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Prosodic Phonology- I: The Syllable, the Foot and the Phonological Word

Objective:

The main objective of the module is to introduce students to the theory of Prosodic Phonology- its motivation, principles and methods of analysis and illustrate them by focusing on the Syllable, the Foot and the Phonological Word.

Contents:

1. Introduction
2. Prosodic Phonology
3. General Prosodic Phonological Properties
4. Criteria for a Category
5. The Syllable
6. The Prosodic Foot

1. Introduction

‘Suprasegmental’ or prosodic phenomena are studied by two complementary theories of phonology, known as Intonational Phonology (e.g. Ladd 1996) and Prosodic Phonology (Selkirk 1984, 1986, Nespor & Vogel 1986). The difference between the two complementary theories is as follows. Intonational phonology deals with the prosodic units of the realization of the intonational structure, such as phrasal tone and nuclear tone. Prosodic Phonology deals with the phenomena of stress and rhythm as well as prosodic units as domains of phonological processes- such as lengthening and assimilation.

As each theory deals with different aspects of prosody, each has its units. The units of Intonational Phonology are, in the main, Boundary tone, Accentual tone and Nucleus. The units of Prosodic Phonology- are Syllable (σ), Phonological Word (ω), Phonological Phrase (φ), Intonational Phrase (I_p) and Utterance. Normally phonological analyses limit themselves to the I_p . As an illustration of the difference between the two theories look at the phonological representations between them in (1) and (2). (1) is an intonational phonological representation of a sentence, while (2) is a prosodic phonological representation of another sentence.

(1)

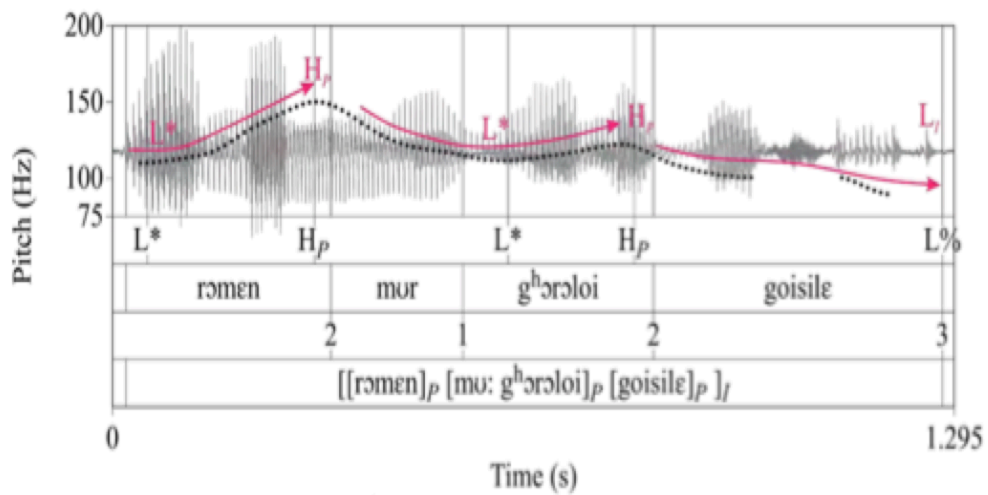
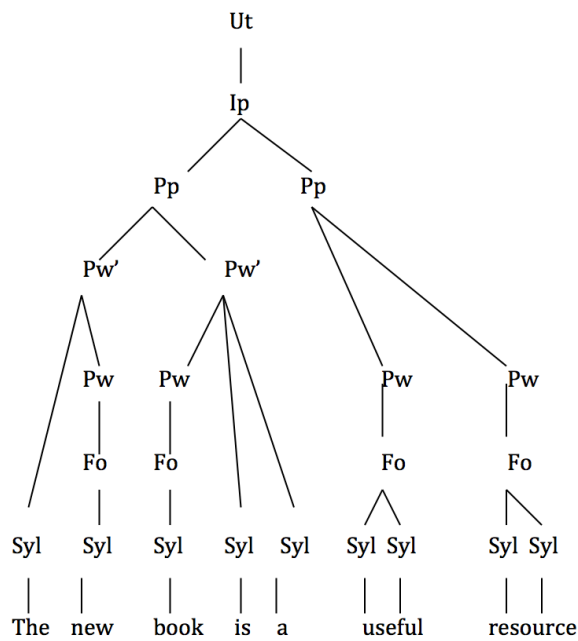


Fig./1: An Intonational Phonological representation of an Assamese sentence
 /rømen mør ghørøloi goisile/ 'Romen had gone to my house'
 (Twaha 2017)

Some other types of intonational phonological representation will be discussed in the following module.

(2)



2. Prosodic Phonology

Prosodic Phonology as we know it today is widely accepted as a theory of phonology that explains the phenomena of stress and rhythm as well as the application of several types of phonological processes referring to higher level domains. In the previous modules on the Syllable (Module 12), the Foot and the Word (Modules 13, 14), we saw how some phonological processes must be stated in reference to these categories. More recent studies on the topic include Wheeldon and Lahiri (2002), Nespor and Vogel (2007), Jun (2007) and Christophe et al. (2008), among others. Féry (2017) is a comprehensive summary of research in this area.

2.1 A brief history

Standard Generative Phonology

There are considerable analytical problems regarding the suprasegmental phenomena of tone and stress in terms of non-linear phonological representations.

In module 8 on an introduction to non-linear phonology, it was discussed how the standard way in which stress was described in generative phonology in the form of linearly arranged sequences of vowel and consonant segments was problematic in terms of its complexity in accounting for a complex stress system as English, as pointed out by Sommerstein (1977: 138) in relation to the following rule in (Chomsky & Halle 1968)

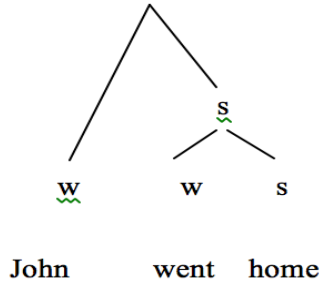
(3)

$$V \rightarrow [+stress] / _ (C_0 \left(\begin{array}{c} V \\ [-tense] \end{array} \right) \left\{ \begin{array}{c} C_0^1 \\ [-son] \left\{ \begin{array}{c} + cons \\ + son \\ -nas \end{array} \right\} \end{array} \right\}) V C_0 \#$$

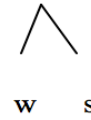
Considering the complexity of the rule in (3), a non-linear sub-theory of phonology known as Metrical Phonology (see Liberman 1975, Liberman & Prince 1977, Selkirk 1982, Hayes 1981, 1995) was proposed in order to account for stress and rhythm. It came to be shown that stress is best seen as relative prominence between syllables and words.

(4)

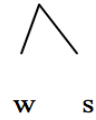
(a) ²John ³went ¹home



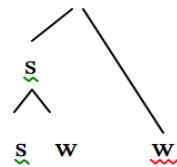
(b) (i) de'fer



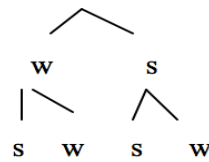
(ii) 'differ



'adver tise

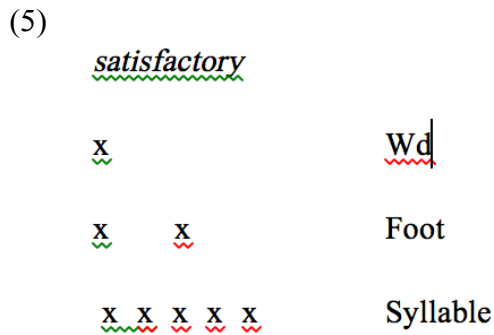


'satis 'factory



(4) shows that the prosodic structure of sentences and words is hierarchical, with parts that are in constitute-constituent relationship. Stress in words and sentences depends on the relationship of strong versus weak constituents, labelled **s w** or **w s**, for short.

A critical contribution to the theory of Metrical Phonology was the introduction of the Foot between the Syllable and the Word, as the unit of stress in words (Selkirk 1982). Module 13 went into the details of the structure and types of the Foot in world languages. A step further in the development of the theory of Metrical Phonology was the notion of the grid structure (Lieberman 1975, Prince 1983)1995), that is easily translated from the tree structure, as shown in Module 14 (Section 5). Further works, including Prince (1976a), Hammond (1984a) and Halle and Vergnaud (1987b) laid the grounds for a grid-based theory of stress in Hayes (1995). The grid representation of the word *satisfactory* is presented in (5). Its tree structure can be seen in (4).



2.2 Prosodic Phonology

Prosodic Phonology incorporates the categories the syllable, the foot and word into a general theory with larger constituents- the phonological phrase and the Intonational Phrase

The essential claim of the theory of prosodic phonology, as can be inferred from (2), is that phonological structure is hierarchical in nature. There are two views regarding the relation between this structure and syntax, namely, **Direct Mapping Hypothesis** or Direct Reference Hypothesis and **Indirect Mapping Hypothesis** or Indirect Reference Hypothesis. The Direct Mapping Hypothesis (e.g. Fry 1955, Lieberman 1967, Kaisse 1985, Odden 1990)

“...assumes a direct relation between acoustic events on the one hand and morphosyntax and semantics on the other hand, without being mediated by phonology and prosodic domains. In the direct approach to intonation, pitch accents and boundary tones are directly mapped to syntactic or semantic constituents. In this conception of intonation, sets of acoustic features correlate with specific functional roles.” (Féry 2017:35)

The Indirect Mapping Hypothesis (see e.g. Liberman 1978, Inkelas & Zec 1990, Selkirk 1984, Nespor & Vogel 1986, Gussenhoven 2004; Féry 2011, Truckenbrodt 2016), in the words of Fery (2017:35):

“...conceives of the relationship between acoustics and meaning as being mediated by phonology, and in the case of intonation, by prosodic constituency and tonal grammar. From this perspective, intonational components are related to linguistic expressions organized in prosodic constituents.”

Prosodic Phonology posits the following prosodic categories that are hierarchically organized- Syllable (σ), Foot (Σ), Phonological Word (ω), Phonological Phrase (φ), Intonational Phrase (I_p) and Utterance. For some phonological analyses, other

The grid representation of the sentence 'The new book is a useful resource'

(7) shows grids for 9 syllables, 4 feet, 4 phonological words, 2 phonological phrases and 1 intonational phrase. The last syllable –*source* of the word *resource*, being the most prominent syllable represented at the Ip level, bears the Nuclear tone in the sentence said with a neutral context or in an All-New-Sentence. (You should note that prominence in a sentence could be placed on any word, especially a content word. For example, you could make *new* or *book* or *useful* as the most prominent word. However, the placement of prominence on these words presumes a context such *not old* or *not the movie* or *not useless*, etc. The prominence on the last content word, *resource*, is placed which is all-new or for which there is not context to be presumed. We will discuss this topic again later in this module.) The Ip contains 2 Pps- (i) *the new book is a*, and (ii) *useful resource*. Both the Pps contain 2 Pwords each- (i)- (a) *the new*, (b) *book is a*, and (ii) (a) *useful* and (b) *resource*. (7) is a grid-based representation of the hierarchical tree structure in (2). Both the representations are raised from the stress pattern shown in (8):

(8) The 'new 'book is a 'useful re'source

The most prominent syllable in (8) has been underlined. The nuclear stress in the sentence has been placed following a general rule in English (see Chomsky & Halle 1968). We discuss it later in this module. The Pwords in the first Pphrase show that they are not equivalent to syntactic words. They include in them the syntactic words as well as the unstressed function words- *the, is, a-* that are normally not stressed. At the lower level- the syllable structure of the function words 'is a' , *i-sa (/i-zə/)*, is different from their syntactic arrangement.

While languages may vary with regard to the construction of prosodic categories, such as whether to admit a Minor Phrase or an Accentual Phrase in it, it is a widely accepted assumption that prosodic hierarchy is universal. We will look at some variation in prosodic phrasing in the following module.

Exercise

Following the discussion above, raise tree structures and metrical grid structures for the following English sentences:

i. All the boys returned to class after the game.

ii. 'John 'treats the 'children 'like his 'own.

3. General Prosodic Phonological Principles

The hierarchical prosodic units are governed by a general principle of prosodic domination called Strict Layer Hypothesis (SLH). SLH has two main ingredients, namely, Layeredness and Headedness, that are inviolable.

Nespor and Vogel propose the following general principles with respect to prosodic trees (9):

(9)

Principle 1. A given non-terminal unit of the prosodic hierarchy, X^P , is composed of one or more units of the immediately lower category, X^{P-1} .

Principle 2. A unit of a given level of the hierarchy is exhaustively contained in the superordinate unit of which it is a part.

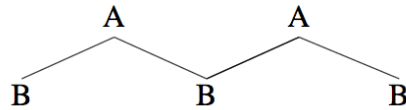
Selkirk (1984) called them Strict Layer Hypothesis. Principle 1 means that a higher level unit immediately dominates a lower level unit (Layeredness), for example, a φ dominates a Σ . Principle 2 means that a lower level unit cannot dominate a higher level unit (Headedness). SLH as a whole reads that "...a prosodic constituent of level C^+ immediately dominates only the constituent of the next level down in the prosodic hierarchy C^{+1} ." (Selkirk 1995a:443).

There are two other components of SLH, namely, Exhaustiveness and Non-recursivity. Exhaustiveness requires that a higher level unit does not immediately dominate a unit lower than its immediate constituent, for example, a ω cannot immediately dominate a σ . Non-recursivity requires that a prosodic unit of a certain level cannot dominate a prosodic unit of the same level, for example, a Σ cannot dominate another Σ . Both Exhaustiveness and Non-recursivity have been found to be acceptable in their weak form, in which they are violable. Notice SLH has been reformulated as constraints in Optimality Theory (OT), along with constraints on the alignment of edges that apply to syntax-phonology mapping. We will look at them in a later module on OT.

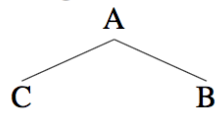
SLH rules out certain configurations, as discussed in Ladd (1996). The structures in (10) below from Ladd (1996: 239) illustrate them.

(10)

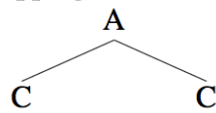
a. Multiple domination



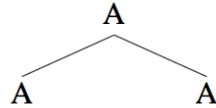
b. Heterogeneous sisters



c. Skipping of levels



d. Recursion



4. Criteria for a category

Are there any criteria for proposing a prosodic category? Nespor and Vogel argue (p. 51) that there are four types of motivation for a particular prosodic category. Each of these can be stated as a criterion

(11)

(i) *Criterion of Rule Statement*: there are rules that need to refer to the prosodic category in their formulation;

(ii) *Criterion of Domain of Rule Application*: there are rules that have it as their domain of application;

(iii) *Criterion of Phonotactic Restrictions*: it is a domain of phonotactic restrictions;

(iv) *Criterion of Prominence Relations*: it is the bearer of prominence relations.

All these types of motivation apply to prosodic categories between the syllable and the Utterance levels.

In the remainder of the present and the following modules, we take up each of the prosodic categories for discussion and justification for why phonological theory needs them. We begin with the syllable.

5. The Syllable

Earlier modules, a module (Module 12) in the present course and Module 22 in the course on Introduction to Phonetics and Phonology, have dealt with the syllable in terms of both processes within the domain of the syllable and the structure of the syllable. As such we will not go into the details of justifying the syllable as prosodic category. Note, however, the following as examples of the criteria of the motivation for the syllable:

(a) *Rule Statement*: A rule such as /l/- velarization in English (Module 22) must refer to the Coda position within a syllable as a part of its environment.

English rule of /l/ velarization

/l/ in English is velarized before a consonant or at the end of words

(12)

(a) look, life, olive

(b) mill, bull, silky, building

Co
|

/l/ → [-Syll, +Cons, +son, +back, +high] _____C

Strengthening and Weakening processes

(b) *Rule Domain*: In the discussion of lexical tone and word-stress in earlier modules in the present course, we have seen that they apply within the domain of a syllable.

(c) *Phonotactic Constraints*: In the discussion of the phonotactic constraints in

languages, we find that they need to refer to the syllable. For example,

(13)

(English, see Roach 1983):

A syllable can have 2 consonants in the Onset position, with the following restrictions:

- a. The second consonant can be any C and the first is a /s/: sl-sp-, sm, etc.
- b. The first C can be any consonants and the second is one of the following: /r l w j/, e.g /kr-, pl-, dw-, pj-/ etc.

(d) *Prominence Relations*: Within Quantitative-sensitive systems, the Rime of the Syllable bears the prominence, not the Onset, in most systems.

Exercise:

(14)

Give the rules of strengthening and weakening (P2_M22) and ask if they satisfy Criterion 1 or 2.

6. The Prosodic Foot

The prosodic Foot is a unit of stress, constituted one or more syllables. The justification of the Foot in the theory is warranted by the following facts

(a) *Rule Statement*

Reduplication in Diyari

Austin (1981[2013]) presents data on a reduplication process in Diyari, an Australian language. Look at the data in (15)

(15)

- | | | | |
|----|--------|------------|-------------------|
| a. | dáka | dakadaka | ‘to pierce’ |
| | yáta | yatayata | ‘to talk’ |
| b. | káninì | kanikanini | ‘mother’s mother’ |
| | wákari | wakawakari | |

The difference between the (a) and the (b) sets of words is that in (a) the entire stem is reduplicated, whereas in (b), only a part of the stem is reduplicated. The explanation of the difference is that the process of reduplication involves a Foot. It is the word-initial Foot that is reduplicated, not the entire word.

(b) *Rule Domain*

In order to account for the Foot as a domain of rule application, it is useful to distinguish between Foot Head (Strong syllable) and Foot Tail (Weak syllable), following Harris (2000).

Look at the phenomenon of vowel reduction in English in the following sets of related words (16):

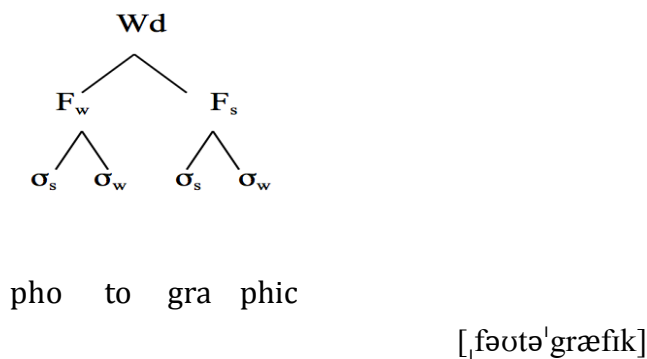
(16)

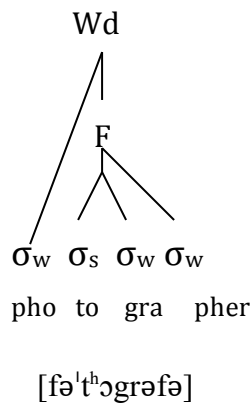
a.		b.	
	<i>history</i>		<i>historic</i>
	<i>photographic</i>		<i>photographer</i>
	<i>commandant</i>		<i>commander</i>

The related words in the two groups show that [ə] alternates with one of the following full vowels- [ɔ əʊ æ a:]. The generalization governing the alternations can be stated as follows- A vowel is reduced to schwa in the Foot Tail, but not in the Foot Head. Stated in this form, it is easy to see that the rule applies within the domain of the Foot (which has Strong and Weak syllables).

The structures of *photographer* and *photographic* are given below.

(17)





Another phenomenon that applies in the domain of a Foot is *h-Sonorantization* in Hindi.

Hindi has two variants of /h/- a spirant, clearly audible [h] and a sonorant, weakly audible or defective [ɦ]. The spirant /h/ occurs in the Foot Head, e.g. /ha:tʰi:/ [ˈha:tʰi:] ‘elephant’, /suha:na:/ [suˈha:nã:] ‘pleasant’. The sonorant [ɦ] occurs in the Foot Tail, e.g. /bəhən/ [ˈbəɦən] ‘sister’, /ʊəh/ [ʊəɦ] ‘(s)he, it’.

(c) *Phonotactics*

Two phenomena can be sighted here as phonotactic in relation to Foot structure. These relate to Foot-internal asymmetries (see Harris 2000).

One of the asymmetries is that in Quantity-sensitive systems, both long and short vowels occur in Foot Head, but only short vowels occur in Foot Tail.

The other asymmetry is that with regard to vowels in general, maximal systems are found in the Head Nucleus, and smaller, contracted systems are found in Head Tail. As we saw for English, most vowels are realized as schwa in weak syllables or in Head Tail.

(d) *Prominence Relation*: Quite obviously, Feet depend on the relative prominence of syllables. We do not need any more example of this fact than already exhaustively discussed in earlier modules (13 & 14). In fact, the notion of stress as relative prominence is at the basis of the development of Prosodic Phonology.

7. Summary

In this module we introduced ourselves to the basic issues in Prosodic Phonology- General properties, the criteria for establishing prosodic categories, the properties of the syllable and the foot meeting the criteria for establishing them as categories. In the following module, we will take a close look at the phenomena of prosodic prominence.

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