Chapter: One

Introduction

1.0. Front matter:

Why is there a predominance of certain phonological features and units in world languages as compared to others? Why does there exist the primacy of certain phonological features in language acquisition? Why are certain features and units found to persist in languages in the context of historical development? Why is the fact that certain features and units in human languages are less prone to impairment as compared to others?

These are some concerns of great relevance which can be explored in the backdrop of findings relating to phonological strength. These queries, I think, can lead to further research questions such as, how we can distinguish between inherent strength versus strength within a system. These research findings will provide an insight to correlate the notion of phonological strength with Optimality Theory (Prince and Smolensky, 1993). OT is usually considered a development of generative grammar, which shares its focus on the investigation of universal principles, linguistic typology and language acquisition. In Optimality Theory, for instance, certain constraints dominant in language X may not be dominant in language Y. According to Optimality Theory languages choose the phonetic form of a word that best satisfies a list of constraints which are ordered by importance: a lower ranked constraint can be violated when this is necessary in order to satisfy a higher ranked constraint. Hence, it is imperative to ask whether ranking is subject to universally non violable constraint hierarchy.

The findings can also throw ample light upon the embedded segmental properties that design the distribution of a segment in a phonological string within the framework of Element theory (Beckley and Kuniya, 2006), a sub branch of Government phonology (Kaye, Lowenstamm and Verganaud, 1990) and the head dependent asymmetry as explicated in Dependency phonology (Anderson and Durand, 1987). The correlation existing between positional privilege and prosodic strength is an issue which can directly or indirectly reflect upon the notion of phonological strength in an explicit canvas.

It is in debate whether the notion of strength should be characterized as a phonetic or a phonological property (Barnes, 2006). Strength asymmetries can be observed in different phonological processes ranging from aspiration to voicing. A segment can be differentiated from each other in terms of perceptual prominence characterized by pitch, loudness and
quality if strength is perceived from phonetic perspective. The phonetic prominence is evidenced by many different physical cues, such as increased duration or amplitude, pitches extreme, released burst etc (Kingston 1985, 1990; Steriade 1993c, 1995 and Kirchner 1996). Pierrehumbert and Talkin (1992) in their phonetic study observed that consonants in weak positions are strongly reduced in duration. In phonological perspective strength can be attributed to certain word positions or prosodic environment. Lavoie (2001) claims that the environment is important for the study of lenition, a claim supported by other studies (e.g. Hooper 1976, Escure 1977, Foley 1977). As for instance, word initial strengthening (Hock 1992) can be mentioned. In the same way the initial position is found to be stronger than the medial position (Beckman 1998; Steriade 1993a, Hooper 1976). In addition, in response to phonological patterning of segments the phenomena which deserve mention include positional maintenance of contrasts which are neutralized elsewhere, positional triggering of phonological processes and positional resistance to processes which apply elsewhere.

1.1. Research Problem:

What is the motivation behind the predominance of certain phonological features and units in the world languages as compared to others? It can be interpreted from the notion of phonological universal, which is a common tendency found in the phonological systems of many languages. Phonological systems which do not conform to universals are possible, but not likely. Since Jakobson linguists have been searching for universals, although their views on the role of universals in languages and linguistics have varied widely. According to Dressler (1996), the universal principles can be categorised in to cognitive, phonetic, psychological, sociological etc and they lead to the establishment of linguistic preferences which guide the explanation of language specific structures. As for example, some phonological universals pertaining to consonant sounds are: all languages are expected to have at least voiceless plosive, nasals, a groove fricative and a laryngeal glide; consonant systems tend to be symmetrical in their points of articulation and manners of articulation (for example, for each voiceless plosive there is a corresponding voiced plosive); a correlation between point of articulation and voicing of obstruents shows up when there are asymmetries in a consonant inventory; a language is likely to have voiceless labial obstruents than any other voiceless obstruents; a language is less likely to have voiced velar obstruents than any other voiced obstruents; most obstruents are voiceless and most sonorants are voiced...
(Dressler 1996). Therefore, this type of conditioning evident in the phonological systems and some idiosyncratic phonological universals observed in the languages of the world provide ample scope for the linguists to reflect upon the theme of phonological strength asymmetries and the patterning of segmental speech sounds.

Phonological inventories are also instrumental in providing explicitly or implicitly formulated phonological theories the focus of which lies in evaluating historical reconstruction, in constructing models of language acquisition and change. As, for instance, stops occur in the inventories of all known languages and have appropriately been regarded as the optimal consonants (e.g. Jakobson and Halle, 1956:42). The most frequently found types of stops are plosives, that is, stops made with an egressive pulmonic air stream. Apart from the differences in place of articulation, stops may vary in a number of ways through variations in laryngeal settings and in the relative timing of voice onset and of a velic closure or opening. In general, language nearly always includes a plain voiceless series of stops. As the number of series expands, a contrast along the Voice Onset Time is added first. Therefore the question arises, is voicing a weakening phenomenon? As reported by Maddieson (1984), the great majority of languages (86.1%) have voiced palatal approximant /j/ and subsequently fewer languages (75%) have a voiced labial approximant /w/. The occurrence of the former is associated with the occurrence of the latter.

If we take in to consideration the vowel inventory in languages it is evident that all languages have at least three phonemic vowels /i/, /a/ and /u/ but among these the vowel /u/ is more often absent than the rest. They each lie at an acoustic extreme. The low vowel /a/ has the highest F1; /i/ and /u/ have the lowest F1 but /i/ has the highest F2 whereas /u/ has the lowest F2 (e.g. Maddieson 1984). This observation made by Maddieson bears affinity with Jakobson’s universal laws of “unilateral implication” in the stratified structure of the phoneme inventory. This dictum implies that the occurrence of mid vowels implies the occurrence of corresponding high vowels, the front round vowels implies the occurrence of corresponding front unround vowels and so forth. These implicational laws are also instrumental in governing also the acquisition and change of phoneme inventories; thus the acquisition of mid vowels implies the acquisition of the corresponding high vowel, and the loss of a high vowel implies the loss of the corresponding mid vowel. This implicational law
is applicable in the domain of consonant sounds such as affricates imply spirants and spirants imply stops.

Within the vowel system certain vowels undergo alternations whereas certain others do not. In Paninian framework, some vowels were considered *mulaksar* or basic vowels and some were considered *sandhyaksar* or derived vowels. Is this classification explainable in the light of strength asymmetries exist among the segments?

The phonological process of assimilation can be explained in the light of strength relations. Given sequence of sounds some sounds assimilate easily to other sounds, but some sounds display resistance to such processes.

As for instance, in English *n+k-ŋ*, but *p+n-pn*. Hence it appears that the less sonorant sound resists assimilation with the more sonorant sounds.

In this regard reference can be made of the argument put forward by Grzgorz Dogil (2007) in his article “Phonetic Dimensions of Segmental Strength”. It is generally assumed in Phonology including Natural Phonology (Donegan 1978) that the relative articulatory strength is just the reciprocal term for relative sonority, and the strength scale ranging from obstruents to vowels is the mirror image of the sonority scale. The strengthening process involves the increase in the constriction of the oral tract caused by the articulatory gesture, and the weakening is identical to sonorization. However the stipulated incompatibility of sonority and strength within a single sound category cannot be maintained because the laryngeals have a low degree of sonority and a low degree of consonantal strength. Their low degree of sonority is evident from the fact that they occupy the weakest positions within the syllable, and their low degree of strength is crystal clear from the fact that they are almost irrepresent to co articulation (Vollmer, K.1997). Articulatorily strong segments are more resistant to co articulation. As for illustration, Recasens' (1989) articulatory model of lingual co articulation identifies the degree of tongue dorsum elevation as the main factor in their articulatory strength that is their level of coarticulatory resistance. Hence palatalis ought to allow less co articulation than labials, dentals and alveolars because they are constrained for larger vocal tract regions.
Within syllabic inventories CV and CVC are found to be more predominant than other syllable types. Sometimes CVC gives rise to CV. Within syllable structures whereas codas undergo various phonological processes, onsets do not. Onsets seem to be stronger in articulation in phonological processes.

Word initial consonants often realize more contrast than do consonants at the end in the word. It is because in the prosodic domain initial consonants in a wide variety of languages undergo a process of strengthening relative to their non initial counterparts (Chao and Jun 2000). Both magnitude and duration of gestures increase initially. Both laryngeal and supralaryngeal gestures are targeted. Strengthening can be perceived as a cumulative phenomenon as it affects segments initial in higher prosodic domains (Utterance, Intonational or Phonological phrase) more dramatically than initial segments in lower domains (Phonological Word). Initial strengthening can be examined, as illustrated by Cho and Jun (2000), syntagmatic as well as paradigmatic perspectives. The former is enhanced by processes increasing the consonantality of initial consonants, sharpening the contrast between them and following vowels whereas the latter is enhanced by processes essentially hyperarticulating characteristic features of initial consonants or vowels (e.g. increased glottal airflow and VOT on Korean lenis and aspirated stops, decreased glottal airflow and VOT for fortis stops). It is interesting to observe that word initial consonants often undergo sonority reducing neutralization processes. Smith (2002) cites Mangolian, Mbabaram and Campidanian Sardinian as requiring low sonority onsets, and Arapaho and Guhang Ifugao as preventing word initial onsetless syllables. Cross linguistically common initial glottal stop epenthesis fits in this slot.

In the same fashion vowel initial words express contrast neutralized elsewhere, often resisting reduction process. Casali (1997) cites evidence of preferential preservation of word initial vowels over word final vowels in hiatus contexts in a variety of languages. Vowels in word initial syllables famously license more contrasts than vowels in non initial syllables. Nauvuri (Casali 1995, Kirchner 1998) initial vowels resist rounding harmony. Russian absolute initial [a] resists duration dependent reduction to [a] which otherwise should apply. In Tamil, quantity and nasalization contrasts are perceived in initial syllables only. Proto Dravidian is reconstructed with initial stress (exclusively monosyllabic roots) (Zvelebil 1970). Massive syncope and reduction of non initial syllable vowels in many daughter languages including Tamil have been found. Most daughter languages (including Tamil) continue to show initial stress or some obvious derivative thereof. In the same manner initial
syllable codas licensing more contrasts or more structural complexity than word internal codas are virtually unattested. Tamil (Beckman 1998, Christdas 1988) and Malayalam (Beckman 1998, Wiltshire 1992) both license independent place specifications in some initial syllable codas, but nowhere else in the word. So a question arises, does initial syllable prominence exist at all?

1.2. Main hypotheses:

The details exemplifying phonological strength can be organized into two sub-groups:

1. In the patterning of segmental speech sounds in a phonological set up there is a correlation between the prosodic environment and the phonological licensing of features. Positional asymmetry is functional in the delineation of the privilege assigned to specific segments in specific environment.

In justification of this hypothesis Beckman’s (1998) positional privilege and Beckley and Kuniya’s (2006) Element theory can be cited which drive home the point that it is the prosodic environment which is instrumental in the patterning and distribution of speech segments. The chapters of this dissertation will revolve around the justification of this hypothesis with the help of several phonological processes such as assimilation, spirantization, gemination and aspiration etc.

1.3 Corollary hypotheses:

Out of the main hypothesis the following corollary hypotheses emerge which also reflect upon the issue of phonological strength both from rational as well as empirical parameters:

2. Strong or privileged positions frequently allow a greater range of licensing of features. As, for instance, the laryngeal feature [+s.g] is mostly attested in the word onset position (Barnes, 2006).

3. Onsets tend to allow greater range of structures than codas. Thus onsets can be said stronger than codas on the ground that codas are prone to deletion or change whereas onsets are found to be prone to alternation cross linguistically (Beckman, 1998).

4. Strength relations pertaining to onset coda asymmetry can be attributed not only to privileged positions under the rubric of phonological licensing of features but also to
concrete and empirical phonetic evidence. It further implies that there is a correlation between physical acoustic cues and prosodic position in a phonological domain.

5. The intrinsic strength of the segmental class determines the triggering of certain phonological processes. All the segmental classes are not endowed with identical properties in triggering phonological processes.

1.4 Justification of the hypotheses:

This study tries to justify the hypotheses stated in the above section in the light of empirical and rational findings derived from the observation of certain phonological processes. The notion of phonological strength is strengthened by the data on assimilation, spirantization and aspiration which I am going to show in this study and thereby establish the hypothesis that there is a correlation between phonological licensing of features and prosodic positions.

The process of assimilation targets mainly the segment in the coda position whereas the segment in the onset position is not susceptible to alternation. As for illustration, consider the following data in Assamese: (for details see chapter-Four)

(1/1)

xat din - xaddin  (seven days)

hat dighbol- haddigbol  (powerful)

From the above instances of regressive assimilation in Assamese it is seen that the segment in the coda position assimilates in terms of the feature [voice] to the following segment in the onset position.

The data on spirantization also adheres to the notion of strength asymmetry and prosodic environment.

(1/2) For illustration consider the data stated below: (for details see the chapter- Five)
In the data stated above what is seen is that the process of spirantization is attested in the coda position where pʰ and bʰ turn in to f and v respectively, but in the word medial and initial positions this process of lenition does not take place. Thus it is illustrative of the intrinsic relationship existing between prosodic positions and licensing of features of lenition.

The same kind of argument holds water in the case of the process of fortition and prosodic positions. As for example, the process of aspiration is found to be attested in the onset position. For convenience consider the following examples in Hindi where aspiration is seen in the onset position and thereby strengthens the claim of positional asymmetry and phonological strength:

(1/3)

[sat] ‘seven’ + [bʰai] ‘brother’ → sad-bʰai
[band] ‘closed’ + [kʰirki] ‘window’ → band-kʰirki
[subʰ] ‘pious’ + [gʰari] ‘deed’ → sub-gʰari

In these above data on morphological concatenations in Hindi it is shown that the aspiration is licensed in the onset position which is subject to delation in the coda position.

Moreover, the debate concerning the onset coda asymmetry is subject to acoustic interpretation. In this study we will see the asymmetric acoustic behaviour exhibited by the
segment ‘h’ in different positions such as word initial and word medial position in Hindi. The data are obtained from five native speakers of Hindi. The acoustic analysis of Hindi ‘h’ in word initial and medial position exhibit distinct properties in PRAAT picture. See the detailed interpretation of ‘h’ in different contexts in Chapter Seven. The results of this study show that segments behave differently in onset and coda position. The formants are lost in the coda position which are present in the onset position and thereby can differentiate from the surrounding vowels in acoustic parameters.

Sometimes segmental properties embedded in a segment prove to be instrumental in the triggering of certain phonological processes such as gemination. This hypothesis can be put in to penetrating light of scrutiny with reference to gemination process in Sanskrit where gemination of obstruents is triggered by the following liquids and glides such as j, r, l, v but not other segments such as nasals and obstruents. Only the liquids and semivowels have the potential to trigger gemination to the preceding obstruents. The motivation hidden behind the non occurrence of the process of gemination of the obstruents followed by nasals and obstruents can be assigned to the fact that obstruent and nasals do not serve as well formed consonant cluster. Hence, it can be argued that glides and liquids have the special property of being appropriate coda as well as a member in the onset consonant cluster resulting in the process of gemination. Positional privilege and prosodic strength are complementary to each other.

1.5 Approach/ Method/ Technique

As far as the data for this research work is concerned they are collected from either informants or from published descriptions of languages. So this study comprises the data collected from both primary as well as secondary sources. I will confine the secondary data to standard publications on Indian languages and certain theories. The languages which I use as database in this study for the justification of the notion of phonological strength are mainly Assamese, Hindi, Pali and Sanskrit. For observations which require investigation of phonetic properties I have collected fresh data for experimental analysis. The research will present analyses of phonological phenomena within various frameworks of phonology such as Government phonology and Optimality theory, wherever they are relevant to the processes being examined. For processes requiring phonetic explanation, I carry out experiments and subject them to acoustic analyses using software such as PRAAT.
1.6 Structure of the thesis:

This thesis is divided into eight chapters.

**Chapter One** is devoted to the explication of the main issues pertaining to phonological strength relations. The major approaches which address this issue both from phonetic as well as phonological perspective are taken into consideration in this chapter. This chapter mainly focuses upon the research questions, hypotheses along with their justifications and the methods that are adopted in order to carry out the research.

**Chapter Two** presents a review of the literature, a justification and a review of the approaches to the investigation of phonological strength. In this chapter the emphasis is laid more on the approach that is best suited to the description of the phenomenon. Although the issue of strength is a topic that has been recently addressed in phonology, yet the notion of asymmetric organization of segments and their representation in a phonological string can be analysed in the backdrop of various theories, the notable amongst which are Natural phonology, Government phonology, Optimality theory, Dependency phonology, Metrical phonology, the theory of Feature Geometry, theories of Positional Neutralization. This chapter attempts at making a critical appraisal of these theories in the light of the notion of phonological strength.

**Chapter Three** is devoted to an exposition of Government phonology (GP) and Dependency phonology (DP). Both the theories are theories of phonological representation. This chapter is designed to address the issue of pattering of segmental speech sounds and the complexity involved in their representation in the framework of these approaches which focus on head dependent asymmetry and governor and governed relationship.

**Chapter Four** deals with the phonological process of assimilation in the light of strength asymmetries. The process of assimilation in this chapter is interpreted from various perspectives such as positional faithfulness theory, perceptual account and P-map theory and OT framework. Here the main focus lies on the regressive voicing assimilation in Assamese and its analysis in the light of assimilatory asymmetry in terms of segment sequencing. Voicing assimilation is functional among the segments of same sonority value and this is blocked between the segments of asymmetric sonority value. However the redundant [+voice] feature of a sonorant consonant never triggers voice dissimilation. This dissertation
shows that voicing assimilation is functional among the segments of same sonority value and this is blocked between the segments of asymmetric sonority value. However the redundant [+voice] feature of a sonorant consonant never triggers voice dissimilation. Indeed, the constraint AGREE is stronger between the constituents having same sonority value.

\[-\text{son}] \quad \text{[-son]} > \quad \text{[-son]} \quad \text{[+son]}\]

**Chapter Five** revolves around the theme of spirantization that can be subsumed under the rubric of lenition. This chapter is designed to address the process of spirantization in Optimality theoretical model with the data drawn from Assamese.

**Chapter Six** analyses the permitted and prohibited consonant cluster in Assamese in the framework of Optimality theory and thereby tries to correlate this phenomenon with the notion of phonological strength asymmetries. To what extent the constraints on syllable shape and sonority sequencing succeed in capturing segment sequencing in linguistic forms is a topic of inquiry in this chapter. Sonority and segment sequencing in Assamese onset consonant cluster provides a new impetus to the issue of cross linguistic design of the arrangement of segments with special reference to the concepts such as onset well formedness conditions, syllable contact law, complexity condition and Margin hierarchy approach etc.

**Chapter Seven** is designed to address the issue of phonological strength in relation to some phonological processes such as aspiration and gemination which are generally considered to be a processes of fortition. In addition h-deletion in certain varieties of Hindi are taken in to consideration in order to explore the issue of onset coda asymmetry and thereby encompass the idea of phonological strength in an explicit way. The theoretical models employed here for the illustration of my hypotheses are based on Element theory, which makes an important distinction between headed and non headed melodic expressions.

**Chapter Eight** is devoted to summing up answers to the questions the thesis has examined. The findings of the study include:

a) Positional privilege and prosodic strength are complementary to each other. Prosodically stronger positions such as onsets and initial positions attest the process of fortition such as aspiration which is subject to loss in weaker positions.
b) The process of lenition such as spirantization targets mostly the prosodically weaker positions such as word final and coda position. The Assamese data on coda deaspiration and spirantization presented in chapter Five bears ample testimony to this finding.

c) Mostly the segments in the onset position are retained whereas the segments in the coda position are subject to alternation. The data on Pali geminates in chapter Seven strengthen this claim. From such patterning a generalization can be drawn that onsets are stronger than codas; word initial positions are stronger than word final positions.

d) Segmental asymmetry by virtue of positions can be further reinforced with the help of acoustic analysis. The acoustic analysis of Hindi ‘h’ in word initial and medial position exhibit distinct properties in PRAAT picture. See the detailed interpretation of h in different contexts in Chapter Seven.

e) Sometimes segmental properties embedded in a segment prove to be instrumental in the triggering of certain phonological processes such as gemination. In Sanskrit gemination of obstruents is triggered by the following liquids and glides such as j,r,l,u but not other segments such as nasals and obstruents.