CHAPTER-5
STRUCTURE AND SYSTEM

5.1 PHONOLOGY

The four preceding chapters examined the sounds of human speech in a general way, and discussed their production and classification. The next step is to consider how the sounds are organized in a particular language. The term 'phonology' is often used for the study of the sound patterns of a language.

Each language uses only a limited number of speech sounds human being can produce. These sounds are then organised into characteristic patterns. They are grouped into significant sound units which are arranged in structures and systems. The term 'structure' refers to what are called syntagmatic relations between units, that is, the way these units are arranged in a sequence to form larger units. The term 'system' is used for what are called paradigmatic relations that is, the way these units form classes on the basis of the places they can take in the structures of the language. For examples, in the spoken English sentence-look at the rat - there occurs a phonetic unit which can be identified as being represented by the letter r in the spellings; it forms part of the linguistic entity, namely-at. It is in paradigmatic relation with those other phonetic units which
could also be found in English in the same place in a linguistic entity as \( r \) is; for example, \( c, b, m \).

look at the cat,

look at the bat,

look at the mat, and so on

The two kinds of relation can be shown thus:

\[
\text{look at the \{ r \at \ b \at \ m \at \ c \at,}
\]

the horizontal link expresses the syntagmatic relations of \( r \) and the vertical link indicates the paradigmatic relations of \( r \). It is therefore quite obvious that \( r \) belongs to a system of elements which can occur in a certain place of a structure in a certain type. Hence, the system is a complete inventory of the elements possible in that particular place; and the structure in this particular case is a single syllable, which is also a word, beginning as well as ending with a consonant.

**5.2 STRUCTURE**

The pulmonic air-stream mechanism is responsible for the
production of a syllable. Its basis is a chest-pulse, on which are superimposed the articulatory movements of the vocal cords and the velum which produce segments. A syllable can be divided into three phases.

(a) the starting by a chest-pulse of a small amount of air on its way out from the lungs;

(b) the passage of this air through the vocal tract;

(c) the conclusion of the movement of this air.

The four monosyllabic words in English ear, tea, egg, bat will illustrate these three points. These segments are related to the phases of the syllable as follows:

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 1 2 3
ear
tea
egg
bat
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Each phase of the syllable corresponds a place in the syllable structure, and different patterns of structure arise from the manner in which the three places are filled by segments, which
represent the elements of syllable structure. There are two kinds of elements, and symbols have already been introduced by means of which the patterns can be expressed in formulas. The symbol \( V \) is used for the element in place 2 which is obligatory and which may be called the syllabic element; and \( C \) is used for the releasing and arresting marginal elements, which are optional, in place 1 and 3. O or zero indicates the empty place with no element of structure there. Thus in the four words, syllables can be exemplified indicating the following four different patterns:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>ear</td>
<td>O</td>
<td>V</td>
</tr>
<tr>
<td>tea</td>
<td>C</td>
<td>V</td>
</tr>
<tr>
<td>egg</td>
<td>0</td>
<td>V</td>
</tr>
<tr>
<td>bat</td>
<td>C</td>
<td>V</td>
</tr>
</tbody>
</table>

The difference between these structural patterns lies only in whether the marginal places are filled or empty. They are four very simple patterns. Other, less simple patterns are possible which arise from complex articulations occurring at the marginal places, resulting in several \( C \) elements there instead of just a single one. For example, the English, syllable screens
has CCC in place 1, and CC in place 3: its structural pattern is CCCVCC. Sequences of C elements of this kind are known as consonant clusters; by the size of a cluster is meant the number of C elements contained in it.

Different languages make use of different ranges of patterns of the syllable structure. Some languages have an even larger number than English, while others have a more restricted range. There is no language known that allows only one patterns, though there are many which have only two. For example, Keresan (a language of the Rio Grande Valley) makes use of the patterns CVC and CVO only, and no other is permissible. These two patterns of syllable structure can be expressed in a single generalized formula (CV(C), where the brackets round the C indicates the optional presence of an element at that place - (C) is equivalent to ‘either C or O’. The existence in a language of only these two particular syllable patterns, where C is obligatory in place 1, is not a common state of affairs. A number of languages make use of only two patterns OVO and CVO, having place 3 always empty. Japanese is such a language, and so are many Polynesian languages. A generalized formula for these languages, constructed in the same way as the one for Keresan, would be (C) VO.
Some languages, for example, Cantonese have all four of the simple patterns OVO, CVO, OVC, CVC. Among the languages which do permit consonant clusters, differences are found in the size of the clusters, and in the structural place where they are permitted. For example, both Spanish and Arabic syllable patterns contain clusters, but of not more than two consonants. In Spanish, clusters are only permitted in place 1, while in Arabic they are only permitted in place 3. The largest possible cluster in place 1 in English is CCC, and the largest in place 3 is CCCC. In Georgian and in other languages of the Caucasus clusters of upto six consonants can be found in place 1. Some American Indian languages also allow clusters of this size.

A generalized formula for English syllable structure constructed in the same manner as the preceding ones, would be (C)(C) (C) V (C) (C) (C) (C). There is a simple way of generalizing syllable structure formulas for languages which have clusters. For example, the formula of English would be Co.3 V Co.4. The subscript figures here indicate the possibilities, the number of elements for that place of syllable structure. Thus Co.3 means that there can be anything from no to three C elements in place 1. Some languages have structural restrictions of various kinds which operate within the limitations imposed by the range of patterns of their syllable structure. Thus in English the
consonant corresponding to the letters ng in the word sing, a voiced velar nasal, can represent a C element in place 1. To converse restriction applies to the consonant h at the beginning of the word hang this can represent a C element in place 1, but never in place 3. A voiced velar nasal is free from this structural restriction in many other languages such as Sanskrit or Arabic.

In the account of syllable structure, the examples have been chosen not just syllable but single syllable words or monosyllables from English. It is sufficient to describe the structure pattern of monosyllables in some languages: they will be the structure patterns of all syllables, including those that go to make up polysyllables, or words of more than one syllable. This would be the case with French. There are various restrictions on the C and V elements of monosyllables which do not always apply to the constituent syllables of polysyllables. For example, tr is not permissible as an arresting cluster in a monosyllable; but it is an arresting cluster, in the pronunciation of many people, in the first syllable of the polysyllable petrol.

Restrictions which concern vowels in English monosyllables do not always apply in polysyllables. The vowels in the words sit, hut, cook can only represents the V element in a monosyllable if place 3 is filled. They cannot occur in a syllable pattern which ends in O.
In many languages, restrictions are found in polysyllables, on what may fill word-initial places or word final places. Thus the consonant which is found in the middle of the word treasure can never be word initial in English, though it may be syllable-initial within the word, as in many people's pronunciation of measure. In German fricatives and stops are always voiceless in word final position. In Finnish, only five consonants, l,n,r,s,t are permissible in word-final position, though others can be syllable-final within the word. In Finnish no clusters are allowed in word final position, though releasing clusters are found elsewhere within the word.

However, syllable division in English does not by any means always go according to the etymology, and sometimes one finds quite unexpected divisions, even when the consonant sequence extends over two words. There is a good deal of personal variation in this point, but the following examples of unexpected syllable division have been noted within words; war-drobe, teas-poon, atmos-phere, ea-chother, ba-ckward, mi-stake, and between words: extre-me, a-tleast, a-thome, thi-safternoon.

Another structural point arises with polysyllables, usually the syllabic element. In the central place of the syllable, is represented by the kind of segment is called a vowel,. For example, in the second syllable of the polysyllable button, as
pronounced by most English speakers, there is no vowel between
the /t/ and the /n/. The /n/ of button, when the word is pronounced
in this way is called a syllabic /ŋ/.

5.3 VOWELS AND VOCOIDS

'Vowels' and 'consonants' can be defined according to the
general phonetic form of the segment, Vowels can be defined as
modifications of the voice i.e. sounds that involve no closure,
friction, or contact of the tongue or lips and all other segments
are termed as consonants.

A vocoid is a segment with a stricture of open
approximation, with or without a velic closure, and with central
passage of the airstream. All other segments are contoids. The
term syllabic for a segment representing a V element of syllable
structure, and non-syllabic for a segment representing a C
element of syllable structure. For example, in English, a syllabic
vocoid in awe, a non-syllabic vocoid at the beginning of yes, a
syllabic contoid in the second syllable of people and a non-
syllabic contoid at the beginning of bat.

Syllabic vocoids and non-syllabic contoids are the most
common in the languages of the world. Non-syllabic vocoids and
syllabic contoids are rare. Voiced non-syllabic vocoids, besides
those at the beginning of English yes and wet, are found at the
beginning of English run, and at the beginning of French huit; and voiceless non-syllabic vocoids of various qualities are found at the beginning of English he, who, half, and in many other words in many other languages. Syllabic contoids are often heard in interjections, such as English sh! or hmm ! Syllabic l and n are found in many languages besides English; syllabic m is found in many African languages; a syllabic trill r is found in Serbian. In English many syllabic contoids can be detected in informal rapid speech. For example, in never forget a syllabic V sometimes makes up the whole of the second syllable of never.

5.4 QUANTITY

The term 'quantity' can be defined as the relative length—duration in time—of segments. From the point of view of general phonetic taxonomy, the length of a segment is quite irrelevant; but it may have phonological importance from the point of view of syllable structure.

In many languages a fixed and predictable relationship holds between the lengths of segments in a syllable. This is true of most kinds of English. All monosyllables in English tend to be of the same length under similar circumstances. The total length of a monosyllable is made up by the lengths of the individual segments that constitute it. Releasing consonants contribute
little; they are uniformly very short. The relative length of the remaining segments on two factors. The first factor is the pattern of structure in which they find themselves. Thus the vowel in a syllable of the pattern CVO is longer than the vowel in a CVC pattern, which in turn is longer than a vowel before a voiceless one. The overall length of the two monosyllables heat, seat is the same, but the vowel of the first has about twice the duration of that of the second. The second factor is illustrated by the fact that the vowel in heat has greater duration than the vowel in hit, and the vowel in seat than that in sit. These two vowel sounds always have this difference of length when they occur in the same circumstances.

There is a difference in vowel duration between the two monosyllables sit and seat, they both exemplify the same pattern of syllable structure, namely CVC. The two monosyllables leak and leak, in this particular accent must be regarded as exemplifying different patterns. The first is CVC, but the second is best formulated as CVVC, the long vowel being indicated by the two Vs. A difference of vowel length which makes a difference of syllable structure is called a difference of vowel quantity.

The particular type of Scottish accent is unusual most accents of English do not have structural distinctions of either
vowel or consonant quantity. Such distinctions are found in many languages. They are most common where vowels are concerned less common where arresting consonants are concerned (Gaelic and Finnish are examples of languages which have distinctions of vowel quantity) for example, Arabic and Hungarian.

There are occasions when a vowel posture is maintained for longer than it is in other circumstances in the language, but its duration extends over two syllables. The word *pitying*, in the pronunciation of many English speakers, has the same vowel posture maintained from the *t* to the *ng*, but a chest-pulse occurs in the course of it. i.e. it represents VV. The French word *creer*, similarly has the structure CCV-V, it contains a single vowel posture, but two syllables which is known as double vowel, which must be distinguished from long VV in *peak*. Double consonants also must be distinguished from long consonants. A double consonant is one whose duration extends over two syllables, whereas the duration of a long consonant is confined to a single syllable. Double consonants are frequently found in English, especially at word junctions: un-known, book-case, this-sunday, etc.
5.5 SYSTEM

The concept of ‘system’ is used for describing the phonology of a language which deals with paradigmatic relations. A system is an inventory of the items in a language that can represent one of the two elements of structure, C or V; there is thus a C-system and V-system. The two are often referred to together as the sound system of a language. Language can differ from each other in the matter of system as well as in structure.

An immediately obvious difference between languages is in the size of their systems, that is to say in the number of items they contain. V-systems, for instance, may range from three items, as in Classical Arabic and some modern forms through five (modern Greek, Spanish), seven (Italian) eight (Turkish), to much larger systems such as those used by educated speakers in Britain, which may comprise from thirteen to twenty one items, C-systems, also, may be small; Hawaiian has eight, English twenty-two, Scots Gaelic about thirty, some American Indian languages, such as Tlingit, spoken in Alaska, over forty.

There seems to be no necessary relation between the size of the V-system of a language and the size of its C-system; both may be large, or both small, or one small and the other large. For example, Kabardian a Caucasian language, which has forty
five items in its C-system, and three in the V-system. The other difference between languages concerning C and V systems lies in the way they use the general resources of the medium. There is nothing striking about English. Thus a C-system with no labial contoids at all is found in Tlingit; and a C-system with no nasal consonants at all is found in Wichita, an American Indian language spoken in Oklahoma. A similar general phonetic characteristic of a system is the presence of a very large number of items made with a glottalic egressive airstream, such as in Kabardian, or of a large number of items made without voice, such as in Icelandic or Gaelic.

Systems can usually be set out according to general phonetic taxonomic categories so as to reveal symmetries of various sorts in the system; indeed there is a strong tendency towards symmetry in the phonology of languages. If, for example, a hitherto undescribed language is under investigation, and in its C-system voiced and voiceless velar stops, voiced and voiceless dental stops, and a voiced labial stop, are found. Such symmetrical pairing of voiced and voiceless stops and fricatives is very widespread. For example, in Egyptian and Arabic no voiceless labial stop is found in C-system. In V-systems also the same kind of symmetry is found; thus a system of six items might consist of three front vowels and three back vowels, or it
might consist of two front, two central and two back. In Icelandic, six front vowels and only two back vowels is having in its V-system.

5.6 PHONEME THEORY

Every language has a large number of vowel and consonant sounds forming the sound system of that language. These sounds can be grouped into a limited number of distinctive sound units which are called the phonemes of that language. Phoneme theory relates a great deal of the variation in the phonetic quality of segments to their environment. It thus reconciles the extensive variety of segments with a limited size of systems. The items in a system are phonemes, not segments and the number of phonemes is much more limited than that of segments in a language. It is possible, in any language, to formulate rules by which the phonetic quality of any given segment can be accounted for (a) by indicating the phoneme it represents and (b) by revealing its environment.

A phoneme therefore is a group of segments which are different from the point of view of general phonetic taxonomy, but have the same function phonologically. The segments which a phoneme comprises, or which represent it, are said to be members of that phoneme or allophones of it. Each allophone is
tied to a certain kind of environment: it never occurs apart from certain features in the environment. In any language, every discriminable allophone has an environment that goes with it. It often seems obvious why different allophones of a phoneme are tied to particular contexts. For instance, *sit* and *sat*, the differing points of contact between the tongue and roof of the mouth for the initial consonant-further forward in the former, further back in the latter. The tongue having to travel the minimum distance in order to reach the posture required for the following vowel. Allophones are not grouped into phonemes by nature, but by the phonology of a particular language. For example, in French a difference between the consonant segments of *qui* and *cas* which is similar to the difference between the consonant segments in English *key* and *cas*. Phoneme theory can be identified by the existence of minimal pairs in a particular language. A minimal pair is a set of two words which differ from each other in one sound. *Meat* and *neat* constitute a minimal pair in English and differ from each other in the initial consonant. *Pin* and *spin* do not constitute a minimal pair because *spin* has an additional sound. So, it can be said that a phoneme is a minimal distinctive sound unit of a language.

Therefore, it can be said that the concepts both of structure and of system deal with abstractions. In the case of structure,
the abstractions are the elements of the patterns, C and V; in the case of system, they are the terms in the system, the phonemes. An actual occurring segment in an utterance simultaneously represents an element of structure, and represent a term in a system; it is not identical with either, since, both are generalization from very many segments.