

Linguistics	
Introduction to Phonetics and Phonology	
Principles of Phonemic Analysis-I	
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Module 19: Principles of Phonemic Analysis- I

Objectives:

- To discuss the two main principles of phonemic analysis used in arriving at phonemes and allophones in a language.
- To introduce informal and formal statements of phonological rules

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19. 1 Introduction

In the present module, we are concerned with introducing ourselves to the Principles of Phonemic Analysis. We will take up two main principles- one of contrastive distribution, which helps determine whether two sounds in question are phonemes, and the other of complementary distribution, which helps determine whether two sounds in question are allophones of a phoneme. In order to grasp the working of the principles, exercises from some text-books are inserted at different points. You are expected to do the exercises before proceeding further.

19.2 Principles of Phonemic Analysis

The principles of phonemic analysis that have come to be exemplar cases of linguistic principles and that have served as a model for structural analysis in other fields, such as anthropology and literature, are based on the foundational notion of two dimensions of structural relations among linguistic units, namely, paradigmatic and syntagmatic, as propounded by Ferdinand de Saussure. The paradigmatic relation among units is investigated by means of substitution of one unit by another. For example, in the word *pit*, there are three sounds. Each of them can be substituted by another sound in the language. Thus if the first consonant in the word is substituted by another consonant, say [b], we get *bit*, if the vowel [ɪ] is substituted by another vowel, say [e], we get *pet* and if the final consonant [t] is substituted by another consonant, say [n], we get *pin*. These substitutions explore the paradigmatic relation among the sounds and help us to draw a certain conclusion about them. The syntagmatic relation among linguistic units is investigated by means of association with other accompanying units. For example, in the words *pit* and *bit*, the vowel is an oral vowel, but in the word *pin*, the vowel is nasalized. Nasalized vowels in English, as we have seen before, are always found before or after a nasal consonant or in both contexts. The search for the context for the features of a sound is in terms of the syntagmatic relation between the sound and its context and helps us to draw a conclusion about the sound being one of its variants or not.

Nikolai Trubetzkoy, the Prague school linguist, elaborated on the notion of contrast of various types and of categorical perception in the midst of contextual variation.

There are three main principles of phonemic analysis:

- a. Principle of Contrastive Distribution
- b. Principle of Complementary Distribution
- c. Principle of Free Variation

There is a fourth principle, in addition: the Principle of Pattern Congruity. It is not so much a principle of analysis as a heuristic device to carry out an analysis, as we shall see.

19.3 Principle of Contrastive Distribution

The Principle of Contrastive Distribution is stated as follows:

19/2

When two phonetically similar speech sounds, X and Y, occur in identical environments and the substitution of one by the other brings about a change in meaning, then the sounds in question are in contrastive distribution. Phonetically similar sounds that occur in contrastive distribution are phonemes.

Look at the following examples to see the working of the principle from data from English:

19/3

(a) [sɪŋk] 'sink' [zɪŋk] 'zink'

In the above words, the sounds [s] and [z] are in contrastive distribution, as they occur in identical environment, namely, a pause before and the sequence [ɪŋk] after:

(b) #__ɪŋk

If we substitute one of the sounds in place of the other, that is, [s] in place of [z] and vice-versa, the meaning of the word changes. The result is two different words.

The best and easiest way to find two phonetically similar sounds in contrastive distribution is to find them in a pair of words that differ only with regards to them and nothing else. Such a pair of words is called a Minimal Pair. A minimal pair is one in which the words differ minimally, that is, with regard to one sound only. *Sink* and *zinc* are examples of a minimal pair. Try to find some more examples of a minimal pair for the sounds [s] and [z] in English.

Although the word-initial position is the one that is the commonest for finding contrastive distribution for sounds, other positions in the word are equally important, as in 19/3 (c).

19/3 (c)

[bʌsɪz] ‘busses’ [bʌzɪz] ‘buzzes’ [pi:s] ‘peace’ [pi:z] ‘peas’

The data in 18/4 below give us minimal pairs with three environments for the contrastive distribution of the consonants [m] and [n]:

19/4

[mɒk] ‘mock’ [nɒk] ‘nock’ [sɪmə] ‘simmer’ [sɪnə] ‘sinner’
[si:m] ‘seem’ [si:n] ‘seen’

What is the result of the finding minimal pairs for the sounds [s] / [z] and [m] / [n]?

The result is that the pairs of sounds are phonemes: /s/, /z/, /m/ and /n/.

Near-Minimal Pairs

Near-minimal pairs are less than minimal, that is, having **more than one point of difference** between a pair of words, but in which the additional difference is irrelevant, as it can be affecting the difference between the two sounds in question.

For example, in Khezha the vowels [i] and [e] can be found in a near-minimal or sub-minimal pair [meli] ‘heart’ and [mele] ‘plank’. The final vowels contrast but there is a difference in them in the two words. The final high front vowel [i] bears a high tone but the final mid front vowel [e] has mid tone (not marked here). The words constitute a sub-minimal pair for the vowels [i] and [e]. A sub-minimal pair is acceptable in a situation where the additional difference cannot be said to be owing to the context. In Khezha, high tone and mid tone are independently found to contrast. The presence of a high tone on the final [i] in [meli] ‘heart’ or of the mid tone on the final [e] in [mele] ‘plank’ cannot be claimed to be on account of the environment. [meli] and [mele] in Khezha can thus be accepted as a sub-minimal pair.

Exercise:

(19/5)

Find minimal and sub-minimal pairs in the following data from Khezha:

1. [ke] ‘to take out food from a dish’, [ʃe] ‘tease’
2. [meki] ‘cold’, [mek^hi] ‘seat’, to add water’,
3. [pù] ‘tell’, [bù] ‘to snip’
4. [keso] ‘truth’, [kehá] ‘red (one)’
5. [kèna] ‘to knit’, [lèn^ha] ‘to make untidy’

Answer: minimal pairs: 1, 3; sub-minimal pairs: 2, 4, 5.

Applying the Principle of Contrastive Distribution

Exercise

Look at the following data from Nepali and list the consonant phonemes on a consonant chart on the basis of the minimal pairs:

(19/6)

- | | | | |
|-------------------------------------|-------------------------------------|-----------------------------------|-------------------------------------|
| 1 [pir] ‘anxiety’ | 2 [b ^h ar] ‘burden’ | 3 [tal] ‘lake’ | 4 [t ^h al] ‘plate’ |
| 5 d ^h ar] ‘edge’ | 6. [g ^h ol] ‘Mix! Stir!’ | 7 [t ^h at] ‘fashion’ | 8 [dol] ‘bucket’ |
| 9 [hat] ‘hand’ | 10 [‘mam] ‘rice’ | 11 [p ^h ir] ‘Turn on!’ | 12 [nʌŋ] ‘nail’ |
| 13 [sat] ‘seven’ | 14 [d ^h ol] ‘a drum’ | 15 [dar] ‘a kind of tree’ | 16 [lat] ‘kick’ |
| 17 [[tsar] ‘four’ | 18 [kal] ‘time, death’ | 19 [sʌʃa] ‘clean’ | 20 [ts ^h ar] ‘ash, dust’ |
| 21 [dz ^h ar] ‘weed’ | 22 [rat] ‘night’ | 19 [bar] ‘fence’ | 24 [nam] ‘name’ |
| 25 [k ^h al] ‘kind, skin’ | 26 [gol] ‘circle’ | 27 [sʌp ^h a] ‘clean’ | 28 [sʌk ^h a] ‘branch’ |
| 29 [tat] ‘ruined’ | 30 [sʌxa] ‘branch’ | 31 [tir] ‘arrow’ | 32 [sir] ‘head’ |

19.4 Principle of Complementary Distribution

The Principle of Complementary Distribution is stated as follows:

(19/7)

When two phonetically similar speech sounds, X and Y, occur in mutually exclusive environments, that is, where one occurs the other does not and vice versa, and the substitution of one by the other does not bring about a change in meaning, then the sounds in question are in complementary distribution. Phonetically similar sounds that occur in complementary distribution are allophones of a phoneme.

Examples of two phonetically similar sounds in complementary distribution are given in the examples in 19/8 from English. The sounds are an alveolar lateral, informally called ‘a clear l’ and a velarized alveolar lateral, informally called a ‘dark l’.

(19/8)

(a)

[l]

[lip] lip
 [li:p] leap
 [let] let
 [læp] lap
 [lək] lock
 [blɒk] blok
 [laɪk] like
 [laʊd] loud
 [ləʊ] low
 [liə] Lear

(b)

[ɫ]

[ˈbelɪ] belly
 [brɪˈli:v] believe
 [srɪˈlekt] select
 [ˈsæli] Sally
 [ˈkɒlə] colour
 [ˈkɒləm] McLeod column
 [ˈwaɪli] wily
 [əˈləʊn] alone
 [ˈbʊli] bully
 [əˈlu:f] aloof

(c)

[l̥]

[p^hleɪ] play
 [p^hlaɪ] ply
 [p^hləʊsɪv] plösive
 [p^hlæsɪd] placid
 [p^hlʊl] plural
 [k^hleɪ] clay
 [k^hlaʊd] cloud
 [k^hləʊs] close_{Adj}
 [k^hlə:] claw
 [k^hleə] clear

[ɫ̥]

[p^hɪl] pill
 [fi:ɫ̥] feel
 [t^het̥] tell
 [serɫ̥] sail
 [kɛɫ̥] cult
 [bɪɫ̥dɪŋ] building
 [bɛɫ̥k] bulk
 [fɪɫ̥m] film
 [bʊɫ̥] bull
 [fu:ɫ̥] fool

The environments for the sounds [l], [l̥] and [ɫ̥] are listed in (19/9)

(19/9)

(a)

[l]

(b)

[l̥]

(c)

[ɫ̥]

(d)

[ɫ]

# __ ɪ	e __ i	p ^h __ eɪ	ɪ __ #
# __ i:	ɪ __ i:	p ^h __ aɪ	i: __ #
# __ e	e __ ə	p ^h __ əʊ	e __ #
# __ æ	æ __ i	p ^h __ æ	eɪ __ #
# __ ɐ	d __ i	p ^h __ ʊ	ɐ __ t
# __ ɒ	k __ aʊ	k ^h __ eɪ	ɪ __ d
# __ aɪ	b __ e	k ^h __ aʊ	ɑ __ k
# __ aʊ	#b __ ɔ	k ^h __ aɪ	i __ m
# __ əʊ	#s __ aɪ	k ^h __ ɔ:	ʊ __ #
# __ ɪə	#f __ əʊ	k ^h __ ɪə	u: __ #

When you pay close attention to the environments, you can see a generalization emerging from the lists. The lists in the columns (a) and (b) are both for the clear [l]. The list in column (c) is for the voiceless [l̥], and the list in column (d) is for dark [ɫ]. The generalization for list (a) is that [l] occurs word-initially and followed by a vowel. We say ‘a vowel’ because if you try to characterize the type of vowel in that position, you will find it is very difficult to do so, as the list includes front and back vowels, close and open vowels and monophthongs and diphthongs. The following vowel thus appears to be any vowel. The generalization for list (b) is that [l] occurs between two vowels. We cannot specify the type(s) of vowel here on the same logic as for (a). The generalization for the environments in list (c) is a preceding aspirated voiceless bilabial and velar plosive and a following vowel. The fact that the voiceless lateral is not preceded by an aspirated voiceless alveolar plosive [t^h] is because the lateral does not occur after an alveolar plosive; if it did we can expect that [l̥] would occur in that position, too. The generalization for the environments in list (d) is a preceding vowel and a following word-boundary or consonant. The generalization regarding a following consonant can be attested by trying to find examples for other consonants in words such as *help*, *bulk* etc. The three sounds are thus in complementary distribution: [l] occurs word-initially or between two vowels or between a consonant (other than [p^h] or [k^h]) and a vowel, [l̥] occurs after an aspirated voiceless labial and velar plosive, and [ɫ] occurs word-finally or before another consonant.

The conclusion we draw regarding the sounds in question is that they are allophones of the same phoneme. A question that arises at this stage is which phoneme are they allophones of? The answer to that question is that the phoneme of which they are allophones is known by the allophone that has the least restricted distribution. In this case, [l] has the least restricted allophone. If we look for more data on the distribution of [l], we will in fact find it occurring in other environments that are not shared by the

other two allophones, as in *Ridley*, *cloud*, *block*, *tablet*, *slide*, *flow* etc. The environments in these words for the occurrence of [l] are as follows:

(19/10)

d __ i
k __ aʊ
b __ e
#b __ ɔ
#s __ aɪ
#f __ əʊ

Thus, [l] also occurs following a consonant other than [p^h] and [k^h]. Therefore, the phoneme constituting [l], [ɫ] and [ɭ] is the most widely distributed allophone [l].

The analysis of the English alveolar laterals can be written in the following informal format:

Informal statement

(19/11)

- a. [ɫ] occurs when preceded by an aspirated voiceless plosive, e.g. [p^hleɪ], [k^hɒʊs]
- b. [ɭ] occurs word-finally or when followed by a consonant, e.g. [fi:ɭ], [ˈbɪɾɪŋ].
- c. [l] never occurs when preceded by an aspirated voiceless plosive or followed by a consonant or word-finally, e.g. [lʊk], [ˈbeli], [t^hæbɫet].
- d. [ɫ], [ɭ] and [l] are all alveolar lateral consonants and differ from one another in voicing or in being velarized and are thus allophones of a phoneme.
- e. [l] has the least restricted distribution.
- f. Therefore /l/ is the phoneme constituting the allophones [ɫ], [ɭ] and [l].

Formal statement-I

The statement above concerning the English laterals can be written in a preliminary formal format summarizing the observations in (19/12) thus:

(19/12)

/l/ has three allophones:

- i. [ɿ] / aspirated voiceless plosive_
- ii. [ɸ] / — $\left. \begin{matrix} \# \\ \text{C} \end{matrix} \right\}$
- iii. [ɿ] / Elsewhere.

The formal statement-I in (19/6) assumes the notion of the phoneme as a family of sounds, with all the three realizations occurring in complimentary contexts. The contexts are stated using minimal formal devices, such as the brace and the slash // and the square brackets. One of the allophones is selected as the basic allophone to represent the phoneme. This is the most widely distributed allophone, or the allophone that occurs in the Elsewhere environment. The Elsewhere environments is stated at the end.

Exercise

Khezha (Kəpfo 2005).

(19/13)

- | | | |
|--------------------|--------------------------------|-------------------------------------|
| 1. [iwe] 'yours' | 2. [hio] 'sacastic' | 3. [di] 'to make a cup with a leaf' |
| 4. [nie] 'rich' | 5. [metʃuru] 'a lump of salt', | 6. [merikà] 'the handle of an axe' |
| 7. [menia] 'noise' | 8. [keti] 'mouth', | 9. [die] 'big' |

Look for the contexts in which the unrounded high front vowel [i] and the unrounded high central vowel [ɨ] occur in the above data from and answer the following questions:

- i. State whether they are phonemes or allophones.
- ii. State the relevant contexts for them and present the generalizations in the informal format as well the Formal Format-I

Formal Statement-II

One of the ways in which phonology has grown in the past sixty years is by trying to present generalizations in as simple a form as possible. The goal has been on the formal presentation of phonological generalizations. This is still one of the major goals of phonology.

As we mentioned above, Formal Statement-I for phonemic statements takes the view of the phoneme as a family of sounds. In addition, it assumes that a phonemic

