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THE TRIANGLE OF MORPHOLOGY, PHONOLOGY AND LEXICON

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ABSTRACT

The interaction of phonology with other components of the grammar can be understood in a wider context. It is well known that the theory of Lexical Phonology (henceforth LP) seeks to explain the inter-relationships between morphology and phonology by allocating some of the phonological processes to the dictionary or lexicon in which the morphemes reside.

The functions of brackets and boundary symbols found in other phonological representations are subsumed into the domains of both morphological and framework of the system of phonological rules within the lexicon and they are subdivided into strata which define both the type of morphological process applicable and the mode of operation (i.e. whether cyclic or noncyclic) of the associated phonological rules.

Processes applied on early strata are invisible to those of later strata through the application of the 'Bracket Erasure Convention .'

This paper consists of three sections. Section One presents an overview of nonlinear phonology . Section two deals with cyclic phonology ,whereas section three is devoted to the phonological effects of word formation processes.

Keywords: *nonlinear phonology, lexicon, lexical phonology, generative phonology, Cyclic phonology*

1.1 NONLINEAR PHONOLOGY

It is a recent approach to generative phonology in which the application of the phonological rules is tied to the morphological word formation processes inside the lexicon. Such rules apply regularly to change the underlying form of a word to its surface, phonetic realization . (Rubach 1987:457).Morphological and phonological rules are grouped into strata within the lexicon and the order of interaction between morphological and phonological components is stratum-dependent.

Two important factors determined the nonlinearity of LP: (1) the structuring of the lexicon and (2) the independence of syllabification from the word-formation process (Katamba1989:254).

Traditionally, the vital role was given to the rules of grammar whereas, the lexicon was just an appendix to the grammar. But, with LP, the key or vital role is given to the lexicon. This is in contrast to what was known that the rules of grammar are the basic.

Unpredictable idiosyncratic phonological, grammatical, semantic can be found in the lexicon , in addition to the morphological information of that lexical item or morpheme .That is to say, the lexicon comprises words, the semantic, syntactic, morphological and phonological rules . To know how

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words are pronounced by the speakers, the phonological information is required .

During the development in linguistics, phonology has witnessed great changes since the publication of Chomsky & Halle's The Sound Pattern of English (SPE) in 1968which is considered the corner stone of all other later theories in the field of Generative Phonology.

In this work, Chomsky &Halle (1968:163) represents a continuation of some of the central concerns of the classical phonemic theory that preceded it, assuming the need for a phonemic representation namely, an underlying one. The main divergence lay in the answer to this question: what are the levels of representation in the phonological theory? The classical theory produced three levels , phonetic, phonemic and morphophonemic. SPE abandoned the intermediate level. Changes and developments in the generative theory led to a phase of preoccupation with the interaction between phonological rule systems and other modules of the grammar.

Siegel (1974:37) proposed that the morphological modules of grammar consisted of ordered 'levels' and that the cyclic rules of word in English are applied within one of these modules after every affixation. Other subsequent developments of cyclic rules led to the birth of Lexical Phonology (Mohanan, 1986: 3). Therefore, this theory is an outgrowth of generative work .

According to McMahon (2003), LP and GP are similar in:

i) how speech is represented in the mind.

ii) making use of abstract underlying forms.

iii) assurance to rule- based description .

1.1.1 Lexical Phonology Verses Generative Phonology

The main distinction between the two theories can be stated in the following points.

1.LP tries to gather phonology and morphology in a single framework, emphasizing the role of lexicon. Whereas, GP does not give morphology any formal status. Morphology is completely ignored with no role for the lexicon .

2.LP is a non-linear theory of phonology since it postulates layers of representation; Whereas, GP isa linear model as it deals with restricted sequential arrangements of segments and boundaries.

3.LP uses a single bracket to indicate the item and its derivations or inflections.

e.g. [[ship[s]--- [ships] .GP uses the + boundaries to indicate the derivations or inflections to an item.

e.g. ships/+consonantal, +coronal, +voicing, etc.

As the name denotes, this theory gives a crucial role to the lexicon, as will be shown in the next section.

1.1.2Lexicalist Hypothesis

Phonologically speaking, LP is a theory about the interface between phonology and morphology developed by Paul Kiparsky (1982, 1985) and a number of other phonologists (Booji, 2006:94).Its basic claim is that all morphological processes, and many phonological ones are carried out in the lexicon.

Lexical phonology is a strong version of the so called Lexicalist Hypothesis .It assumes that all word formation, including inflection is carried out in the lexicon.

Firstly, in this theory, the basic issue is to what extent and how the morphological structure of words determines their phonetic realization. Secondly, the main claim of LP is that morphology and the rules of word phonology apply in cycle. Given a word with its underlying phonological form, the relevant rules of word phonology are applied to that word, then applying a morphological rule to that word in its derived phonological form. This creates a new domain of application for the rules of word phonology. Thus, we derive the lexical phonetic forms of words that will

subsequently be combined into phrases and larger constituents by the rules of syntax .

Here comes the role of post lexical phonology which is accounted for by a component of post lexical level that applies after syntax (ibid.) Thus, the theory holds that there are two distinct types of phonological rule applications. The first is when rules apply within the lexicon (the lexical phonology), while the second is when rules apply to the output of the syntactic component (the Post lexical, sentence level or phrasal phonology) (Pulleyblank, 1986:2).

Katamba (1989: 254) is the first who sees LP as the most promising analysis of the relation between phonology, morphology and the lexicon. Thus, it is a model in which phonology and morphology are interwoven into one framework to account for the word building process. Carr (2008:90), on the other hand, contemplates that LP postulates different levels (also known as 'strata') of word formation, with different phonological rules and/or constraints holding at those different levels .For Rubach (2008: 456), LP is extreme because it claims that all word formation, including inflection, takes place in the lexicon.

Viewed differently, Clark &Yallop (1990: 349) argue that "LP does allow for abstract underlying forms". In this sense, rules used in this theory are of two types: lexical and post lexical ones. The former are fed by the morphological component that supplies the various affixed and compounded forms ,and the latter apply to the output of lexical rules. They add that it is "a standard generative phonology" (ibid).

Also, LP is a generative, derivational model with a set of underlying representations of morphemes, which are converted to their surface forms by passing through a series of phonological rules. With its emphasis on morpho-phonology, LP has inherited many of the assumptions and much of the machinery of Standard or Classical Generative Phonology of Chomsky and Halle (1968), as McMahon (2000:5) maintains. Further, this theory was developed immediately after the theory of generative phonology and Crystal (2003: 267) describes this approach as "based on the insight that much of the phonology operates together with the word- formation rules in a cyclic fashion to define the class of lexical items in a language". Certain restrictions on the possibilities of representations in the lexicon, and quite different restrictions on the output of the post lexical phonology have been stated by Goldsmith (1996: 9) .

Regarding the word formation processes in LP, Katamba (1989: 257) claims that "both inflectional and derivational word formation processes in lexical phonology can be displayed on a series of linked levels or strata". Thus, the lexicon consists of levels which are the domain for certain phonological or morphological processes. The figure below which shows the overall structure of LP is adopted from Kaspersky (1982:132).

1.1.3 Importance of the Lexicon

The lexicon consists of ordered levels, which are the domain for certain phonological or morphological processes. These ordered lexical strata function as the domain of application for phonological and morphological rules.

In terms of LP, Giegeich (1999:130) explains that the lexicon is seen as being more than just an appendix to the grammar, containing unpredictable phonological, grammatical, semantic and lexical information about morphemes and lexical items .

Actually, LP gives the lexicon this central role as it contains idiosyncratic phonological, grammatical, semantic and lexical information (Katamba,1989:254). All these different kinds of information would be included in the lexicon as they are relevant to the application of semantic, syntactic, morphological and phonological rules. What is needed is phonological information in order to know how words are pronounced. In a stress language like English, the lexicon shows the special effects of a particular suffix on the stress pattern of the base to which it is attached. A suffix like {–ity} (as in **electricity**) attract stress to the immediately preceding syllable.

Furthermore, the lexicon should contain a list of forms that are exceptions to particular rules. For instance, it needs to show that **sheep** has no overt marking of plural. It should show us as well the various subclasses to which words belong because some morphological and phonological rules apply to certain subclasses of words.

In English, for example, word-formation rules are sensitive to the distinction between native and borrowed words from Latin or French. Except for the word oddity, only foreign words of Latin or French origin take the noun-forming suffix {–ity} as in **banality** or **community**. The other two more important roles for the lexicon are the inclusion of grammatical properties of words like nouns, verbs, etc. and the inclusion of semantic information which needs no explanation as listing word meanings is the basic function of the lexicon (ibid.: 255f).

SECTION TWO

2.1CYCLIC PHONOLOGY

McMohan (2000: 43) explains that the central assumption of LP is that each lexical level constitutes the domain of application for a subset of the phonological rules as well as certain word-formation processes. That is, the phonological rules do not apply between the morphological strata, but are assigned to them. The output of every morphological operation is passed back through the phonological rules on that level. This builds cyclicity into the model, and allows for the progressive and parallel erection of phonological and morphological structure .

Likewise, Katamba (1989: 258) asserts that the rules of morphology and phonology applying within the lexicon are essentially cyclical because rules are made to apply in a cycles first to the root, then outward to the affixes nearest to the root and then again outward to the outer layer of affixes. To clarify, the word can be likened to an onion with the root of the word as the core and level 1 as the inner layer, level 2 as the outer layer and post lexical phonology (henceforth PLP) as the skin on the outside. This is how it looks like:

[[level 2 aff.] [level 1 aff.] root [level 1 aff][level 2 aff]]

If there are more than two morphemes in the input; that is, a stem plus more than one affix, then, in principle, there are two possibilities: either we add all the affixes at the same time, or we first add one affix, then we apply phonology, and then we add another affix. This is one of the basic views of so called 'cyclic phonology' — usually incorporated into LP - that the latter is the case. The model is called cyclic, because we go in a circle: we add a suffix, then we apply phonology, then we add another suffix, etc. (Oostendorp, 1994: 96).

According to LP, the motivation for the cycle can be drawn from the interaction between morphology and phonology as in English al-Nominalization. As Rubach (2008: 462) cites in Siegel (1974) observes that {de-}verbal {al-}Nominalization in English is sensitive to stress. Specifically, {-al} is attached to verbs whose final syllable is stressed, as in **arrive** /ə'raɪv/ +/əl /= **arrival** /ə'raɪvl/ (or **propose** – propos+{-al}, where the accent marks stress). The rule is systematically blocked if the final syllable is unstressed, so *édit+{-al}, from édit, is not a possible word. Siegel's observation is readily accounted for if the derivation is cyclic. On cycle 1, the roots **arrive**, **propose** and **edit** receive stress from the Main Stress Rule of SPE. Consequently, when the {-al} Nominalization applies on cycle 2, the stress on the root morphemes is visible, so the rule can make the correct choice of the base to which {–al} can be attached.

2.1.1Strict Cyclicity Condition (henceforth**SCC)**

What the strict cyclicity principle ensures is that rules only apply to one layer at a time. The output of a morphological rule at level 1, for instance, cannot undergo a level 2 phonological rule, and vice versa (Katamba, 1989: 24).

Concerning the main constraint on LP, McMohan (2000:15) argues that it is the Strict Cyclicity Condition (SCC), which does follow from the architecture of the model, insofar as it is restricted to the (universally cyclic) first lexical level. Thus, LP

restricts rule application. On the other hand, by Strict Cyclicity, it is meant that phonological rules can only affect those strings of sounds that are put together by a word- formation rule applying at the same level. Thus, level 1 rules may only modify structures created by one level of morphological processes (Salman, 2008: 35).Moreover, McCarthy (2007: 111) contemplates that "there were many criteria that tended to segregate processes by stratum, such as structure preservation or the strict cycle". What is Unique to LP is the idea that a subset of the lexical filters constrains the effect of rule application in the lexical component. Actually ,this is precisely the hypothesis of 'Structure Preservation' proposed by Kiparsky in 1985 .

2.1.2Bracketing Erasure Condition

"Bracketing Erasure Condition" is another main principle of LP which states that internal brackets are erased at the end of the level as a result of which no morphological information is available to non-cyclic processes .

2.2 LP : LEVEL MORPHOLOGY

The idea here is that the lexicon has internal structure, not merely a list. and it is assumed that this structure is hierarchical. This issue has become under some dispute regarding the number of the structural levels that need to be recognized. So, Halle and Mohanan (1985) argue for a four-level morphology. This is again controversial, as Katamba (1989: 258) expounds. However ,Salman (2008: 34) explains that between two to four levels of morphology are involved in the lexicon of English, which are irregular inflection, derivation, compounding and regular inflection respectively . The first two levels seem to encompass the LP only. Here ,there is a need for the elaboration of the onion metaphor. Hence, there may be an underived lexical item at the center of the word, and such underived lexical items consist of a single morpheme such as **big**, **boy**, **girl**, **talk** and **soon**. For such words, there is No word-formation rule of any kind is used to produce them .Also, they appear in the lexicon with the phonological, grammatical and semantic properties with which they surface. That is, Level 1,as (Katamba, 1989: 259) argues contains bound morphemes like{**ab-**}and{**-duct**} in **abduct** or **{con-}** and{**-ate}** in **conjugate** which cannot occur independently but must always be attached to some other form.

2.2.1Strong and Weak Mode suffixes

The suffix{ –ate} will be dealt with first as it shows how an affix as a derivation in a grammar of English needs to capture. It is the Level 1 rules that would be used to state the vowel changes which in turn illustrates an important property of level 1 rules: such rules tend to cause radical changes in the root to which they are attached (ibid: 261). Another example comes to derive verbs from nouns (e.g. **bleed** from **blood**; **bathe** from **bath** or **feed** from **food**).The two level 1 rules are applied. One rule changes the vowel. When the final consonant is a voiceless fricative, another level 1 rule operates, changing it into a voiced fricative (Mohanan, 1982: 28).

It is important to note that all level 1 affixes are not restricted to affecting the segmental phonology of the forms to which they are attached, and they can also affect stress.The suffix {-ic }as in **phonemic** or **academic** is a strong mode one: it places stress on any syllable preceding, whereas{ -ate} as in **accommodate** or **arrogate** and {-an} as in **American** are weak mode suffixes and only put stress on the preceding syllable if it is heavy; otherwise they shift it onto the second syllable to their left. The other point is that certain level 1 suffixes can both affect stress and lead to the modification of the segments in a word. A classic example of this is the suffix{–ity }(used to change adjectives into nouns). For instance :

sane /eɪ—— /sanity /æ/

serene /ɪ/ —— / serenity /e/

It can be noticed from the above example that not only does the presence of the strong mode suffix {-ity} make stress move to the immediately preceding syllable (if it is not already in that position), it also causes the shortening (or laxing) of the diphthong or long (tense) vowel of the root which, as a result, is then realized as the corresponding short (lax) vowel

(Katamba, 1989: 261f). These were some examples for level 1 LP.

2.2.2 LP : Level 2

It is stipulated by the theory that all level 1 rules must precede all level 2 rules which, in turn, precede all post lexical rules. If a particular rule applies at level 1, it will always have precedence over those rules which are at level 2; if a particular rule is at level 2, it will always precede any rules which apply post-lexically. Thus, the ordering of levels has serious implications for the way in which rules interact (ibid.).

The main features of the Level 1 rules are different than those of L2 rules .That is , they are normally

i) more idiosyncratic than level 2 rules and
ii) often the meaning of level 1 affixes is unclear;
iii) their phonological effects are unsystematic and
iv) their applicability is erratic.

On the other hand ,Level 2 rules have fewer exceptions and their phonological effects and semantic properties are more predictable. Here, consider{ -er}, a typical level 2 affix. By suffixing {-er} to it, virtually any verb base can be turned into an agentive nominal meaning 'doer of activity X designated by the verb'. For instance, **read** and {-er} is **reader** or **speak**+ {-er} is **speaker**. Notice, however, **cook** +{-er} = **cooker**. It is an exception because **cooker** does not denote 'doer of activity.'

Some agentive nominal , as Katamba, (ibid.: 269) states, are formed by a process known as 'Zero Suffixation' whereby morphological derivation is achieved without the overt addition of an affix, as in the case of judge (n.) which is derived from judge (v.). This is another exceptional irregularity

2.2.3 Post Lexical Rules

Based on their paper 'From Cyclic to Lexical Phonology' , Mohanan (1982),and Kiparsky's (1982) propose that phonological rules are of two kinds: lexical rules and post lexical rules. Moreover, in the lexicon as some linguists and phonologists affirm that the lexical rules are interacted with the word formation rules. This is because word formation is placed, in which the lexical rules are predictably limited to the domain of words as words and not sentences are derived in the lexicon. In contrast, Rubach (2008: 459)argues that post lexical rules take the sentence as their domain, because they apply to strings derived by syntactic operations. So, as McMohan (2003: 48)states , Lexical rules must apply before post lexical rules and a further prediction is that a rule that applies across word boundaries must be post lexical.

2.3 WORD PHONOLOGY AND PHRASE PHONOLOGY

Here , Carr (2008: 90f) states the fact that LP postulates a distinction between word phonology and phrase phonology, claiming that word-level phonological operations have distinct characteristics from phrase-level operations.

The clearest example in English is that word-level phonology contains the kinds of affixation and process. Also, the phrase-level phonology contains phenomena such the Linking 'r' of many non-rhotic accents of English, whereby a word-final underlying /r/ is said to be realized if the following word has an empty onset, as in far away, pronounced[fɑ:rəwei].

2.4 LEXICAL (L) AND POST LEXICAL RULES (PLRS: DISTINCTIONS

The distinction between lexical rules (henceforth LRs.) and post lexica rules(henceforth PLRs.) is clarified by Hargus&Kaisse (1993: 16) in the following points :

1 .LRs may refer to word-internal morphological structure, whereas

PLRs cannot refer to word-internal morphological structure (due to the Bracket Erasure Convention.(

2 .LRs may be sensitive to morpheme boundaries, whereas PLRs cannot be sensitive to morpheme boundaries .

3 .LRs may not apply across word boundaries, whereas PLRs may apply across word boundaries.

4 .LRs may be cyclic, whereas PLRs cannot be cyclic.

5 .LRs if cyclic, then subject to the Strict Cycle Condition, whereas LRs are non-cyclic, hence apply across-the board (everywhere), and only once.

6 .LRs may be restricted to applying only in derived environments (by the Strict Cycle Condition), whereas PLRs may not be restricted to applying only in derived environments .

7 .LRs must obey Structure Preservation (can't create non-contrastive sounds), whereas may violate Structure Preservation (can create non- contrastive sounds).

8 .LRs may have lexical exceptions (counter examples), whereas PLRs cannot have lexical exceptions.

9 .LRs must precede all post lexical rules, whereas PLRs must follow all lexical rules .

10 .LRs produce changes which are generally obvious to the consciousness of native speakers; whereas PLRs produce changes which native speakers are generally unaware of ' allophonic rules.'

11 .LRs apply categorically, whereas PLRs may apply gradiently .

12 .LRs apply to lexical categories only (nouns, verbs, adjectives, and adverbs), whereas PLRs apply to both functional and lexical categories .

13 .LRs are disjunctively ordered with respect to other lexical rules (due to the Elsewhere Condition), whereas PLRs are conjunctively ordered

with respect to lexical rules (and other post lexical rules)

14 .LRs are diachronic: lexical diffusion, whereas PLRs are diachrony :

Neogrammariansound change (no exceptions). 15. LRs have weak or no effects in on-line tasks (nonce words, secret languages, experiments, foreign-language learning), whereas PLRs have effects in on-line tasks (Parker, 2015:65).

It is important to note that, as Goldsmith (1996:2) states, certain LP places restrictions on the possibilities of representations in the lexicon, and quite different restrictions on the output of the post lexical phonology.

SECTION THREE

3.1 PHONOLOGICAL EFFECTS OF WORD FORMATION PROCESSES

Based on above, It can be seen that the phonological change or the use of a word formation rule influences the pronunciation of several words. The following examples give an overview of phonological effects of word formation rules,as stated by Jensen,(1993,: 192ff:)

3.1.1 .The Vowel Shift Rule

divine [dɪ'vaɪn] – divinity [dɪvɪnətɪ] → /aɪ / → /ɪ/

wise /waɪz/ – wisdom ['wɪzdəm] → /aɪ/ → /ɪ/

When the suffix –ity is added to the verb divine to form the noun divinity, the /aɪ/ sound changes to /ɪ/.The same happens to the word wise when it is changed into wisdom.

insane [ɪn'seɪn] – insanity [ɪn'sænəti] → /eɪ/ → /æ/

Actually, this example shows the vowel shift from /eɪ/ to /æ/.So, the vowel shift rule has no effect on the stress of the words.

3.1.2 .Vowel Reduction

explain – explanation → /ə/

compose – composition → /ə/

commerce – commercial → /ə/

The vowel reduction, as the word reduction expresses, omits the /ə/ sound.

3.1.3Voicing

north – northern /θ/ → /ð/

bath – bathes /θ/ → /ð/

cloth – clothes /θ/ → /ð/

worth – worthy /θ/ → /ð/

It can be seen here that the voiceless inter dental fricative changes to the voiced inter dental fricative, that means a change from a voiceless sound to a voiced sound, happens to the pronunciation when adding a suffix .

proof – proves /f/ → /v/

grief – grieves /f/ → /v/

knife – knives /f/ → /v/

loaf – loaves /f/ → /v/

shelf – shelves /f/ → /v/

Once again ,the same appears in this place: the voiceless labiodental fricative changes into voiced labiodental fricative because of the pluralization.

use (noun) – use (verb) /s/ → /z/

abuse (noun) – abuse (verb) /s/ → /z/

In short , this word formation process effects the change from voiceless alveolar sibilant into voiced alveolar sibilant in forming the verb from the noun.

3.1.4Palatalization

coerce – coercion /s/→ /ʃ/

press – pressure /s/ → /ʃ/

By attaching the suffixes{ –ion} and {–ure}, a voiceless alveolar sibilant /s/ changes into voiced palatal affricate /ʃ/

revise – revision /z/ →/ʒ/

expose – exposition /z/ →/ʒ/

confuse – confusion /z/→ /ʒ/

As mentioned above, the suffix{–ion causes a change from voiced alveolar sibilant /z/ into voiced palatal sibilant /ʒ./

depart – departure /t/→ /ʧ/

digest – digestion /t/→ /ʃ/

Phonologically speaking,this word formation rule shifts the voiceless alveolar stop to voiceless palatal fricative.

3.1.5 .Velar Softening

electrical – electricity /k/→ /s/

critic – criticism /k/ →/s/

Velar softening causes an alteration from a voiceless velar stop /k/ to a voiceless alveolar sibilant.

analogue – analogy /g/ →/ʤ/

Here a change from voices velar stop /g/ into the sound /ʤ/ takes place.

3.1.6 .Spirantization

intimate – intimacy /t/ →/s/

democrat – democracy /t/→ /s/

Spirantization moves the voiceless alveolar stop /t/ to the voiceless alveolar sibilant. The words ‘intimate’ and ‘democrat’ are stressed on the first syllable. The

suffix displaces the stress to the second syllable to 'intímacy' 'demócracy.'

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