllable is uttered; it is therefore a feature of the syllable [4]) and since most, if not all [5]), syllables must have some

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[3]) *op. cit.*, p. 227.

[4]) Compare L. Hjelmslev, (*The syllable as a structural unit*, Proceedings of the Third International Congress of Phonetic Sciences, Ghent, 1935, pp. 266–272) who defines the syllable as a unit of accent placement.

[5]) E.g., the pronunciation of *Thank you* as /kkju:/ where the linguistic strong stress is to be correlated with the initial unexploded voiceless velar stop.

absolute amount of articulatory force, the distinction between stressed and unstressed syllables, to use the customary terminology, lies, not in the presence of stress in the former and its absence in the latter type of syllable, but in the fact that stressed syllables have a *greater* force of articulation than the unstressed ones which have a *weaker* articulatory force. Hence we find in all definitions of stress in English the use of some comparative term to make clear the relative nature of stress; for Bloomfield stress "consists in speaking one of these syllables louder than the other or others" [6]; Trager and Bloch look upon stress as "degrees of loudness" [7]; Pike says that stress is "a degree of intensity upon some syllable which makes it more prominent or louder than an unstressed syllable" [8]; Jones states that "stress is defined as the degree of force with which a.... syllable is uttered" [9]. In spite of fundamental differences in linguistic outlook and methods, all these authorities are agreed on the relative character of stress and all proceed from their respective definitions to establish two sharply contrasting categories of stress: strong stress associated with syllables said with a relatively strong articulatory force and weak stress associated with syllables having a relatively weak force of articulation. It is perhaps not surprising that they should agree on this dichotomy which, for the most part, is intuitively felt by all speakers, linguist and non-linguist alike. The fact is that the contrast between strong and weak stress is so marked that the need to draw a hard and fast boundary line between them rarely, if ever, arises; and for that reason, despite their undoubted relative character, strong and weak stress assume for most speakers a quasi-absolute value.

4. Most linguists however seek to carry their investigations into word stress further and to establish other degrees of stress intermediate between strong and weak; and it is here that their erstwhile unanimity disappears. Jones says that "it seems possible to distinguish up to four degrees of stress" but goes on to add that "this number is, however, rarely essential. It is often possible to manage sufficiently well

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[6] L. Bloomfield, *Language*, New York, 1933, p. 90.

[7] B. Bloch and G. L. Trager, *Outline of Linguistic Analysis*, Baltimore, 1942, p. 35.

[8] K. L. Pike, *Phonemics*, University of Michigan Publications, Ann Arbor, 1947, pp. 250 and 63.

[9] D. Jones, *Outline of English Phonetics*, Leipzig, 1949, p. 227.

with three degrees, and sometimes even two" [10]). Effectively Jones distinguishes three types of stress, adding one intermediate category, namely his secondary stress, between the strong (or primary or principal) and the weak categories. Bloch and Trager, as we have said, set up four degrees of stress, adding two categories between their strong and weak stresses. Newman has six varieties of stress which he organises into three phonemes, and basically, though more complex than Jones', Newman's system is somewhat similar to that of Jones in that they both establish one major stress category or phoneme between strong and weak.

5. It is instructive at this point to enquire why this disagreement on stress arises as soon as it is a question of differentiating stress categories intermediate between the generally accepted strong and weak classes. For this state of affairs there appear to us to be two important reasons. Firstly with the introduction of just one intermediate degree of stress, the need to establish some sort of boundary line between the various stress types becomes much more pressing. The contrast between strong stress and intermediate stress or between intermediate stress and weak stress is much smaller than that clear contrast between strong and weak stress. A speaker may instinctively feel, for example, that at a given point in an utterance the stress involved is not a weak one; and in a stress system of two classes such negative identification of the strong stress is alone sufficient. But, when the choice is between three or more degrees of stress, the elimination of one of those degrees does not in itself make positive identification possible; a further more complicated and less clearly defined contrast between at least two other stress categories has to be considered before any identification is at all possible.

6. The second reason for the disagreement among linguists on the nature and number of the intermediate types of stress is that the criterion employed in the establishment of stress categories varies from linguist to linguist. Indeed in some cases several different criteria are apparently used by the same linguist, criteria which, we are tempted to think, are not strictly consistent with the definition of stress as articulatory force. For Jones, his secondary stress before the principal stress is more important than that which occurs after

[10]) D. Jones, *The Pronunciation of English*, Cambridge University Press, 1956, p. 142.

the principal stress, and consequently in his *English Pronouncing Dictionary* [11]), the secondary stress is more consistently marked before the principal stress than after it. A careful study of all entries in EPD strongly suggests that any secondary stress found preceding a principal stress is in reality a principal stress which lacks the pitch prominence always associated with a principal stress. The word *equidistant* for example is given in EPD as either /ˈiːkwiˈdistənt/ or /ˌiːkwiˈdistənt/: in the former pronunciation the initial syllable is accorded a principal stress, indicating here a relatively high level and prominent pitch, whilst in the latter form the same syllable has a secondary stress, signifying a relatively low level and non-prominent pitch. If both versions are said normally, that is with a falling nuclear tone on the third syllable, the articulatory force of the initial syllable is clearly greater than that of the second syllable (which has weak stress) and, more important, it is weaker than that of the third syllable *in both cases*. That the initial syllable, in both pronunciations, appears to be weaker than the third is attributable, we are convinced, to the prejudicial effect that the nuclear tone, here occurring on the third syllable, can have on our judgment of stress [12]); as Newman so rightly says: "Syllables with nuclear heavy stress or 'nucleus tones' are perceived so strongly intense that all other syllables fade to an equal or nearly equal level" [13]). If, however, to overcome such prejudices, we replace the normal pitch patterns by a monotone in both pronunciations of *equidistant*, we find, not only that the stresses on the first and third syllables of /ˈiːkwiˈdistənt/ cannot be distinguished one from the other, but also that the same syllables in /ˌiːkwiˈdistənt/ likewise appear to have similar articulatory force. Thus by removing pitch differences we have obscured, if not altogether destroyed, the basic distinction between Jones' principal stress and the secondary stress occurring before the principal stress. In cases when it is shown in EPD after the principal stress, the secondary stress most often indicates, in a compound word having the nuclear tone within its

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[11]) Hereinafter referred to by the initials EPD.

[12]) Thus for example leading H. E. Palmer (*Grammar of Spoken English*, Cambridge, 1939, p. 6) to regard word stress as referring to "a syllable, in a word of more than one syllable, which is susceptible of receiving one of the four nucleus tones".

[13]) *op. cit.*, p. 178.

first element, that syllable of its second element which, if the second element is said in isolation, bears the nuclear tone; thus *school-mistress* is given as /ˈskuːlˌmistris/, the secondary stress on the second syllable indicating the nuclear syllable of the isolate *mistress*. In simple words on the other hand, this post-nuclear secondary stress is not marked: *conversely* therefore appears as /ˈkɔnvəːsli/, although in our view the stress relationship between its second and third syllables is approximately the same as that between the second and third syllables of *school-mistress*; in both cases the second syllable is more strongly stressed than the third. It is significant that, when it is shown in EPD, this post-nuclear secondary stress, like that which precedes the nuclear tone, is always associated with a non-prominent pitch [14]. Newman likewise, it seems to us, sometimes utilizes non-stress criteria to establish his stress phonemes. The phoneme of weak stress, it is true, is distinguished from the heavy and middle categories by its relatively weak articulatory force; but the differentiation between heavy and middle seems to depend predominantly upon the pitch associated with them, a prominent (nuclear or relatively high level) pitch with the former and a non-prominent (always non-nuclear and relatively low level) pitch with the latter. Indeed we are of the opinion that Newman's heavy and middle stress phonemes bear the same relation to each other and are distinguished on the same basis as Jones' principal and secondary stresses. Furthermore, the criterion used by Newman to separate the two sub-categories within each phoneme differs from phoneme to phoneme. Nuclear heavy contrasts with subordinate heavy, as we might expect from the terminology, in that the former coincides with the nuclear tone, the latter with a non-nuclear but prominent pitch — a pitch distinction therefore. The two varieties of middle stress, full and light, are apparently derived from a distinction of articulatory force, whilst the essential difference between the two types of weak stress, sonorous and pepet, is undoubtedly one of vowel quality.

7. We have gone into these matters in some detail to show how difficult it is firstly to obtain a widely acceptable hierarchy of more than two stress degrees in English and secondly to establish more than two stress categories without some reference, explicit or implicit,

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[14] Assuming a falling nuclear tone, this is a low level pitch.

to non-stress criteria such as pitch and vowel quality. The fact is that variations of articulatory force are in themselves extremely difficult to seize and most times recognition of any stress type results, not from an accurate assessment of articulatory force alone, but from the interplay of this force and other, non-stress factors. Very often, in word or in utterance, the non-stress factor which gives, or is taken to give, the strongest indication of the various stress degrees is the pitch pattern accompanying the word or utterance. Now we have already referred to the prejudicial effect that pitch pattern can have on our recognition of stress and it seems to us to be imperative that in any study of stress we should try to discover and define our categories without any reference, explicit or implicit, to pitch phenomena. In this endeavour three procedures are open to us: firstly we can eliminate pitch phenomena altogether by testing all our material said on a monotone; secondly we can minimize their effects in a study of word stress by testing the word well within the body of an utterance where the word will not coincide with the nuclear tone; thirdly we can neutralize the effects of pitch phenomena by seeking to identify our stress degrees by, and to correlate them with, other speech phenomena that have as close a relation to stress and produce as strong a linguistic effect as does pitch. It is the last of these procedures that we have adopted though at the same time all the words considered in our analysis have also been subjected to the first procedure. The second procedure we have rejected completely since the stress pattern of the isolate word is often changed to a greater or less extent as soon as the word is placed in an utterance context.

8. We believe that the degree of stress placed upon any syllable in the word or utterance can be freely determined by reference to the rhythm pattern that accompanies the word or utterance. Classe in his book on rhythm says that "The phenomenon which, by recurring at more or less regular intervals, creates what may be called.... a feeling of rhythm in speech is generally admitted to be stress" [15]). This statement clearly implies a very important point: in an utterance there are two degrees of stress, of which the stronger tends to recur at approximately equal time intervals, whilst the weaker is associated with all the syllables of the utterance which do not bear the stronger

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[15]) A. Classe, *The Rhythm of English Prose*, Oxford, 1939, p. 12.

stress thus defined. Hence the study of rhythm in any utterance not only indicates the placement of the so-called stress in that utterance but also effectively distinguishes between two categories of stress, STRONG corresponding to a strong rhythm beat and WEAK corresponding to a weak rhythm beat. In our experience consistently better results in the recognition of stress in utterances are achieved by students if they are taught to interpret stress by reference to rhythm rather than to articulatory force. Though our analysis is designed primarily for other purposes, it also seeks to show that this same technique of interpreting stress according to rhythm can be applied with equally good results to the isolate word.

9. The study of the rhythmic patterns in English words yields us the two same basic categories of stress which we have just noted in connection with the utterance, STRONG corresponding to the strong rhythm beat and WEAK corresponding to the weak rhythm beat; thus *compatibility*, for example, with rhythm pattern ᴗoᴗoᴗo [16]), has a strong stress on its second, fourth and sixth syllables and a weak stress on the remainder. We shall however find it useful to distinguish between the strong stress which in the word falls on the nuclear (that is, nuclear-tone-bearing) syllable and that which accompanies the non-nuclear syllable(s); these two types of strong stress will be referred to as TONIC STRONG and NON-TONIC STRONG. In making this distinction we are fully conscious that we are utilizing a criterion, namely pitch, which it is our expressed aim to eliminate from the study of stress; but we must emphasize that our reasons for doing so are purely practical, that at no time do the terms TONIC STRONG and NON-TONIC STRONG imply a difference in *degree* of stress and that they are always to be taken to indicate the same degree of stress associated with different pitch features. Our stress categories are then: TONIC STRONG, NON-TONIC STRONG and WEAK.

10. We must now give the reasons which prompted us to make the distinction between TONIC STRONG and NON-TONIC STRONG.

(a) Our analysis, as we have said, is designed in the first place to show the distributional relationships between the stress categories we have just established. Now if we consider the word as a whole, the

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[16]) Hereinafter o is used to indicate simultaneously a strong rhythm beat and a strong stress and ᴗ is to be understood as a weak rhythm beat and a weak stress.

statement of such relationships becomes extremely cumbersome since consideration of the word in its entirety yields very many differing rhythmic stress patterns. In order, therefore, to simplify our statement we have utilized the incidence of the TONIC STRONG stress to split the word into three constituent parts: the pre-tonic sequence, the tonic syllable bearing the TONIC STRONG stress and the post-tonic sequence. All words must have a tonic syllable; they may have one or other or both of the pre-tonic and post-tonic sequences. Nor is this procedure as arbitrary as it may first appear. Our investigations have shown that the rhythmic stress patterns in pre-tonic and post-tonic sequences present a quite remarkable symmetry and dividing the word into the above constituent parts allows us to simplify considerably our statement of the distributional relationships between our stress categories. Our analysis will then fall into two main sections: we shall consider first the stress possibilities in pre-tonic sequences and subsequently proceed to investigate post-tonic sequences. Though the TONIC STRONG stress is not specifically studied in either section, its occurrence either immediately following or preceding, is always implied in the analysis and the distribution of NON-TONIC STRONG stress and WEAK stress in either sequence is readily related to the TONIC STRONG stress.

(b) Our analysis is also designed to make clear the correlation between vowel quality and our stress categories, and our investigations have revealed that certain vowel qualities are usually associated with WEAK stress and others with STRONG stress, whether TONIC or NON-TONIC. A difficulty however arises with vowels /i/ and /u/ [17]). Though they are most often weakly stressed in pre-tonic and post-tonic sequences they are also frequently associated with TONIC STRONG stress, as for example in *civilize* and *butcher*. Now it is a well-known fact that the TONIC STRONG stress is often carried over to related words and always carried over to compound [18]) words as a NON-TONIC STRONG stress:

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[17]) All symbols used in this paper have EPD values.

[18]) Throughout the analysis of pre-tonic and post-tonic vowel sequences of two or more syllables we regard any word as COMPOUND if it can be split either into two or more complete words or into a separable prefix and a complete word, in both cases the tonic syllable occurring within the first element of the COMPOUND whether complete word or separable prefix. However, in the assessment of the stress values in monosyllabic pre-tonic sequences (para. 66a) it is necessary to extend the significance of the term COMPOUND word to include words of the type *arm-chair* in which the tonic syllable occurs within the second element.

thus *civilization* shows a NON-TONIC STRONG stress on /i/ in the initial syllable, the corresponding /i/ in the related word *civilize* having a TONIC STRONG stress; likewise we find a NON-TONIC STRONG stress on /u/ in the compound *pork-butcher*, corresponding to the TONIC STRONG stress on the same vowel in the simple word *butcher*. We have then to account for certain occurrences in pre-tonic and post-tonic sequences of /i/ and /u/ that are *not* weakly stressed. In cases typified by *civilization* the difficulty can be resolved by the PRINCIPLE OF RELATED WORDS:

> *When, in a pre-tonic sequence of three or more syllables* [19]*, all vowels or all except the last* [20]*) are of the type usually associated with* WEAK *stress, a* NON-TONIC STRONG *stress occurs on vowel* /i/ *of that syllable in the pre-tonic sequence which corresponds to the tonic syllable of* RELATED WORDS.

We must however here emphasize that this principle needs to be invoked comparatively rarely: its application is only necessary for, and has been limited to, tri-syllabic pre-tonic sequences in which the first two syllables both show /i/ and four-syllabled or longer pre-tonic sequences having /i/ in the first two or the first three syllables. In this way the contrasting stress values of pre-tonic sequence /i – i – i/ [21]) in *civilization* o‿‿ and *delineation* ‿o‿ can be clearly differentiated. In cases of the type *pork-butcher* we shall have recourse to the PRINCIPLE OF COMPOUND WORDS:

> *In a* COMPOUND WORD, *having the* TONIC STRONG *stress within its first element and a post-tonic sequence of two or more syllables, a* NON-TONIC STRONG *stress occurs on that syllable of the second element which bears the* TONIC STRONG *stress if the second element is said as a* SIMPLE WORD.

This principle is most useful in dealing with COMPOUND words the post-tonic sequence of which contains only vowels usually weakly stressed: thus, for example, the differing stress values of /u/ in post-

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[19]) Pre-tonic sequences of one or two syllables create no difficulty in this respect; compare para. 20.

[20]) i.e., that of the syllable immediately preceding the tonic syllable. We shall see that this last syllable of polysyllabic pre-tonic sequences always has WEAK stress irrespective of vowel quality.

[21]) Hereinafter vowel symbols separated by hyphens and enclosed in diagonal brackets indicate vowel sequences with or without intervening consonants, and the words *vowel sequence* are omitted.

tonic /u – ə/ of *pork-butcher* (NON-TONIC STRONG) and *ambulance* (WEAK) call for no further explanation. Very occasionally this principle is also necessary for COMPOUND words having successively in their post-tonic sequence two vowels which are usually associated with NON-TONIC STRONG stress but one of which in fact appears to have WEAK stress (see para. 93 for example) [22]). At this stage in our argument however the important point arising from both these principles is that their establishment depends entirely upon the differentiation between TONIC STRONG and NON-TONIC STRONG stress.

(c) The division of the word into its three constituent parts, pre-tonic sequence, tonic syllable and post-tonic sequence, which is made possible only by distinguishing between TONIC STRONG and NON-TONIC STRONG stress, is important in another direction. This division allows us to consider the pre-tonic sequence or the post-tonic sequence as a whole but at the same time divorced from the tonic syllable; in this way we are able to compare, rhythmically speaking, the component syllables of the pre-tonic or post-tonic sequence and thus ascertain their individual stresses, without having our judgment at all impaired by the effect of the nuclear tone associated with the tonic syllable. If, for example, we divide *conversely* into its constituent parts, tonic syllable /kɔn/, post-tonic sequence /vəːsli/ and compare the two syllables of the post-tonic sequence, it is evident that the first of these two syllables has a strong rhythm beat, and therefore a NON-TONIC STRONG stress, whilst the second bears a WEAK stress, corresponding to a weak rhythm beat. If however we consider the word *conversely* as a whole, the effect of the nuclear tone of the initial syllable is such that the two remaining syllables appear very weakly stressed in comparison and we may be tempted, on that basis, to ascribe to them both a WEAK stress, in spite of their differing rhythmic values within the post-tonic sequence. Of course this method of assessing the stress degrees in pre-tonic or post-tonic sequences by comparing their syllables each with the other but never with the tonic syllable leads

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[22]) At the outset we did seriously consider classifying SIMPLE and COMPOUND words separately but we found that no material advantage resulted from such a procedure. The vast majority of COMPOUND words behave rhythmically in much the same way as SIMPLE words in that they show a high degree of correlation between stress and vowel quality; and even if SIMPLE and COMPOUND words were treated separately something on the lines of the PRINCIPLE OF COMPOUND WORDS would still be essential.

to an obvious difficulty in the case of words with only one syllable preceding or following the tonic syllable. For such words the only possible comparison is that between the pre-tonic or post-tonic syllable and the tonic syllable, and such a comparison, owing to the association of the nuclear tone with the tonic syllable, leads to an assessment of relative stress values which at best is unreliable and at worst quite erroneous. By comparison, the second syllable (equals post-tonic sequence) of the noun *converse* is very much weaker than its initial, tonic, syllable, and for that reason, as well as by the argument that it is as weak as it can be, some may assert that this second syllable is indeed to be taken to have a WEAK stress. Yet the rhythmic treatment of the corresponding syllable in *conversely* strongly suggests that / və:s / in *converse* is not as weak as it could be and should therefore be accorded a NON-TONIC STRONG stress. In view of this difficulty, we have considered, in the initial stages of our investigation, only those words where effective comparison of non-tonic syllables is possible within any one given sequence, that is to say, words the pre-tonic or post-tonic sequence of which is at least dissyllabic. After our analysis of such words, however, we shall be able, from the general rhythmic stress behaviour of their immediate pre-tonic and post-tonic syllables and from any correlation(s) that can be made between stress and vowel quality in such syllables, to infer the rhythmic stress values that are probable in monosyllabic pre-tonic and post-tonic sequences.

(d) English is often referred to as a language in which the stress (that is, strong stress) in words is free; unlike some languages, such as French and Polish, the stress is not tied to any given position, initial syllable, penultimate syllable and the like. This we believe to be only a partial truth. The TONIC STRONG stress is unquestionably free but we believe that our analysis will show that the NON-TONIC STRONG stress is anything but free. The patterning of NON-TONIC STRONG stress and WEAK stress in pre-tonic and post-tonic sequences, viewed in conjunction with the correlations we shall make between those two stress types and vowel quality, shows quite clearly that the incidence of NON-TONIC STRONG stress is very much tied to the incidence of TONIC STRONG stress in the word. This fundamental difference in their nature, free on the one hand and bound on the other, more than justifies, it seems to us, the distinction between TONIC STRONG and NON-TONIC STRONG stress by pitch criteria.