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## Metrical tree And Metrical grid

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# **Abstract**

This research sheds light on Metrical phonology , and the main aim for this theory is to find stress for one word , word within a phrase or word with in a sentence . This theory has put to solve many problems which many theories failed to do so , like liner and SPE .

Metrical phonology consists of two parts metrical tree and metrical grid and they are laying in a hieratical way to find a stress in language passages .

# Introduction

Metrical phonology is a branch of phonological theory that is related to stress or linguistic prominence . It is first founded by Mark Liberman ( 1975 ) and developed by Liberman and Alan Prince ( 1977 ) as well as Halle and Vergnaud ( 1978 ) . Metrical phonology is so-called as it invested poetic meter in a hierarchical prosodic binary branching structure to be a domain of stress ( Hammond, 1995 ) , instead of being organized in matrix of features by SPE model , the innovative feature of this theory is that the prominence of a unit is defined in relative to other units in the same phrase . Liberman and Prince assumed the segments are organized in syllables which are the first level of their structure . In a language , stress means one syllable in a word is more prominent than others whether the word is single , compound or in a phrase . Metrical phonology holds that stress is separated from pitch accent and has phonetic effects on the realization of syllables beyond their intonation . the theory presents stress in two kinds of representation : metrical tree and metrical grid . Metrical phonology is a great challenge to Linear phonology proposed by Chomsky and Halle ( 1968 ) as in their SPE ; Chomsky and Halle presented phonological representation as re-write rule of feature with ( + , - ) values . As far as stress is concerned , their rules are sensitive to numerical values of the feature [ stress ] such as / æn.θrə.pɒl.ə.dʒi / as " 0 " refers to unstressed syllable and " 1 "

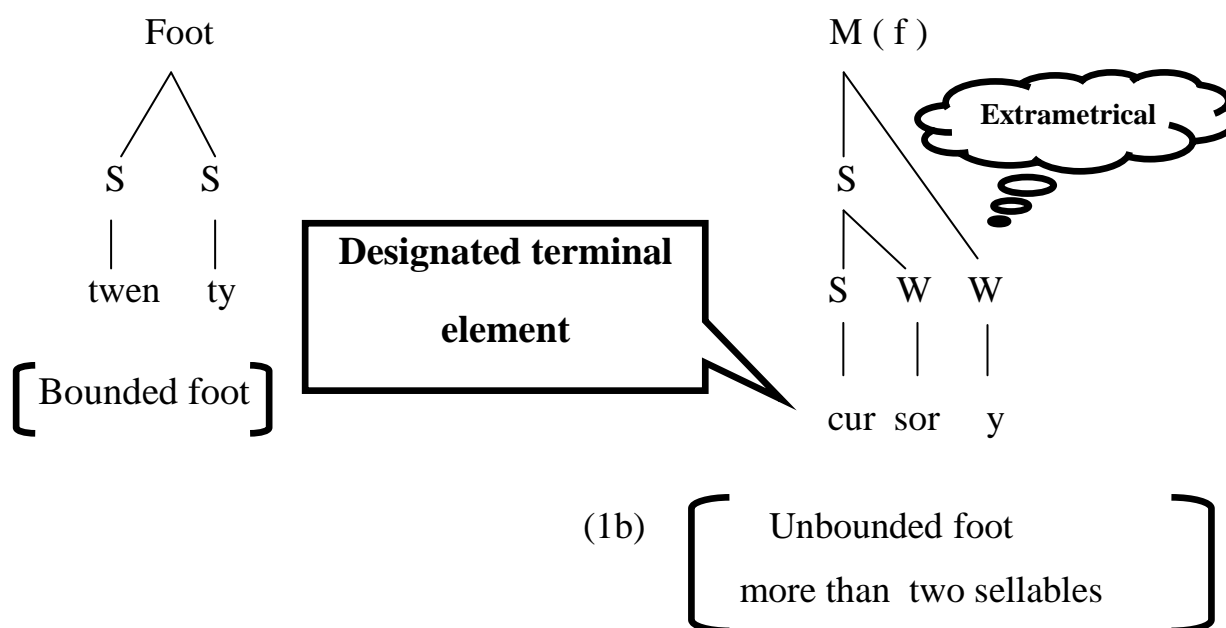
refers to Primary Stress whereas " 2 " refers to secondary stress . All even numbered syllables are elevated to primary in the following rule :  $V \rightarrow [ 1 \text{ stress} ] / - C0VC0 [ 1 \text{ stress} ]$  and the last one is the primary one in the following rule  $V \rightarrow [ 1 \text{ stress} ] / C0VC0 \#$  .

# METRICAL TREE

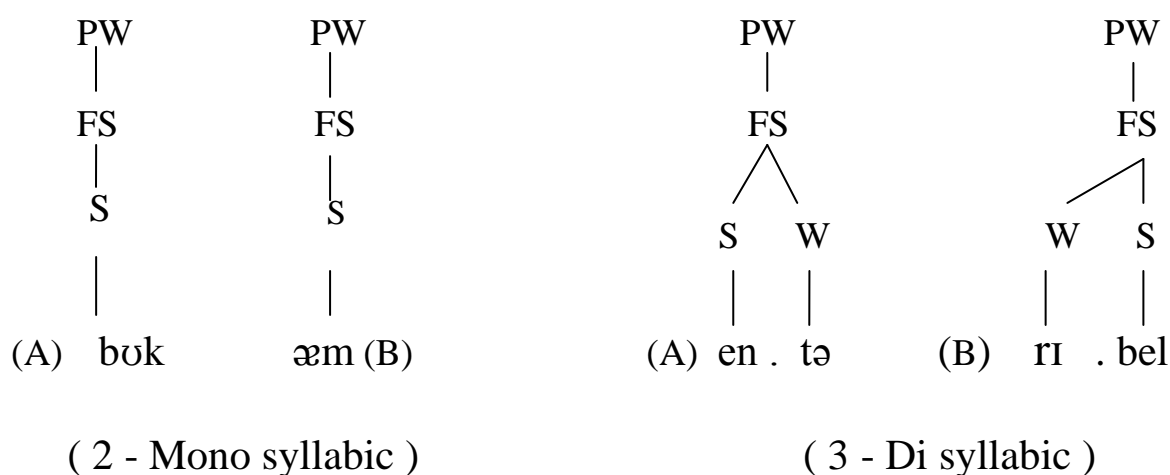
Metrical tree is a phonological hierarchy in which segments are combined together into syllables, syllables into "feet" and feet into phonological words. This internal organization in a form of binary branching trees is proposed by Liberman and Prince (1977) for representing word stress or phrase stress patterns.

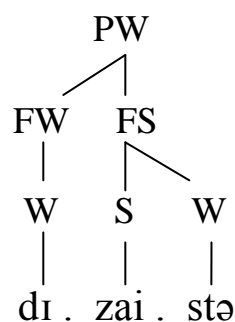
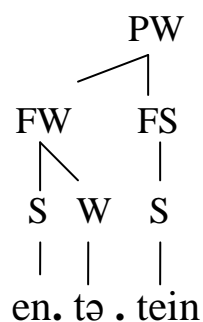
The first treatment of English stress by Liberman and Prince is stress rules. The stress rules assign two marks [ + , - ] which are put under the vowel and each one has double meaning: ( + ) for stressed or tensed vowel, while ( - ) for unstressed - lax vowel as in *Pamela*, this Perfect linking can't be maintained in general since a [ + stress ] vowel can occur in weak element of metrical foot as in *Raccoon*, in addition each single [ + stress ] followed by single or sequence of [ - stress ], is associated with left branching tree labeled ( **S** , **W** ) level of stress, syllable level; whereas right – branching structure ( **S** , **W** ) dominating syllable level represents "foot" level. Feet are two kinds; iamb and trochees each dominates two syllables. Iambic foot dominates (weak – strong) syllable, so the place of stress is on the second syllable. Whereas trochaic foot dominates (strong – weak) ones, and the place of stress is on the first syllable. The most prominent syllable in a phrase or word is the one that doesn't have any weak nodes above it, this syllable is called "the designated terminal element" as in figure (1b) below.

English foot likes right to left directionality of foot formation and it is bounded by binarity as in (1a). In on the other side unbounded foot is unlimited in number of syllables. So extra syllable considered extra metrical which is always marginal left or right, as a result it must be attached to a higher level (Kenstowics, 1994) as in (1b) below.

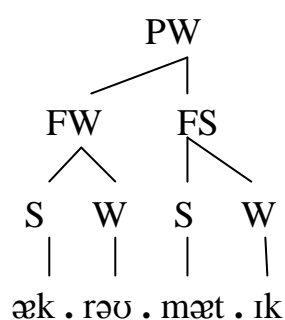
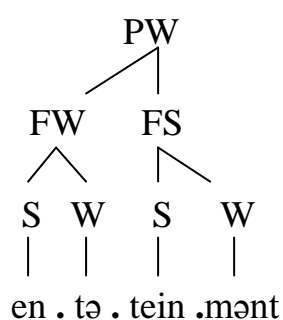


Foot is quantity sensitive as it is influenced by the syllable weight ( S , W ) , and it assigns stress to heavy syllable ( if it is found in the word ) . Metrical formulate is not only specifying the location of main stress but rather labeling every node in the tree , as a result tree diagram is built on syllable projection which is the stressed one (Gussenhoven , and Jacobs . H ) , as in the following representations of Mono , Di , Tri , Tetra syllabic words and compound words .



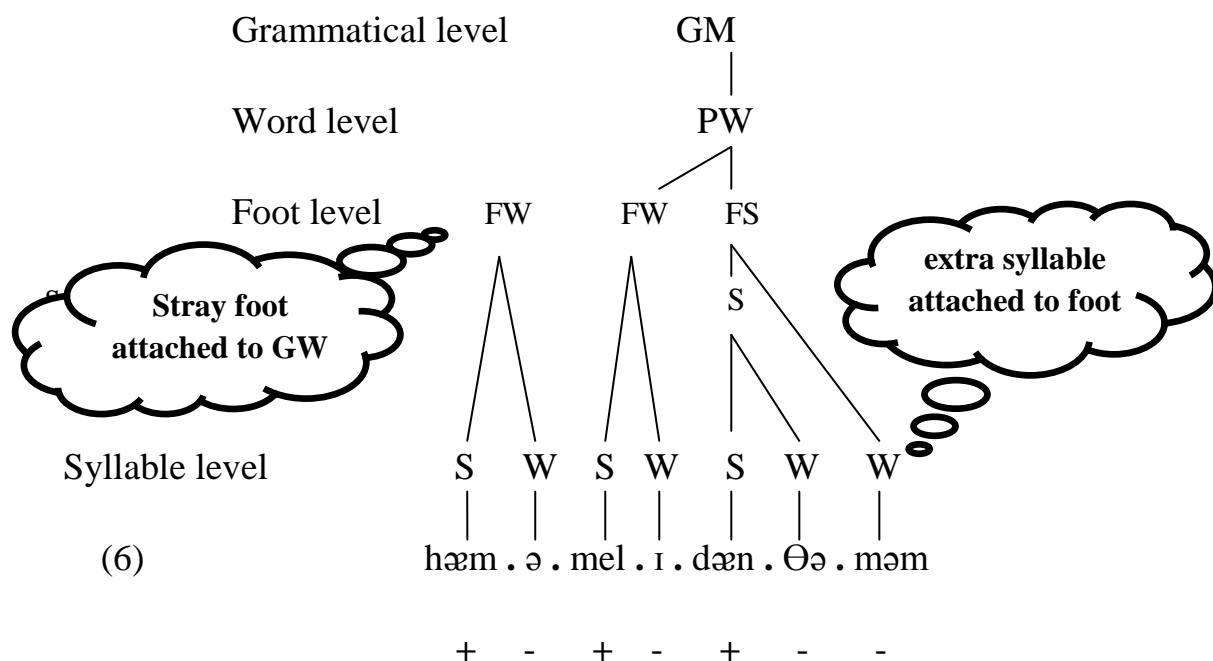


( 4 - Tri syllabic )

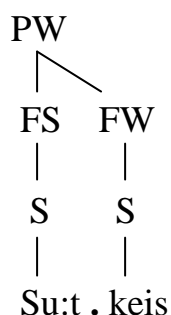


( 5 - Tetra syllabic words )

These four diagrams can be put in one word as in the following representation of the word " hamameldanthemum "

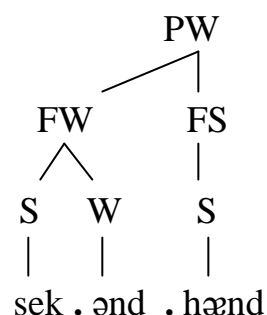


Metrical tree can be applied on compound words whether they are noun modifies noun as in ( 7 ) or adjective modifies noun as in ( 8 ) , as well as adjective modifies two nouns ; stress on the first noun must be shifted to adjective if the second begins with strong syllable as in ( 9 ) , the following representations show different metrical trees of stress .



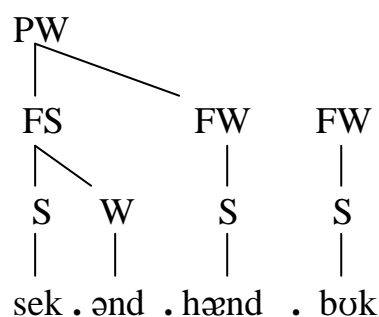
N - N

( 7 - Compound )



Adj - N

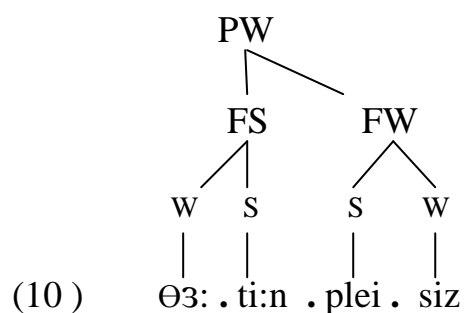
( 8 - Compound )



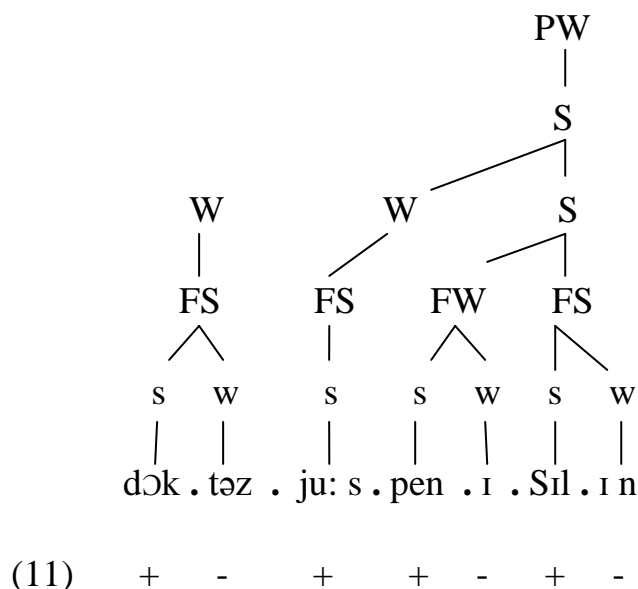
Adj - N - N

( 9 - compound )



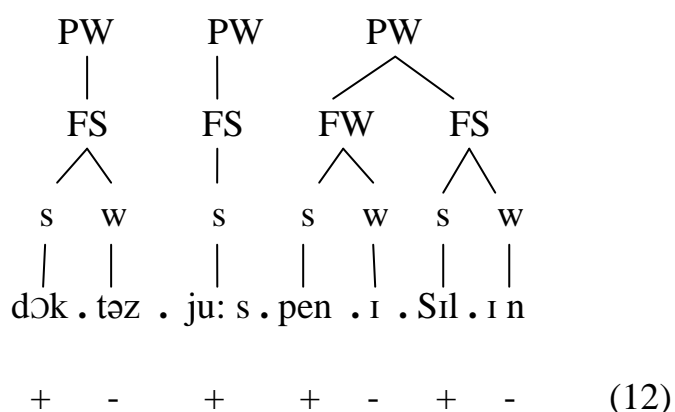


The flexible treatment of stress is one of the important points in metrical tree which enables us to change the stress pattern especially in the phrase . This can be shown in figure (11) , the tree representation of the phrase , " doctors use penicillin "



This simple phrase has broad focus on " penicillin " as it provides new information , but the matter is different when this phrase has narrow focus on the word " doctor " ; if it is used in response to the question like "who uses the penicillin ? ". The flexibility of metrical trees will appear here when the stress pattern is changed by switching sound ( W \ S ) sister nodes so the stress pattern will be on " doctor " as in (12 )

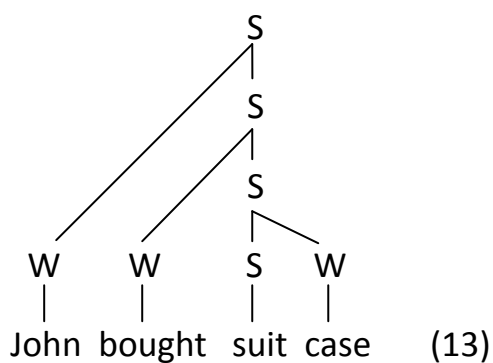




In SPE by Chomsky and Halle , syllables are dealt with separately and each one is independent from its neighbors . By interaction of compound stress rule ( CSR ) and nuclear stress rule (NSR) , Chomsky and Halle succeeded to specify primary stress in compound word separately and within the phrase such as :

John	bought	suit	case	
1	1	1	1	( syllable level )
		1	2	( CSR level )
	2	1	3	( NSR level )
2	3	1	4	( NSR level )

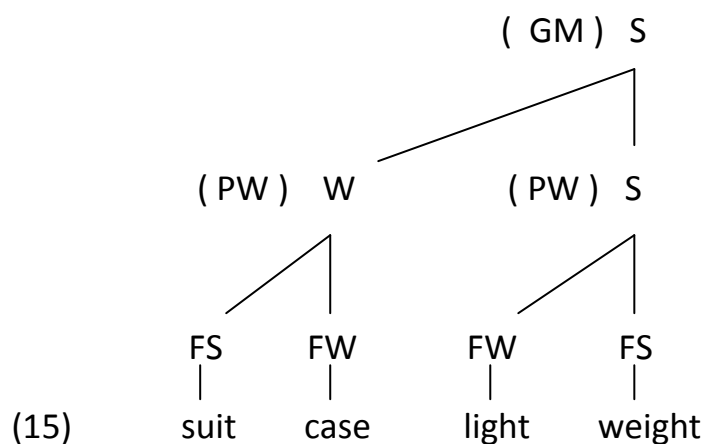
Whereas in metrical tree , compound embodied in phrase represented as follows



The problematic case of SPE model is that it failed to specify primary stress in phrase embodies in compound as rules are sensitive to numerical values of the feature [ stress ] such as :

	Suit	case	light	weight	
(14)	1	1	1	1	( syllable level )
	1	2	2	1	CSR NSR level
	*1	3	3	2	( CSR level )

First , primary stress is assigned to each word by using number 1 . Then by applying CSR on " suit case ", primary 1 is assign to the word " suit " and primary 2 to the word " case " and by applying NSR to the " light weight " primary 1 is assigned to the word " weight " and primary 2 to the word " light " , since CSR considers " light weight " ultimate and " suit case " penultimate in case it is applied finally so , penultimate is the primary 1 and ultimate is 2 , as a result stress is incorrectly specified ( Hammond , 1995 ) . Liberman and prince 's tree solves the problem as in the following representations of the same example :



# METRICAL GRID

The second phonological model in metrical theory is metrical grid , Liberman and Prince stimulate this in their discussion of the rhythm rule in English . metrical grid is partially taken from tree structure specially in its hierarchy building (from syllable level to inflectional phrase level ) as in ( 1 ) . On the other hand both structures ( tree and grid ) are related in such away to designated terminal element of an S node that must be more prominent than the designated terminal element of its sister W node ( Liberman , Mark , Prince and Alan 1977 )

### ( 1 ) The hierarchy building of of metrical grid

X  $\longrightarrow$  Inflectional phrase

$$X \longrightarrow \text{Grammatical word}$$
$$X \longrightarrow \text{Prosodic word}$$
$$X \quad X \longrightarrow \text{Foot level}$$

X X X X  $\longrightarrow$  Syllable level

The form of metrical grid represents a hierarchical representation of rhythm ( Liberman 1975 , Liberman and Prince 1977 , Prince 1988 , Selkirk 1984 ) the grid is built by using columns of marks or ticks with syllables , and these marks of grid indicate different levels of prominence or stress . Height of columns represents a syllables relative prominence as in ( 2 ) . Each position in the grid is characterized by the height of its column of grid marks that is called ( Metrical strength ) .

X → Main stress or prominence .

X → Syllables with any degree of stress .

X X X → Syllabic .

( 2 ) Pær . ə . lel

The followings diagram shows extra examples for metrical grid in Mono , Di , Tri syllabic .

X

X

bæt

( 3a - Mono syllabic )

X

X X

ek . strə

( 3b - Di syllabic )

X

X

X X X

dɪ . za: . stə

( 3C - Tri syllabic )

Halle and Vergnaud ( 1987 ) emphasized on the need of foot boundaries , they were so charmed by the return of the grid suggested in Prince ( 1983 ) , that they decided to add the foot brackets to grid and extra metricality is marked with angled brackets , rather than returning to the tree shape as in (4 )

X

X

X ( X X )

h3: . bɪ . said ( 4 )

All examples which are mentioned before show a perfect rhythmic alternation , since all strong foot – level beats are separated by weak syllable – level beat , but the matter is different in dis-rhythmic situation ( stress clash ) .

Clash is where two adjacent strong beats without an intervening of weak beat of next – lower level ( Ibed ) , In a sense word clash occurs when two adjacent marks are in two adjacent levels . Metrical grid is used when metrical tree failed to treat clash of strong syllable . To avoid this clash the rhythmic rule makes switching between the W / S of the modifiers as in ( 5 )

( 5 – four wheel drive )

X

X

X X

X X

fɔ: . wi:l ( A )

draiv ( B )

X

X X

X X X X

fɔ: . wi:l + draiv  $\neq$  fɔ: . wi:l . draiv ( C )

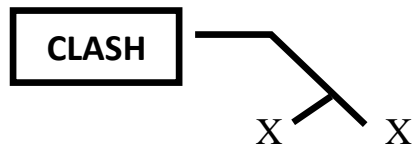
X  
X        X  
X    X    X

fɔ: . wi:l . draiv ( D )

In grid of ( 5A ) and ( 5B ) reflects a perfect rhythmic alternation , in contrast with ( 5C ) which shows ( stress clash ) , in the grid of ( 5D ) the rhythmic rule is responsible for the left word shift of stress in a modifier to avoid the clash stress .

( 6 ) Thirteen days

X	X
X    X	X
θɜ: . ti:n (A)	deiz (B)



X    X    X  
θɜ: . ti:n    deiz

Two adjacent marks  
are in two adjacent  
levels

The switching in  
modifier to avoid the  
clash

X        X  
X    X    X  
θɜ: . ti:n    deiz

# conclusion

Stress ; the great force or articulatory energy applying to an element of speech , is expressed in two tracks of metrical theory , the S / W labeling modal and grid columns model each of which exhibits independent properties . These two tracks of metrical theory have a number of advantages . Over a system they represent stress as a feature that is apply to individual segment or syllable without reference to the other syllables in phrase . Metrical phonology avoids the inexplicable difference between the stress feature and other phonological feature ( Liberman , Marks and Prince Alan 1977 ) . It also correctly predicts the ambiguity between broad and narrow focus ( Ladd , D . Robert , 1996 ) . Finally metrical phonology is consist with patterns of deaccenting in which accents can shift both left and right , this is because swapping sand W nodes ( Ladd , D . Ropert , 1980 ) .

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