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The Basic Tenets of Generative Phonology

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Abstract
Among the various schools of phonology, generative phonology is well-known because it has become a standard theory against which most other work in phonology has been measured and evaluated. It is a branch of phonology that came to prominence with Chomsky and Halle's (1968) "Sound Pattern of English" wherein their aim is to eliminate and factor out redundancy from phonological analyses by using phonological rules. Most phonologists agree that they should share the flavor, the spirit, and the mood of generative phonology. As such, the present study aims to limelight this phonological theory through presenting a theoretical framework about this branch of phonology focusing on its emergence, its components, its distinctive tenets, the phonological theories that stemmed from it as well as some post-generative theories and frameworks.
Keywords: generative phonology, Sound Pattern of English, distinctive features, post-generative theories.

1. Generative Phonology (GP): A General Overview

Getting indulged into dealing with generative phonology, it is important first to come across the term "**generative**" and its meaning. Crystal (2008:199) states that the term generative is introduced by Noam Chomsky in his book "Syntactic Structures" (1957) to denote "the capacity of a grammar to define the set of grammatical sentences in a language". Crystal (ibid.) mentions that "there are two main branches of generative linguistics: generative phonology and generative syntax".

GP is an approach of generative linguistics whose aim is to establish a set of rules, principles or constraints efficient to produce the surface phonetic forms of a language and to model the internalized linguistic knowledge of native speakers (Chapman and Routlege, 2009:77). It was a central idea in linguistic research throughout the 1960s and although it has undergone reforms and changes in subsequent decades, it continues to be the dominant framework for many developments in phonological theory (ibid.). It is a component of generative grammar that "assigns the correct phonetic representations to utterances in such a way as to reflect a native speaker's internalized grammar" (ibid.).

This school of phonology was founded by N. Chomsky and M. Halle near the end of the 1950s. It is built on N. S. Trubetzkoy's idea of phonemic opposition and R. Jakobson's work on distinctive features. It draws on the general aspiration of generative grammar to stipulate a set of rules capable of producing all and only the surface forms of a natural language, focusing on its speech sounds (ibid.).

1.1. GP as Opposed to Structural Phonology

Chomsky and Halle (1968: 35) reject the various aspects of American structuralism (i.e., structural phonology SP) initiated by Leonard Bloomfield (1887-1949) in his 'Item and Arrangement model' and Edward Sapir (1884-1942) in his 'Item and Process Model'. An "Item and Arrangement" (IA) model, with emphasis on explicit methods of analysis, is adopted by Bloomfield and is a descriptive morphological model in which words are seen as a linear sequence of morphs; thus, a word like 'girls' is analyzed as 'girl+s' (Crystal, 2008: 246). An "Item and Process" (IP) is designed by Sapir as an alternative to IA which failed to explain irregularities in English such as 'mice' (ibid.). This model postulates an abstract phonological representation which is changed into a phonetic representation by processes that "delete, add, and change sounds" (ibid.). In this model, the relations between the words are seen as "processes of derivation", for example, the verb "made" is the product of a derivation process which changes the velar /k/ into the alveolar /d/. Similarly, the word "took" is the product of a derivation process involving vowel change (ibid.).

McCarthy (2007: 99) and Ogunsiji and Sunday (2011: 162) mention that structural phonologists regarded the phoneme as the fundamental unit of organization of sound systems, and, for them, the scientific way to establish the phonemes of a language was called phonemics. Generative phonologists, conversely, rejected the notion of phoneme and replaced it with the notion of 'underlying representation' (ibid.).

In SP, three levels of representation are recognized: (1) allophonic or phonetic, (2) phonemic, and (3) morphophonemic (ibid.). The allophonic or phonetic level offers a more or less accurate transcription of the actual speech event [$k^h æ^? ts$] (cats). At the phonemic level, only contrasting speech sounds are represented /kæts/. At the morphophonemic level, every morpheme has a unique representation //kæt-p//, where //p// is a morphophoneme that abstracts over the plural allomorphs /-s/, /-z/, /-iz/ (ibid.).

GP differs from Structural phonology in repudiating that there are separate phonemic and morphemic levels. McCarthy (2007: 99) emphasizes that Chomsky and Halle distinguished between two levels of representation:

underlying phonological level and surface phonetic level. The underlying level comprises a set of phonological rules applying to the underlying forms to yield surface phonetic representation (ibid.101).

To sum, the following figure is a generative grammar model of language:

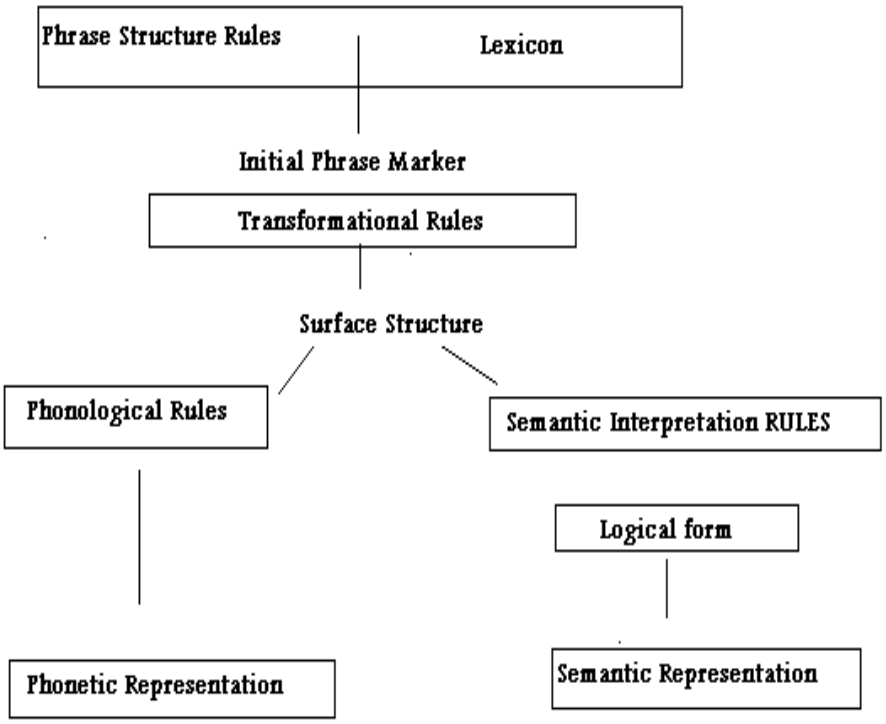

Figure (1): A Generative Grammar Model of Language (After McCarthy, 2007: 99)

1.2. GP and the Sound Pattern of English (SPE)

Ogunsiji and Sunday (2011" 163) argue that the **SPE** is the major contribution of Chomsky and Halle to phonology; it is an attempt to build a description of English phonology on a transformational generative theory of language. In it, Chomsky and Halle attempt to state explicitly the phonological rules underlying the speech sounds of native English speakers. Thus, it is regarded as the defining text of GP which has established its standard framework that reads as follows:

"There are abstract rules determining the actual acoustic output of speech; the rules apply sequentially to produce a series of derivations resulting in an abstract representation of the phonetic representation; phonetics consists of a series of segments that could be exhaustively defined in terms of sets of binary features; the rules are strictly ordered" (Chomsky and Halle, 1968: 78) (cited in Ogunsiji and Sunday, 2011: 163).

Accordingly, phonological representations are considered as "sequences of segments made up of distinctive features.

Goldsmith and Laks (2012: 1-2) state that the use of rules and features as the elements of phonological description in GP means that the concept of phoneme is under threat. They (ibid.) contend that for generative phonologists, the phoneme is a hindrance to description; yet, this does not mean that Chomsky and Halle totally ignore the concept of phoneme; rather, they regard each phoneme as a bundle of distinctive features and incorporate Jacobson's (1942) distinctive features into their theory which regard the use of distinctive features as the centre of phonological descriptions. *Thus, the hallmark of GP is feature analysis*. Hence, each phoneme, according to this phonological model, is seen as being made up of a bundle of features rather than an irreducible contrastive unit of sound (ibid.). For example, back rounded vowels include the following distinctive features:

-Consonantal
+back
+round
+syllabic

1.3. Components of GP

The following are the essential components of GP:

1.3.1. Phonological Rules

Goldsmith (1993: 66) defines phonological rules as "mapping between two different levels of sound representation: (1) the abstract underlying level and (2) the surface level" to portray how speakers go from the abstract

representations stored in their mind to the actual sounds they articulate when they speak. Generally, phonological rules begin with the underlying representation of a sound and yield the surface form that is actually spoken (ibid.). An underlying form may have multiple surface forms; this is referred to as 'allophony', e.g., the English plural suffix may be pronounced: /s/ in books, /z/ in cars, or /əz/ in buses. "All these forms are stored mentally as the same s, but the surface pronunciations are derived through a phonological rule" (ibid.). Examples of phonological rules are the following:

1. "Intervocalic alveolar flapping" is a process through which the consonants /t/ and /d/ are changed via a rule into a quick flap consonant in words such as (butter and writer) by speakers of American English dialects (ibid.). The stop consonants /t, d/ are changed into a flap when they are preceded and followed by vowels, the first of which is stressed while the second one is unstressed (ibid.). This phonological rule is represented by the following re-write rule:

[+stop, +consonant,+alveolar]→[flap] / [+vowel,+stressed] _ [+vowel,-stressed]

2. Devoicing is an allophonic rule via which voiced consonants tend to be devoiced at the end of words (ibid.).

[+cons,+voice]→[+cons,-voice] /-#

1.3.1.1Types of Phonological Rules

Phonological rules are divided into:

a. Assimilation rules: These are rules via which a sound may alter one of its features to become more similar to a neighbouring sound (Web resource 1). This type of rule occurs in the English plural rule where the plural suffix becomes voiced or voiceless depending on whether the preceding consonant is voiced or voiceless (ibid.).

b. Deletion rules: These are rules through which a sound such as an unstressed syllable or a weak consonant may not be pronounced, e.g., most American English speakers do not pronounce [d] in (handback) (ibid.).

c. Insertion: These are rules by means of which an additional sound is inserted between two other sounds to ease their pronunciation (ibid.). For example, when the English plural morpheme (s) is added to (bus), (bus-s) would be difficult to pronounce, so a short vowel /ə/ is inserted between the two (s) to make the pronunciation of the words easy (ibid.).

1.3.1.2 Formal Properties of Generative Rules

Hayes (2009:122) mentions that Chomsky and Halle's (1968) generative rules have the following formal properties:

1. Generative rules are sequentially ordered re-writing rules (i.e. rules which "change or transform one symbol into another" (ibid.).
2. Generative rules "apply sequentially, that is, one after another, rather than applying simultaneously": this means that each rule creates as its output a new intermediate level of representation which serves as the input to the next rule (ibid.).

1.3.2. Levels of Phonological Representation

GP postulates two levels of phonological representation: "a phonological underlying representation and a phonetic surface representation" (Web source 2). The underlying representation is "the most basic form of a word before any phonological rules have been applied to it". It refers to the abstract underlying phonology of the language. A phonetic representation, on the other hand, is the form of the word that is spoken and heard (ibid.).

Chomsky and Halle (1968: 78) suggest that there is no phonemic level intervening between Sapir's phonological and phonetic representations. They (ibid.) aim to discover rules that alter phonological representations to phonetic ones

1.3.3. Derivation

A phonological derivation is "the set of stages used to generate the phonetic representation of a word from its underlying representation" (Web source 3). The following is a diagram and an example representing the stages of a derivation, wherein phonological rules influence each stage of a derivation:

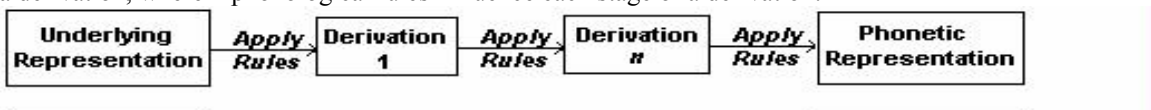

Figure (2): Stages of a Derivation in GP (Adopted from Web Source 3)

Word……. **impossible**

↓

Underlying representation…… /im/ /pasəbəl/

↓

Assimilation …… /impasabəl/

(derivation 1) ↓

Aspiration……. /imp^hasəbəl/

(derivation 2) ↓

Phonetic representation……. [imp^hasəbəl]

1.3.4. Linearity

A stream of speech is described as "a sequence of discrete sound segments" (Web source 1). Kenstowicz and Kisseberth (1979:77) state that each segment in a generative model consists of a linear bundle of features known as distinctive features.

1.3.5. Distinctive Features (DFs)

According to Chomsky and Halle (1968: 34), speech sounds are portrayed as "bundles of plus-or-minus valued features". Gussenhoven and Jacobs (2005: 65) state that distinctive features are "the smallest units of linguistic structure from which larger units are built"; they are sometimes seen as "attributes by which phonemes can differ".

In a prior attempt, Jensen (2004: 79-80) has mentioned that segments are composed of features; these features play fundamental rules. They are used to indicate how segments contrast with each other and what groups of segments natural classes have in common (ibid.).

The theory of DFs was first developed by Jacobson (1941) who was considered the father of the theory which has later become the standard model in Chomsky and Halle's SPE (ibid.). All Jacobson's features were equipollent, with two values, each characterizing a definite property (e.g., nasal/oral, tense/lax) (ibid.).

Ogunsiji and Sunday (2011: 156) state that generative phonologists have adopted Jacobson's theory of binary DFs, but they have refined them using principally articulatory definition. They have also reinforced the binary nature of the features using plus and minus values in underlying representations, e.g., (+/-nasal) (ibid.). The presence of a feature is indicated through the use of a positive value, whereas the absence of a feature is denoted through the use of a negative value. These features, called univalent or privative features, can only describe the classes of segments that are said to possess those features and not the classes that are without them (ibid.).

DFs, Ogunsiji and Sunday (ibid.) argue, are considered as an economical model in generative phonology allowing the possibility of writing rules using a considerably smaller number of features than the phonemes of language. They are grouped into categories according to the natural classes of segments they describe as in the following examples:

+anterior p b t d m n f v
+voiced b d g a e ð m n
+dorosal k g ŋ

Ogunsiji and Sunday (ibid.) state that in terms of DF matrices, there is a distinction between maximally specified DF matrix which includes redundancies, and minimally DF matrix which excludes all redundancies. For example:

(1)
/p/→ +obstruent, +consonantal, -continuant, -voiced
(2)
/p/→ +obstruent, +consonantal,- continuant, -voiced, -sonorant,

(1) is a minimally specified DF matrix because all redundancies are excluded, while (2) is a maximally specified DF matrix because redundancies are included: obstruents are automatically –sonorant (ibid.).

2. Classes of DFs in GP

2.1. Major Class Features

According to Katamba (1989: 35), these features represent the major classes of sounds. They are called so because they are required for dividing sounds into classes such as vowels, and consonants (ibid.). Binary oppositions of this kind, Katamba (ibid.) emphasizes, are needed for describing phonological patterns. These features include:

1. +/- Syllabic

Syllabic segments can work as the peak of a syllable, while -syllabic segments cannot. Thus, +syllabic designates vowels as well as syllabic consonants like /l,m,n/ as in 'bottle', 'cotton', 'blossom', whereas –syllabic designates all consonants including glides (ibid.43).

2. +/- Consonantal

Consonantal segments are produced with a drastic stricture in the vocal tract, while nonconsonantal segments are produced without such stricture (ibid.).

3. +/- Sonorant

Sonorants are produced with "a vocal cavity disposition which makes spontaneous voicing easy, while nonsoronants (obstruents) have a vocal cavity disposition which inhibits spontaneous voicing". Thus, +sonorant indicates vowels, nasals, and liquids. –Sonorant includes fricatives, affricates, and stops articulated with a noticeable turbulence caused by imbalance of air pressure in the vocal tract (ibid.).

2.2. Manner Features

These features characterize the way in which the airstream is obstructed in the production of a consonant (ibid. 35).

1. +/- Continuant

Continuants are produced with impeding, but not completely blocking, the airflow through the glottis, the pharynx, or the centre of the oral tract. Noncontinuants are made with completely blocking the airflow through the centre of the vocal tract. Affricates, nasals, stops, and laterals are noncontinuants. All other sounds are continuants (ibid. 36).

2. +/-Nasal

This feature refers to the position of the soft palate. +Nasal segments are produced by lowering the soft palate so that the air passes through the nasal tract. –Nasal segments are produced with the soft palate raised to make a velic closure with the nasal cavity so that the air is forced to go out of the mouth. +Nasal includes /m,n,ŋ/ ; all other sounds are –nasal (oral) (ibid.).

3. +/- Strident

Only fricatives and affricates can be strident. Acoustically, strident sounds are characterized by more random noise than their nonstrident counterparts (ibid. 37).

4. +/- Lateral

A lateral sound is produced if the airflow through the centre of the mouth is blocked and the air escapes over one or both sides of the tongue. In nonlateral sounds, the air flows out through the centre of the mouth. /l/ is an example of a lateral liquid (ibid. 38).

5. Delayed release- Instantaneous release (+/-Delayed release)

This feature is relevant to sounds articulated in the mouth cavity and differentiates stops from affricates. In producing stops, the air is released abruptly, while in producing affricates, the release is gradual. Only affricates can have the property + delayed release; all other sounds are –delayed release (ibid.).

2.3. Cavity Features

These features refer to place of articulation. They specify where in the vocal tract modifications in the airstream take place in the production of particular sounds. These features include:

1. +/-Labial

A sound is labial if the stricture is made by the two lips; if there is no such stricture, the sound is nonlabial (ibid.).

2. +/-Coronal

Coronal sounds are produced with the tip or the blade of the tongue raised towards the front teeth, the alveolar ridge, or the hard palate; for noncoronal consonants, the blade of the tongue remains in a neutral position. Dental, alveolar-palatal, and palatal are coronal.

3. +/-Anterior

In the producing anterior sounds, "the main obstruction of the airstream is at a point no farther back in the mouth than the alveolar ridge". Labials, dentals, and alveolars are anterior (ibid. 39).

2.4. Laryngeal Features

These are the features that specify the glottal states of sounds. They include:

1. +/-Voiced

Voiced sounds are produced with a vibration in the vocal folds, while voiceless ones are produced without such vibration (ibid.).

2. +/-Spread glottis

This feature indicates "the openness of the glottis". It indicates the voicelessness and aspiration of a segment. Aspiration is absent in nonspread sounds. Spread sounds include aspirated stops, voiceless vowels, and voiceless glides. All other sounds are nonspresd (ibid.).

2.5. Tongue Body Features

1. +/- High

High sounds are produced with "the tongue raised from its neutral position, while nonhigh sounds are made without such raising of the body of the tongue". High sounds include vowels like /i,u/, the glides /w,j/, and velar consonants (ibid. 40).

2. +/-Low

Low sounds are produced with the tongue depressed and lying at a level below that which it occupies when at rest in neutral position. Nonlow sounds are produced without depressing the level of the in this manner. Open vowels like /a,o/ are low (ibid.).

3. +/-Back

Sounds produced with the body of the tongue retracted from neutral position are back. Sounds produced with the body of the body of the tongue either in neutral position or pushed forward are nonback. This feature differentiates between back vowels like /o,u/ and front vowels like /a,i/ (ibid.).

2.6. Tongue Root Features

1. Tense/Lax (+/-Tense)

Tense vowels are articulated with a greater muscular effort, slightly higher tongue position, and longer duration than lax vowels. English long vowels and diphthongs are tense, while the short vowels are lax (ibid. 41).

3. Problems with SPE

Chapman and Routlege (2009: 78) state that the SPE became a standard against which most other work in phonology was measured and evaluated; yet, in the 1970s, critics started to find certain problems with some of its basic assumptions. For example, its focus on abstract phonological rules rather than concrete phonetic ones, and the formal complexity of many of its proposals became "stumbling blocks" for many linguists (ibid.). These criticisms led to the development of natural generative phonology which tried to set up rules that were more plausible than those of the SPE (ibid.).

4. Theories Stemmed from GP

4.1. Natural Generative Phonology (NGP)

Clark and Yallop (1995: **66**) argue that NGP has emerged from a number of papers by Venneman in the early 1970s and is most comprehensively expounded by Hooper in her book "An Introduction to Natural Generative Phonology" (1976).

On his part, Hooper (1976: 151) mentions that NGP is a derivational approach which is similar to GP introduced by the SPE. The proponents of NGP do not claim to depart radically from the mainstream of GP; they describe their school as "based in part on transformational generative theory as developed since the mid 1950s". However, NGP is quite radical in its attack on abstractness (ibid.). Roca and Johoson (1999: **112**) argue that Venneman has proposed to rule out any underlying form that is not identical to a surface form and prohibit rule ordering. Hooper abandons abstract underlying form; she suggests that within NGP, rules and representations are directly related to surface forms and that phonological analysis is more concrete and more realistic than in SPE (ibid.). In other words, the major claim of NGP is that "speakers construct only generalizations that are surface true" (ibid.).

The differences between GP and NGP can be summarized in the following table:

Table (1): The Differences between GP and NGP

GP	NGP
Rules are strictly ordered	It abandons rule ordering
There are abstract rules determining the actual acoustic output of speech	It is radical in its attack on abstractness
Rules are regarded as a way to generate surface forms	Rules are regarded as generalizations to surface forms (rules and representations are directly related to surface forms
	The phonological analysis is more concrete and realistic than in SPE.

4.1.1. Rule Types in NGP

a. Phonetically Conditioned Rules (P-rules)

These are rules that are thoroughly explained in "purely phonetic terms, that is, phonological features and phonological boundaries (syllable boundaries, pause boundaries)" (Venneman, 1974: 87). P-rules are "automatic and have no exceptions" (e.g., the rule aspirating syllable initial voiceless stops in English); they are equivalent to the "natural processes of natural phonology" (ibid.).

b. Morphophonemic Rules (MP- rules)

These rules refer to "morphological or syntactic categories, to arbitrary lexical categories or to word or morpheme boundaries". The rule voicing fricatives in certain English plurals (e.g., wife-wives) is an example of MP-rule which contains both lexical and morphological information. This rule applies to a small class of nouns and it applies only in the plural" (ibid.).

c. Via Rules

Venneman (ibid. 77) suggests that "a correct account of the synchronic residue of the Great Vowel Shift of English, for example, is a via rule. Accordingly, ser[i:]ne and ser[ə]nity would not be derived from the same underlying form as proposed in SPE, rather the underlying forms would be essentially identical to the phonetic forms and the lexical entries for both items would be marked to indicate that they are related to each other by a via rule" (ibid.).

i:→ə

Therefore, it would be possible for an individual speaker to "perceive a relationship between **serene** and **serenity**, but to fail to see a relationship between **obscene** and **obscenity**. In this case, the former pair would be lexically marked as related by the via rule, whereas the latter pair would not" (ibid.).

4.1.2. An Example of NGP

In German, word final devoicing is regarded as a classic case of neutralization process; similarly, it is perfectly acceptable as a rule in NGP since it expresses a true generalization: all word final obstruents are voiceless (Roca and Johoson, 1999: **112**).

a.	ta[k]	day	b. ta[g]e	days
	lei[t]	sorry	lei[d]en	to suffer

Voiced obstruents become voiceless when they occur at word final position (ibid.).

4.2. Natural Phonology (NP)

Donegan (2002: 64) states that NP is a theory proposed by Stampe in the mid 1970s. He (ibid.) contends that phonology, according to Stampe, is "based on innate constraints that are either active or suppressed based on a specific language".

Donegan (ibid.) adds that NP emphasizes the importance of natural processes which are defined as a set of universal rules that govern the phonology of a language; these rules are considered natural because they are phonetically plausible. Moreover, they are considered innate because they represent "the constraints which a child has to follow when learning a language" (ibid.).

Natural phonologists, as Donegan (ibid.) puts it, have proposed the term process to refer to a natural phonetic constraint, i.e., a "constraint which simplifies articulation". Accordingly, phonology is based on "a set of universal phonological processes which interact with one another; which ones are active and which are suppressed is language specific" (ibid.).

Naturalness, according to Donegan (ibid.), can be approached in terms of markedness: what is natural can be said to be unmarked, and what is not natural can be said to be marked.

5. Post-Generative Theories and Frameworks

Chapman and Routlege (2009: 77) manifest that major post generative ideas in phonology have generally been extensions of GP or objections/reactions to certain aspect of it. These theories and frameworks include the following:

5.1. Autosegmental Phonology (AP)

Chapman and Routlege (ibid.) argue that AP is an approach to phonology proposed by John Goldsmith in 1976 and was originally used to describe tone in tone languages. Then, it was expanded to deal with features which extend over more than one segment, especially vowel and consonant harmony (ibid.). Goldsmith (1976: 33-4), in a prior work, has mentioned that autosegmental phonology sees phonology as consisting of several tiers; each tier comprises a linear arrangement of segments which are linked to each other by association lines indicating how they are to be coarticulated.

This theory has similarities to and a difference from GP. These are as follows:

(1) Similarities

- It is a linear theory (in which each tier consists of a linear arrangement of segments linked to each other by association lines).
- It shares the assumption that we have an internal grammar and phonology is an attempt to represent the abstract constructs.
- It makes use of features. Different features may be placed on separate tiers.

(2) Difference

- The difference from GP is represented by the fact that AP goes beyond the place and manner of articulation and focuses on tone and vowel and consonant harmony.

5.2. Metrical Phonology (MP)

Hayes (1980: 66) states that MP is a phonological theory developed by Liberman (1974) and Liberman and Prince (1977) to handle stress phenomena and to complement autosegmental phonology which was first designed for the description of tone and later used to account for other aspects of phonology.

Within MP, phonological strings are presented in a hierarchical manner using such notions as segment, syllable, foot, and word (ibid.). Segments are organized into syllables, syllables into feet, feet into words, and words into larger units. This organization is represented by metrical trees (ibid.).

What is crucial in MP is the fact that a stressed syllable is more prominent than an unstressed syllable. Prominence, here, is expressed using "binary branching trees labeled strong (s) and weak (w)" wherein strong refers to the prominent syllable, while weak refers to the less prominent syllable (ibid.). For example:

milkman

milk man
(s) (w)

Giegerich (1985: **65**) demonstrates that MP is introduced as a direct reaction to the linear analysis of stress proposed within the SPE framework in which stress is considered as a property of individual segments (i.e. vowels). In MP, stress is seen as a relational property obtaining between constituents expressed in metrical trees. For example:

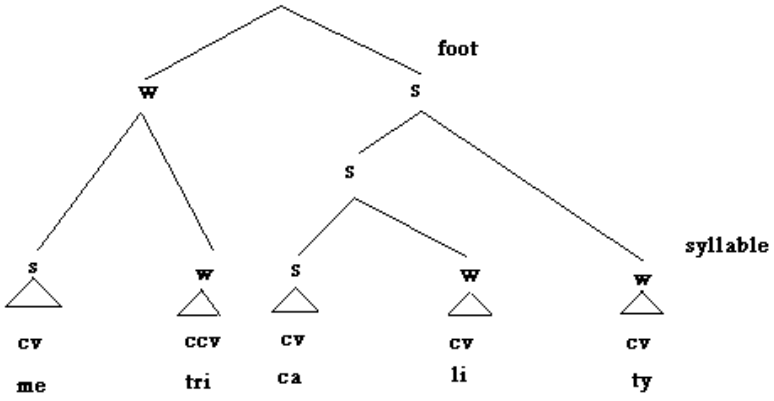

Figure (2): The Metrical Tree of the Word 'metricality' (Adopted from Web Resource 4)

5.3. Lexical Phonology (LP)

Mohanan (1986: 112) argues that LP is a theory of phonology in which "morphological and phonological rules are brought together within a single framework". It deals with the relationship among phonology, morphology, and the lexicon (ibid.). In this theory, the lexicon is given a key role; this represents a significant departure from classical models. LP, Rubach (2008: 456) asserts, is clearly generative in its style of theoretical modeling and its commitment to rule-based descriptions including the principle of cyclic rule application.

Mohanan (1986: 112) has stressed the difference between the model of phonology proposed in SPE and the model he proposes as having an intermediate level of representation in the latter. This is represented as follows:

SPE

underlying representation→ phonological rules→ phonetic representation

LP

underlying representation phonetic representation
↓ ↑
phonological rules→ lexical representation→ phonological rules

Although LP is an extension of GP, yet, there are some differences between the two theories. These differences can be stated as follows:

1. LP differs from GP in adding lexical representation as an additional level (Mohanan,1986: 112-3).
2. LP is a theory of phonology in which morphological rules and phonological rules are brought together within a single framework that is why it is called morphophonology, whereas GP does not give morphology any formal place (ibid.)

5.4. Optimality Theory (OT)

Kenstowicz (1994: 142-4) and McCarthy (2002: 1) state that OT is a theory developed around 1990 by Prince and Smolensk and is initially applied to phonology, and then became applicable to topics in morphology and syntax. The core of OT is the assumption that linguistic generalizations should be described by using a set of constraints on surface representations which are ranked in term of their importance (ibid.).

OT is regarded as a development of GP so it maintains the basic distinction between underlying and surface levels of representation. Although, there are similarities and differences between OT and GP, OT can be considered as a drastic development in the general theory of generative grammar (ibid.). The comparison between OT and GP can be summed up in the following points:

1. Both models admit universality in language and phonology in particular. OT maintains that constraints are universal (ibid.).
2. Both models maintain the basic distinction between underlying and surface levels of representation. (Such levels are expressed in terms of input and output in OT) (ibid.).
3. GP is a rule-based model, whereas OT is constraint-based model.

McCarthy (2007: 4) illustrates that the basics of OT are: generator (GEN), evaluator (EVAL), and constraint (CON). GEN takes some input as its argument and produces a set of candidates for evaluation. CON(s) are universal and fixed across languages. Yet, different languages impose different rankings on the elements of CON. EVAL selects the optimal candidate from the forms given by GEN. it contains the set of ranked constraints which evaluates output candidates (ibid.). Accordingly, the basic architecture of OT is illustrated in the following figure below:

input→GEN→candidates→EVAL→output

McCarthy (ibid.) contends that the GEN is capable of generating an infinite number of candidates; the EVAL selects the most optimal candidate (i.e., the candidate which violates the least number of high ranked constraints); Constraints are of two main kinds: faithfulness and markedness constraints. The former ensure that output representations resemble input representations, while the latter require that output forms be unmarked (ibid.).

6. Conclusions

On the basis of what has been presented and discussed throughout this study, the following conclusions can be set out:

1. GP is an influential phonological theory based on rules that change abstract phonological representations into concrete phonetic representations.
2. The basic components of GP are:
   (a) Phonological rules that map between two different levels of sound representation to yield the surface form that is actually spoken. Phonological rules are either assimilation rules, deletion rules, or insertion rules.
   (b) Two levels of phonological representation: an underlying level (the basic form of the word before any phonological rule has been applied for it) and a surface form (the form of the word that is spoken or written).
   (c) Stages of derivation are used to generate the phonetic representation of a word from its underlying representation.
   (d) Linear sequence of discrete sound segments.
   (e) Units of linguistic structure (called $DF_{(s)}$) from which larger units (phonemes) are built. These features are the hallmark of GP.
3. There are four distinctive tenets of the theory of GP. These are as follows:
   (a) GP aims at developing fully explicit phonologies which generate the surface forms of a language.
   (b) The explicit phonologies developed should employ derivational means to generate the forms of a language.
   (c) Discovering deep rule ordering is a high priority of the theory. For each pair rules, one can attempt to determine that one and only one ordering of the rules is consistent with data.
   (d) There are no syllables included in the model of the theory. Segments are represented as bundles of binary features.
4. Various theories have been introduced as new or modified versions of GP with all of which adopting the basic principles of this theory. Thus, GP remains the prevalent and prevailing framework for many developments in phonological theory.

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