Post-Graduate Diploma in the Teaching of English

GENERAL AND ENGLISH LINGUISTICS

BLOCK I

PHONOLOGY

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BLOCK I

PHONOLOGY

Contents

INTRODUCTION TO THE BLOCK

The aim of this block is to tell you not a great deal about the theoretical aspects of phonology, but to give you some experience of what phonologists do and why they do it. The block consists of four units:

Unit 1: Segments vs Features
Unit 2: Phonological alternations
Unit 3: The form and notation of rules
Unit 4: Syllable in phonology

These units stress only the analytical techniques rather than theory construction or evaluation of competing theoretical models. In other words, they aim at achieving the more practical goal of learning how to see patterns in phonologies and understanding how phonological systems work.

It is impossible to teach a subject like phonology without reference to a host of languages. Data from different languages have been used to exemplify different phonological processes. There are nearly 5000 languages in the world today. And no two languages have the same sound structure, and yet they show striking similarities in their sound system. Phonologists try to understand the structure behind these systems.

Unit 1

Segments vs Features

Contents

Unit 1
SEGMENT VS FEATURES

1.0 Introduction

A phoneme, if you recall from your course on *Phonetics and Spoken English* is defined as a *minimal distinctive* unit of sound. While reading preliminary books on Phonetics and Linguistics, you might have noticed that the terms sound/segment and phoneme are often used interchangeably. This sometimes leads to confusion in the minds of beginners. I shall, therefore, begin by trying to make a very simplistic distinction between a sound/segment and a phoneme.

A sound/segment becomes a phoneme only when it is perceived within the context of a particular language. Hence when we say a phoneme is a minimal, distinctive unit of sound what we mean is that a phoneme is a minimal, distinctive unit of sound in a particular language. We can, therefore, say that the sound /θ/ is a phoneme of English but not of Hindi (or any other Indian language, for that matter). If, on the other hand, we talk of the sound [θ] without putting it in the context of a particular language, then we are NOT talking of the phoneme /θ/ but of the sound or segment [θ]. (Notice how we capture this notion by using different types of brackets). In other words, while talking about the segment, we are only concerned with the ***form*** of the sound (the way it is produced by the speaker and/or perceived by the hearer). When we talk of the phoneme, we are concerned with the way the sound ***functions*** in a particular language (whether it occurs in a contrastive or complementary distribution or in free variation, whether it occurs initially, medially or finally or in all the three positions, etc.).

This rather simplistic distinction between a segment and a phoneme is often taken for granted in most books on phonology. Perhaps this is because it is assumed that the reader is aware that "phonologists attempt to make explicit statements about the sound patterns of ***individual languages*** in order to discover something about the linguistic ***knowledge*** that people must have in order to ***use*** these patterns" (0' Grady, et aI 1991:54). Isn't this quote a bit complicated? Let me try to deconstruct this a bit.

In your course on *Introduction to Linguistics* (for the PGCTE), I had sketched a brief history of Linguistics wherein I had explained in detail the aim of 'modern' Linguistics as understood within the

framework of Generative Linguistics. The aim of generative linguistics is to ***discover*** something about ***linguistic structure*** and ***linguistic constructs*** (of not only the sound patterns (phonology) but also the syntax, the morphology and the semantics of individual languages) that are innate. These innate linguistic structures/constructs help us in ***acquiring*** and ***using*** the observed patterns of language. Generative linguistics is an attempt at establishing these structures and constructs that constitute ***linguistic knowledge***. Linguists are interested in finding out the structure of this knowledge. What constitutes this knowledge? Do we store every bit of information (that we need in order to use language) in our brain or only a part of it? For example, phonologists have to find out how native speakers of English know that forms like ***slish*** and ***screak*** are possible 'English' sequences, while forms like ***srish*** and ***sgreple*** are not. Linguists are concerned with patterns, which exist in individual languages at every level of organization, i. e. sounds, words, meaning properties, etc.

The ultimate goal of generative linguistics is to examine individual languages in order to discover ***universal*** patterns (of sound, syntax or meaning) which may exist for ***all*** languages.

One of the developments in the direction of establishing 'universal' patterns is the discovery that phonemes are no longer the minimal distinctive units of sound. Linguists are now of the opinion that phonemes are composed of smaller units called ***distinctive features***. In this unit, I shall explain why phonemes can no longer be considered the minimal, distinctive phonological units and redefine and reclassify the phonological units of sounds in terms of distinctive features. By the end of this unit, you will be able to:

- explain the difference between different types of features, and
- define a given sound in terms of its distinctive features.

1.1 Distinctive features: a preliminary view

Current linguistic practice does not assume that segments (or phonemes for that matter) are the ultimate units of phonological structure. Instead, linguists argue that segments (or phonemes) are composed of smaller units, the ultimate, universal substantive in phonology (other instances of universal substantives in linguistics are noun, verb, adjective in grammar; morpheme, affix, etc. in morphology and so on). The phoneme is ***no longer*** the minimal distinctive unit of sound. The minimal or the smallest unit of sound is the ***feature.***

Now, what is a feature? You have already seen in your course on *Phonetics and Spoken English* that sound is produced by a number of co-ordinated articulatory activities such as voicing, tongue position, lip rounding and so on. Each of these activities is given the name of a feature. Hence if lips are rounded for the production of a sound then one of the features used to describe that sound is [round]. Features like [labial], [anterior], [consonantal], (features are written in square brackets) are directly grounded in articulatory gestures. Each feature is rooted in, more or less, independently controllable aspect of sound/speech production. A segment like [p] is, for example, composed of features like [labial], [+consonantal], [-continuant], etc. These features simply describe the place and the manner of articulation required for the articulation of the segment [p].

Let us take a concrete example and look at the gesture of articulation in detail. For the production of the sound [p] we take the help of lips (remember, its place of articulation is bilabial) hence we say that the sound [p] is composed of the feature [labial]. Again, when we say [p] there is a complete closure in the oral cavity. In your course on *Phonetics and Spoken English* you have read that consonants are produced when there is an obstruction in the oral cavity or when the two articulators (active and passive) come so close that the air escapes with friction. Hence, another feature necessary to describe the sound [p] is the feature [+consonantal]. Since there is complete closure and the air does not escape through the oral cavity during the closure stage of [p], we can say that [p] is also a [-continuant] sound (implying the absence of continuous airflow).

Depending on the way a particular sound is produced, we can describe its features. For example, the sound [p], in English, is made up of features like [labial], [+consonantal] and [-continuant]. In other words, for English, we can say that a combination of [labial], [+consonantal], and [-continuant] will always result in [p].

Well you might wonder why we couldn't have the same features for the sound [b] and the sound [m]. You are right in questioning this. In order to find the answer for this, you have to ask another question: Which other features are needed in order to distinguish [p] from [b] and [m]? The feature [voice] distinguishes [p] from [b] and [m] ([p] as you know is a voiceless sound). The feature [nasal] distinguishes [b] from [m] ([b] is an oral sound while [m] is a nasal sound). Thus, we see that the set [labial, +consonantal, -continuant] gives us the set of sounds [p, b, m] and we require further specification to get to individual sounds, i.e. [-voice] for

[p], [+voice] for [b], [nasal] for [m]. The addition or deletion of a feature helps us in distinguishing one sound from the other.

What we have understood so far about features is that each segment is composed of a number of features; that the feature is the smallest, irreducible unit of sound and that each feature or group of features defines a specific property of the segment.

You would have noticed that features are sometimes represented in ***binary*** terms. A binary feature either has the value '+' or the value '-'. The value '+' indicates the presence of a feature while the '-' value, indicates its absence. It also implies that both the groups of segments that has the [+] value and the group that has the [-] value form natural classes. For example, the features [+, -consonantal], [+, -voice] and [+, -continuant] are binary features. Some features are ***privative.*** In this case, reference can be made to the class of segments that has the feature, not to the collection of segments that does not possess it. Other terms for privative are ***unary, single-valued, univalent***. For example, the feature [labial] is a privative feature. It allows reference to the group of labial segments only. By claiming that it is a privative feature phonologists are also making a claim that no language ever refers to the class of non-labial segments.

There is no reason why all features should be of the same type.

Let us take the feature [voice] and [consonantal] both of which are binary and compare them with [labial] which is privative.

[+voice]	[-voice]	[+consonantal]	[-consonantal]
vowels			vowels
glides			glides
liquids		liquids	
nasals		nasals	
fricatives	fricatives	fricatives	
stops	stops	stops	

(by stops we mean plosives and affircates).

If you look at the feature specifications, you will find that both [+] and [-] specifications specify natural class of segments in languages. That is why we say these features are binary valued. As opposed to this you will find that no language needs to isolate the set of segments specified as [-labial], i.e. unrounded vowels, unrounded glides, coronals and velar sounds. (Some of the unfamiliar terms used here will be discussed later.) This set just does not constitute a natural class (the notion of ‘natural class’ is

also discussed later). Only [+labial] does. This is the reason why we say that the feature [labial] is a privative feature and you need to specify only its presence.

In the following sections we will introduce you to a set of distinctive features, some of which are binary and some privative. Meanwhile consider the feature ***matrix*** (a collection of features) given below to describe the English consonant /p/.

/p/

(1) [+consonantal] → This is one of the sets of features that distinguishes a consonant, from a vowel or a glide.

[-voice] → This is one of the sets of laryngeal features that defines the 'state of the glottis'. [-voice] implies that the vocal cords are stiff and do not vibrate.

[labial] → This is one of the sets of features that define 'place of articulation'. Notice that there is no need to say [+labial], [-velar], etc. since the presence of one place normally implies the absence of other places.

[-continuant] → This is one of the sets of features that define 'manner of articulation', e.g. [lateral], [nasal], [delayed release], etc.

Looking at these rather complicated feature specifications, one is tempted to ask why we can't be happy with just the three-term labels! Let us, therefore, first examine the reasons why linguists have settled on features as the basic/smallest phonological unit. However, before we move on to that, here's a small activity for you.

Activity A

What is the difference between a sound, a segment, a phoneme and a feature? Do these terms semantically overlap each other?

_____
_____
_____
_____
_____
_____
_____

Discussion

I would go through section 1.1 very carefully once again before writing down the answer for this activity. Yes, there is some amount of overlap in the use of the terms sound and segment. A phoneme and a feature, on the other hand, are well defined.

1.2 Why distinctive features?

There are a number of reasons why phonologists have settled on features as the most basic phonological unit. Some of these reasons are discussed below:

a. Speech is a co-ordinated activity

Speech, as you know, is produced by a number of co-ordinated articulatory activities such as voicing, tongue position, lip rounding, etc. Features reflect individual aspects of articulatory control or acoustic effects produced by articulation. Features like [voice], [round], [back] directly reflect this activity. Each feature is rooted in an independently controllable aspect of speech production. A segment consists of a number of features called ***matrix*** - which when taken together describe a segment. ***Describing segments in terms of features thus reflects this co-ordinated activity.***

b. Natural classes

It is found that phonological processes that are operative within human languages do not involve arbitrary sets of elements, but rather natural sets or natural classes. For a group of sounds to constitute a natural class they must all ***share one or more features, and there should be no other sounds that have this feature or combination of features.***

For example, English has a voice-voiceless contrast which distinguishes phonemes like /p, t, k/ from /b, d, g/ by the feature [voice] alone. Fewer features will therefore be required to describe a ***natural class*** than to describe any ***one*** of its members. Thus more features will be required to describe a single sound, say [p] than natural classes of sounds e.g. [p, t, k] and [b, d, g]. Also notice that it is very difficult to specify arbitrary sets of sounds which do not constitute a natural class, e. g. [p, d, k].

(2)

[p]	**[p, t, k]**	**[b, d, g]**	**[p, d, k]**
[+consonantal]	[+consonantal]	[+consonantal]	[+consonantal]
[-sonorant]	[-sonorant]	[-sonorant]	[-sonorant]
[labial]			If labial or velar [-voice]
[-voice]	[-voice]	[+voice]	If coronal [+voice]

One may ask, "where is the need to specify 'natural classes'?" The prediction that feature theory makes is that natural classes are specified in phonological generalisations, e.g. the set [p t, k] is aspirated syllable initially in English; it occurs after a [s] in a syllable and the set [b, d, g] is devoiced initially and finally in English. Unnatural sets on the other hand, are impossible to characterise precisely because they are never part of any generalisation ***in any language.***

Because features define natural classes, we can now say that it is not individual phonemes like /p/ and /b/ or /t/ and /d/ which contrast in English, rather, the entire class of voiced stops contrasts with voiceless stops. ***It is not the individual segment but the feature [voice], which is contrastive***. Since this single feature is involved in this voice/voiceless contrast, we can say that [voice] is a ***distinctive feature*** of English. Other features provide for other contrasts.

With features, we merely have to re-word the generalisations that we had made with the help of 'minimal pairs' in our earlier course in *Introduction to Linguistics.* For instance, the minimal pair **pit~bit** establishes [+, -voice] as a distinctive feature in English; the pair **pit~pet** the feature [+, -high] and so on. Following this procedure we can establish the set of distinctive features for English.

Thus by systematically combining the phonemic contrasts of a language we can arrive at the phonologically distinctive features and make the phonemic inventory of these languages in terms of these irreducible linguistic units.

c. Simplicity and Naturalness of Rules

Phonologists agree that the notion ***simplicity*** is closely connected to the notion ***generality,*** the more general a process, the more simply it should be statable. The most straightforward way to measure simplicity is by counting the elements that are involved.

Distinctive features make it possible for a rule to be stated in a simple way. For example, consider rules (3) and (4). If they are written, as they are, it is not possible to convey the fact that rule (4) is more general than (3):

(3) k → tʃ /--------i
(i.e., [k] becomes [tʃ] when it is followed by [i])

(4) k → tʃ /---------[i]
[e]
[æ]
(i.e., [k] becomes [tʃ] when it is followed by [i] , [e], and [æ])

However, if distinctive features were used instead of phonemes, the two rules would be represented as (5) and (6), respectively:

(5) k → tʃ /---------[+syllabic]
[+high]
[-back]

(6) k → tʃ / ------- [+syllabic]
[-back]

If we use distinctive features (DFs) it becomes clear that rule (4) (reformulated as (6)) is more general than rule (3), because rule (6) utilises fewer symbols than rule (5) and refers to a natural class of sounds, namely front vowels. DFs thus make it possible for us to capture the notion "generality of a rule" or "simplicity of a rule." (You will read about these in detail in the following units). Further, the use of features explains why this change takes place. Compare the two formulations below:

(7) k → tʃ / ---------[+syllabic]
[-back]

(8) tʃ → k /----------[+syllabic]
[-back]

Both seem equally plausible when stated on phonemes. However the moment you specify sounds in tenns of features (as in (9) and (10) respectively), it becomes clear that whereas (7) is a plausible rule type, (8) is not.

(9) [+cons, +back, -voice] → [+cons, -back, -voice] / ---[+syllabic, -back]

(10) [+cons, -back, -voice] → [+cons, +back, -voice] / --- [+syllabic, -back]

In other words, feature specifications reflect our intuition that (9) is a case of assimilation; the frontness of the vowel fronts the preceding velar sound. Phonological theory also predicts that (10) is highly unnatural, if not altogether impossible as a rule.

d. Universality

Making an inventory of the sounds of a language in terms of segments has a disadvantage. For every language a new phonemic chart will have to be made, because the value of a particular phoneme is defined in terms of the relationship it enters into with the other phonemes of the language.
For example, the value of [n] in a language which has only two nasals, e.g. [m] and [n] will be different from that of a language which has three nasals, i.e. [m], [n], and [ɲ]:

	[n]	**vs**	**[n]**
(11)	(in [m] and [n] system)		(in [m], [n] and [ɲ] system)
	[+nas]		[+nas]
	[labial/coronal]		[labial/coronal[+,-high]]

In a language where there are only two nasals, we need to just choose between labial and coronal. However in a language with a three way contrast between labial, coronal and palatal nasal, we need to specify further as to whether the coronal is [+] or [-] high.

DFs thus transcend individual languages. The use of different DFs will capture the difference between languages. DFs constitute a ***universal set*** that applies to all human languages in a uniform and unambiguous way. This is possible because features are set up on the basis of the characteristics of the vocal apparatus, which is the same for all languages.

e. Allophonic variation better statable

Distinctive features also enable us to understand the nature of allophonic variation more exactly. Allophonic variation is now looked at not simply as the substitution of one sound for another, but rather as an ***environmentally conditioned change***. For example, in English, when we state that liquids and glides [i.e., 1, r, j, w] are devoiced when they are preceded by voiceless stops, what we are actually saying is that the feature [voice] changes its

value from [+voice] to [-voice] when it is preceded by a syllable initial stop.

(12) $\begin{matrix}[+\text{sonorant}] \\ [+\text{voice}]\end{matrix} \rightarrow [-\text{voice}] \; / \; [-\text{continuant}]\text{------} \begin{matrix} \\ [-\text{voice}]\end{matrix}$

Instead of saying

(13) l, r, j, w → l̥, r̥, j̊, w̥ / p, t, k---------

Notice that the same set of sounds, namely [p, t, k], occurs in so many statements in English. It occurs in the statement pertaining to aspiration; it is the conditioning factor for the devoicing of liquids and glides; and it is the set that is allowed after [s] syllable initially.

These reasons are arguments enough to convince us that recognizing features as the smallest/basic unit of phonological structure is definitely advantageous. Features help us to state all phonological facts about a particular language. Only a limited number of features are needed. Instead of listing individual sets of contrastive phonemes, the contrasts are now expressed at the level of the feature. Remember, whereas a list of phonemes is an arbitrary set, a set of 'phonemes' identified by a set of features is a natural class. Features thus constitute an important part of a theory of what is possible in the phonological behaviour of human beings.

The use of features, at first, may look a bit more complex and clumsy than the use of segments. But in the long run it is very advantageous. In later units, when you begin to analyse data from different languages, you will see how features help us to state phonological rules more naturally and economically.

In the following section we shall examine in detail the definitions of all the features used in current linguistic research. However, before we do that you should try to do the following activity:

Activity B

Give at least two reasons to establish the superiority of distinctive features over phonemes as the minimal phonological unit.

You should not take more than 20 minutes to do this activity.

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_____
_____

Discussion

I would mention natural classes and the fact that allophonic variations are better statable in terms of distinctive features as my answer. This is because, when we do phonology, these two reasons actually force us to use distinctive features and show us how a rule is very NATURALLY statable if we use distinctive features, i.e. the conditioning segments constitute a 'natural class' and the changes that are brought about constitute a 'natural change'.

1.3 Distinctive features of English

I think it will be a nice idea to take a good look at the features needed to describe all the sounds of English before going on to understand what an individual feature stands for. The following charts give you a glimpse of features needed to describe the consonant and the vowel sounds of English.

Feature Matrix for Consonants

		p	b	t	d	k	g	f	v	s	z	θ	ð	ʃ	ʒ	tʃ	dʒ	m	n	ŋ	l	r	j	w	h	ʔ
Major class	[consonant]	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-
Features	[sonorant]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	-*	-*
Place	[labial]	+	+					+	+									+						+		
Features	[coronal]			+	+					+	+	+	+	+	+	+	+		+		+	+				
	[anterior]			+	+					+	+	+	+	-	-	-	-		+		+	+				
	[strident]									+	+			+	+	+	+									
	[distributed]			-	-					-	-	+	+	+	+	+	+		-		-	-				
	[dorsal]					+	+													+			+			
	[radical]																									
Laryngeal	[voice]	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	+	+	+	+	+	+	+	-	-
Features	[CG]																									+
	[SG]																								+	
Manner	[nasal]																	+	+	+						-
Features	[continuant]	-	-	-	-	-	-	+	+	+	+	+	+	+	+	-	-	-	-	-	+**	+	+	+	+**	
	[lateral]																				+	-				
	[delayed release]															+	+									

Absence of both '+' and '-' indicates that the features is redundant for the description of that particular sound.
*Status of [h] and [ʔ] as [-sonorant] is controversial.
**Status of [l] and [h] as [+continuant] is unresolved.

Feature Matrix for British English Vowels

		iː	I	e	æ	ʌ	ə	ɜː	ɑː	uː	U	ɒ/ɔ	ɔː
Major class Features	[consonant]	-	-	-	-	-	-	-	-	-	-	-	-
	[sonorant]	+	+	+	+	+	+	+	+	+	+	+	+
Laryngeal Features	[voice]	+	+	+	+	+	+	+	+	+	+	+	+
Place Features	[labial]									+	+	+	+
Dorsal Features	[high]	+	+	-	-	-	-	-	-	+	+	-	-
	[back]	-	-	-	-	*	*	*	+	+	+	+	+
	[low]	-	-	-	+	+	-	-	+	-	-	+	-
	[tense]**	+	-	-	-	-	-	+	+	+	-	-	+
Manner Feature	[continuant]	+	+	+	+	+	+	+	+	+	+	+	+

Some of the dorsal features are also applied to consonants, but for the purpose of this introduction, we will regard them as applying just to vowels and glides.

*Central vowels are generally not specified for [back].

**Since we have specified the vowel for [tense] we cannot specify them for [ATR].

Various English words whose vowels differ in relative tongue positioning are given below along with the corresponding symbols they represent.

	American	**British**		**American**	**British**
beat	[iy]	[iː]	bat	[æ]	[æ]
bit	[I]	[I]	father	[a]	[ɑː]
bait	[ey]	[ei]	foot	[U]	[U]
bet	[∈]	[e]	boot	[uw]	[uː]
bought	[ɔ]	[ɔː]	but	[ʌ]	[ʌ]
boat	[ow]	[∂u]	about	[∂]	[∂]
bird	[∂r]	[∂ː]	cot	[a]	[ɔ]

For vowels in words like *beat, bait, boot,* and *boat* only the first segment of the diphthong is taken into consideration.
Words like *father* and *cot* are pronounced alike in American English.

You may have noticed that most features have labels that reflect traditional ***articulatory*** terms such as [voice], [consonantal], [nasal], [round], [back], [lateral], [labial], etc. These features require little explanation. A few features have less familiar labels like [coronal], [anterior], [continuant], [strident], etc. These need some explanation. However, before we move on to understanding each individual feature let us examine, in brief, the historical origins of DFs.

Historically, features go back to the Prague School of Phonology. It was way back in 1952 when Jakobson, Fant and Halle proposed that each segment/phoneme could be further sub-divided into a number of features. Their description of each feature was based on the ***acoustic*** characteristics of the segment. In other words, the 1952 model of DFs described the sounds in terms of the way in which sound waves travelled from the speaker's mouth and the way they were perceived by the hearer.

The sound [p] was described by the features [+grave, - compact, - sharp, etc.]. The feature [grave] for example, reflected the concentration of energy in lower frequencies of the spectrum. Energy, frequency, spectrum, etc. are terms used in a branch of phonetics called ***acoustic phonetics***. You may find these terms difficult to understand at this point. However, what is important to know is that by 1968 the model of DFs propagated by Chomsky and Halle had shifted its focus from acoustic to ***articulatory*** phonetics. Features were described in the way sounds were produced in the oral cavity. The focus was on the active articulator - its state, or configuration rather than its location (as in the traditional place of articulation prevalent in phonetic description).

In the current linguistic practice, features are described in terms of their articulatory characteristics. Features now, not only distinguish the members of a phonological system, they also relate them to other members in the system. [p], for example, may be ***distinguished*** from [b] by being voiceless as opposed to voiced, the same [p] may also be ***united*** by that same feature (voiceless) with some other segment (perhaps a [t]). Hence the set of DFs that characterises any one phonological element, in addition to distinguishing it from other elements of the same inventory, simultaneously identifies it as occupying a particular place in a complex network of contrasts.

One of the major roles of DFs is to ***distinguish*** and ***relate*** the elements of phonological systems across the range of possible human languages. Features are not arranged haphazardly in a

matrix. Rather, they are organised into groups that reflect natural classes.

In the following section we shall explore what these classes are and how the features represent them. Meanwhile, why don't you try to answer the following question?

Activity C

What in your opinion is the difference between the 1952 and the 1968 models of distinctive features?

You should not take more than five minutes to answer this question.
Write the answer in the space provided below.

_____
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_____
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_____
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_____
_____
_____
_____
_____

Discussion

The crucial difference lay in the way phonolgists described the distinctive features.

1.4 Classes of feature classification

The features are broadly classified into the following natural classes.

A. Major class features (which classify segments into segment types like 'vowel' and 'obstruent')
B. Place features (which encode the place of articulation)
C. Laryngeal features (which specify glottal properties of the segment)
D. Manner features (which specify the type of constriction, or more generally the manner of articulation)

A.**Major class features**: There are only two major class features: **consonantal**, and **sonorant**. Major class features primarily deal with the behaviour of the ***vocal tract***. Vocal tract behaviour, as you already know, can be described as an alternation of closing and opening (which results in the production of voiced or voiceless sounds). All major class features are binary in nature.

i. **Consonantal/nonconsonantal** [+, - cons]: Consonantal sounds are produced with an obstruction (in the flow of air-stream) in the vocal tract. The obstruction should be at least to the extent required in the production of fricatives. All nonconsonantal sounds are produced without such an obstruction. [+cons] is the feature required for all the **plosives, affricates, fricatives, nasals** and **liquids** like [l] and [r]. (The term 'lateral' is used for any l-type sounds, while the term 'rhotic' refers to any r-type sound, laterals and rhotics are often referred to as 'liquids'.) [-cons] is the feature needed for vowels and glides. The term glide is used to refer to semi vowels [j] and [w] and also the glottal sounds [h] and [ʔ] because their stricture is in the larynx rather than the vocal tract. [cons] is the short form of the feature consonantal. While writing the features of a segment we can state whether it is a [+cons] or a [-cons] sound. [-cons] sounds are also known as nonconsonantal sounds. This is a binary feature.

ii **Sonorant/obstruents** [+, - son]: Sonorant sounds are those in the production of which the vocal tract (i.e. the glottis) is in the open position so that spontaneous voicing is possible. [+son] sounds are **vowels, glides** like [w, j], **liquids,** and **nasals**. [-son] sounds also known as **obstruents** are **plosives, affricates** and **fricatives**. Since the vocal tract does not include the larynx, [h] and [ʔ] are [-son]. (However, the characterization of [h, ʔ] as [-son] is controversial. Some phonologists assume that they are [+son]). Informally, sonorant sounds are the sounds, which are singable -- you can sing a tune while producing a sonorant in isolation (without an accompanying vowel.) The converse of a sonorant is an obstruent. You could either use [sonorant] as a binary feature i.e., [+sonorant] and [-sonorant] (as most phonologists do) or use two labels [sonorant] and [obstruent]. Like the feature [consonantal] this is also a binary feature.

Another major class feature that has generated a lot of discussion is the feature **Vocalic/nonvocalic**. Vocalic sounds are those that constitute syllable peaks/nucleus, like vowels and syllabic consonants. Nonvocalic sounds are glides and nonsyllabic

consonants. Some phonologists replaced it with the feature syllabic/nonsyllabic. However, as a further development, this feature has been eliminated altogether because, unlike true features, this feature expresses a syntagmatic property of the sound not an inherent property of that segment. For instance, when we describe a sound like [labial], we mean that it has the property of labiality. But when we say that a segment is [vocalic] what we mean is that it occurs as the peak of a syllable--a purely syntagmatic relationship that it enters into with its neighbouring segments in that particular sequence.

Review question I

State how the following sounds from English can be described by using one/two/three of the following features:

[+cons], [-cons], [+son] and [+obst]/[-son].

For example, /s/ can be described as [+cons] and [+obst]/[-son].

[d] _____ [i] _____

[l] _____ [w] _____

[m] _____ [tʃ] _____

B. **Place Features**: These features represent the ***place of articulation***. Among the place features, there are four privative features specifying the major areas of articulation. These are [**labial], [coronal], [dorsal]** and [**radical**]. All place features are privative in nature. This implies that a segment either has the feature or it does not. In other words, not all features will be specified for all the place features. A consonant that is not a coronal will not have the feature [coronal]. However, binary place features will be used to characterize the place distinction **within** a major articulator area like [coronal], [dorsal], etc. The feature [+ anterior], for example, will be used to specify only those coronal segments that are articulated at or in front of the alveolar ridge, while the feature [- anterior] will be used to characterise only those that are articulated behind the alveolar ridge.

When we consider place of articulation, we are considering a particular dimension of pronunciation, which has several different points along it, which are mutually exclusive. This means that other things being equal, a consonant cannot be simultaneously labial and velar, or coronal and glottal. (This is not to say that it's

impossible to have secondary articulation. However, to say that a labial stop has been palatalised, for instance, is not the same as saying that the stop is simultaneously a labial and a palatal stop).

i. **Labial** [lab]: As the term implies any sound articulated with one or both lips is a labial. [lab] sounds are **labial consonants** (i.e. bilabials and labio-dentals) and rounded vowels.

   Some phonologists state that the feature [labial] is further specified for the binary feature [+, - round], while others claim that the feature [labial] is sufficient to distinguish the place of articulation in vowels. Recent developments in phonology have also established this as a privative feature. We shall ignore this feature in this unit.

ii. **Dorsal [dorsal]:** These features represent the placement of the ***body of the tongue.*** They are also known as tongue-body features. Generally these sounds are used to describe vowel sounds. All vowels are [dorsal]. [k, g, ŋ and j] are the only dorsal consonants in English. Dorsal features are further specified for features like **high, low, back, tense**, and **advanced tongue root** that specify where the tongue-body is located. These features are also known as articulator-bound features in the sense that they depend on a specific articulator (here [dorsal]) for their execution.

   - **High/non-high** [+, - high]: High sounds are produced by raising the body of the tongue toward the palate. This applies to both vowels and consonants. [+high] sounds are **palatals, velars, palatalized** and **velarized consonants**, **high vowels** (traditionally known as vowels which occur in close or above half-close positions) and **glides**. All other sounds are [-high].

   - **Low/non-low** [+, - low]: Low sounds are produced by drawing the body of the tongue down away from the roof of the mouth. This applies to both vowels and consonants. [+low] sounds are **pharyngeal** and **pharyngealised consonants** and **low vowels** (vowels which occur below the half-open position). All other sounds are [-low].

   - **Back/non-back** [+, -back]: Back sounds are produced with the tongue body relatively retracted from its neutral position toward the rear wall of the pharynx. [+back] sounds are **velars, uvulars, pharyngeals, velarised** and **pharyngealized consonants, central vowels, back vowels**

and **glides**. All other sounds are [- back].

- **Tense/lax** [+, - tense]: Tense sounds are produced with a greater amount of deformation of the vocal tract away from its neutral position. The tongue body also involves a greater degree of constriction. [+tense] sounds are [iː, uː, ɜː, and ɔː,]. [-tense] (or lax, although this term is not generally used in phonology) vowels are [I, U, e, ə, and ∧].

  Usually the long vowels are distinguished from the short ones by the feature [tense]. Short vowels are generally considered to be [- tense] and the long ones [+tense]. [+ or - tense] has proved to be one of the most controversial features in the history of phonology.

- **Advanced/unadvanced tongue root**. [+ or - ATR]: As its name implies, this feature is implemented by drawing the root of the tongue forward, enlarging the pharyngeal cavity and often raising the tongue body as well. [+ATR] vowels are [i, u, e and o]. [-ATR] vowels are [i, u, ɛ, æ, ɑ and ɔ].

  According to Halle and Clements (1983) and Ladefoged and Maddieson (1996) this feature along with the feature [+ or - tense] is not known to ***cooccur*** distinctively in any language and may be a variant implementation of a single feature. In other words, a language may need either the feature [+ or – tense] or the feature [+ or – ATR]. But these two features are not interchangeable.

iii. **Coronal** [cor]: Coronal sounds are produced with the tip and the blade of the tongue. [cor] sounds are **dentals, alveolars, retroflex, palato-alveolars**, and **palatals.** [coronal] segments are further specified for features [+, -anterior], [+, – distributed], and [+, -strident]. No noncoronal sounds are minimally distinguished by these features, nor do these features define natural classes including noncoronal features. The presence of these features in a segment entails the presence of [coronal].

- **Anterior/non-anterior** [+, - ant]: A coronal sound articulated at or in front of the alveolar ridge is considered to be [+anterior]. [+anterior] sounds are **dentals** and **alveolars. Post-alveolar sounds, retroflex sounds** and **palatoalveolar** sounds are [-anterior].

- **Strident/non-strident** [+, - strid]: Strident sounds are

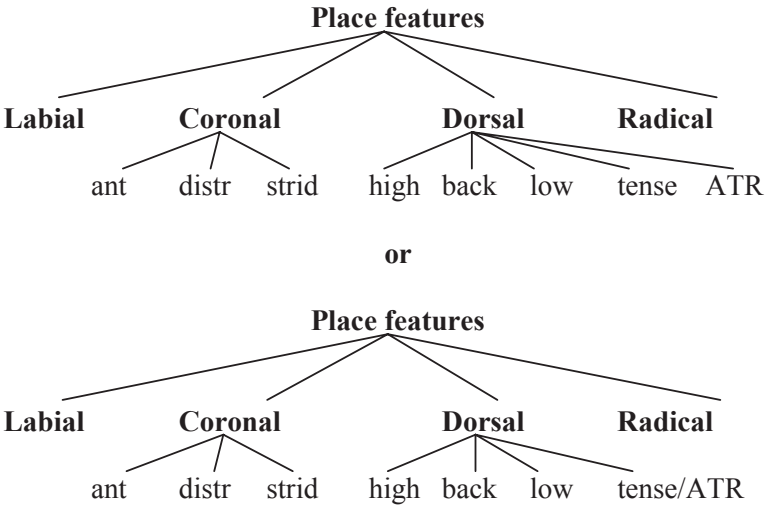
produced when the two articulators are in close approximation and the air escapes with high intensity fricative noise. The stage of close articulation could be either during the production of the entire sound (as in the case of fricatives) or during the release stage (as in the case of affricates). [+ strid] sounds are **fricatives** [s, z, ʃ, ʒ] and **affricates** [tʃ and dʒ]. Significantly, the dental fricative is [- strident].

- **Distributed/non-distributed** [+, - dist]: Distributed sounds are coronal sounds produced with a constriction that extends for a considerable distance in the oral tract. [+distr] sounds produced with the blade or front of the tongue are **dentals** and **palato-alveolars**. All other coronal sounds are [-distributed].

  You might wonder why we find so many features to subclassify coronal sounds only. If you examine ANY language, you will find that the maximum number of distinctions exist at the coronal place only and hence the need for finer distinctions among coronals.

iv Radical [radical]: Radical sounds are articulated with the root of the tongue, like the **voiceless fricative** [ħ] or the **approximant** [ʕ].The feature radical was a later addition to the set of place of articulation features.

One can build a *feature tree* exclusively for all the subconstituents that form a part of the place feature.



With the help of this representation we can clearly see that the phonological process can refer to constituents like [coronal, anterior, distributed, strident] but not to the constituents like [high, anterior], for instance.

Review question II

State how the following sounds from English are described by using the following features: [lab], [cor], [+ant], [-ant], [+strid], [-strid], [+distr] and [-distr].

[z]_____ [ʃ]_____
[w]_____ [l]_____
[t]_____ [r]_____
[f]_____ [θ]_____

Review question III

State which of the following sounds from English are [+ or – tense] / [+ or – ATR], [+ or – back], [+ or – low], [+ or – high].

[i]_____ [æ]_____
[ɔ]_____ [u]_____
[e]_____ [ʊ]_____

C. **Laryngeal Features**: These features represent different states of the ***larynx***. There are three laryngeal features: **voice, spread glottis,** and **constricted glottis**. There is also evidence (McCarthy 1988) to say that laryngeal features are not specified for manner or place features.

i. **Voice/voiceless** [+, - voice]: Sounds produced with the vibration of the vocal cords are voiced. Voiceless sounds are produced with a glottal opening so wide that it prevents the vibration of the vocal cords. Apart from the voiceless sounds of English, which are naturally [-voice], all other English sounds are [+voice]. Therefore, the set of [+voice] sounds of English include **voiced consonants, nasals, liquids**, **glides**, and **vowels**. This is a binary feature.

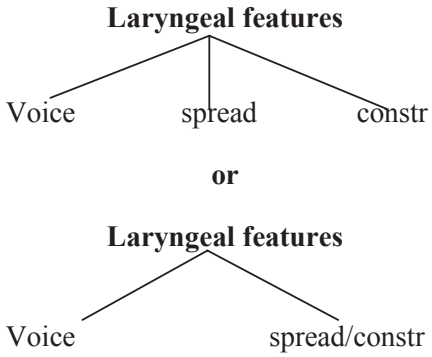
ii. **Spread/non-spread glottis** [spread]: This feature distinguishes aspirated from unaspirated consonants. [+spread] sounds are **aspirated consonants, breathy voiced** or **murmured consonants, voiceless vowels** and **glides**. All

other sounds are [-spread]. In English only [h] and the aspitated stops have the specifications [+spread]. This is a privative feature. All phonological processes involving aspiration refer to only [+spread], never to opposite ([-spread]) value. Thus if a sound is aspirated we describe it as simply [spread] which would imply that it is a [+spread] sound. For unaspirated sound there is no need to specify the feature [spread].

iii. **Constricted/non-constricted glottis** [constr]: Constricted sounds are produced when the glottis is close. [+constr] sounds are **ejectives, implosives, glottalised obstruents**, **laryngealised vowels** and **laryngealised sonorant consonants**. None of these sounds exist in English. In English only the glottal stop [ʔ] is a constricted sound. (In some varieties of English, e.g. London Cockney, we find glottalised consonants and the glottal stop. For instance, the final consonant in words like 'stop' and 'hat' respectively.) All other sounds are [+constr.]. Again this is a privative feature. All phonological processes involving glottalization refer to only [+constr], never to the opposite ([-const]) value. Thus if a sound is glottalized we describe it as simply [constr] which would imply that it is a [+constr] sound. For unglottalized sound there is no need to specify the feature [constr].

Since vocal cords can't be simultaneously constricted and spread it is impossible to have both positively specific at once, i.e. [+constr, +spread] is an impossible combination. Thus if a sound is [constr] it will not be [spread] and vice versa.

The *feature tree* representing the laryngeal features will be as given below:



Review questions IV

State how the following sounds from English can be described by using the following features:

[+voice], [-voice], [spread glottis], [constricted glottis].

[h]_____ [ʔ]_____
[p^h]_____ [j]_____

D. Manner features: These features represent ***manner of articulation***. These are **nasal, lateral, continuant,** and **delayed release**.

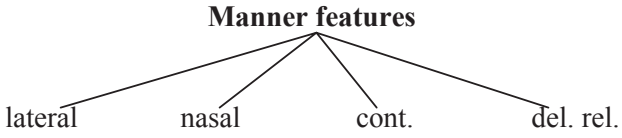
i. **Nasal** [nasal]: Nasal sounds are produced by lowering the velum and allowing the air to pass outward through the nose. [nasal] sounds are **nasal consonants** and **nasalised vowels**. This is also a privative feature.

ii. **Lateral** [+ or – lat]: Lateral sounds are produced with the tongue placed in such, a way as to prevent the air stream from flowing outward through the centre of the mouth, while allowing it to pass over one or both sides. [+lat] sounds are **lateral sonorants, lateral fricatives** and **lateral affricates** (some of these sounds do not exist in English). All other sounds are [- lat]. Most importantly, [+, - lateral] is used to differentiate between [l] and [r] which share all other feature specifications. Further, these two sounds frequently participate in alternation, allophonic variation, etc., across languages.

iii. **Continuant/stop** [+, - cont]: Continuant sounds are produced when the airflow through the oral cavity is free or nearly free. [+ cont] sounds are **vowels, glides, r-sounds**, and **fricatives**. [- cont] are **plosives, nasal consonants, affricates** and **laterals**. (The status of [l] as a [-cont] is still unresolved.)

iv. **Delayed release/instantaneous release** [del reI]: This feature describes sounds that are released slowly as in the case of affricates. It is a privative feature, which is used only for **affricates**. (The interpretation of affricates is controversial. In more recent descriptions affricates are treated as complex consonants.)

The feature tree for laryngeal features would have the following constituents:



Review question V

Describe the following sounds from English, using the manner class features.

[tʃ]_____ [m]_____
[b]_____ [l]_____
[r]_____ [w]_____

Feature notation does not provide a convenient way to distinguish the diphthongs from the other vowels. Diphthongs are usually treated as a vowel-glide sequence when using features.

We can summarize by saying that not all features are binary. Only the features [consonant], [sonorant], [voice], [continuant], [high], [low], [back], [ATR] are binary and significantly place features like [labial], [coronal], [dorsal], [nasal], [spread glottis], and [constricted glottis] are privative. The feature [lateral] is needed only to distinguish [l] from [r]. Features [anterior], [distributed] and [strident] are relevant only for the feature [coronal]. Significantly, [f, v, θ, ð] are not strident.

Feature representation may at first look more complex than the strictly segmental representations, but as I have shown, in section 1.2, it is in the long run very advantageous. Now instead of listing individual segments/phonemes for each language we can express the contrast at the level of features. Hence, for English, we no longer need to specify that [p, t, k, tʃ, ʃ, θ, etc.] have contrastive voiced counterparts like [b, d, g, ð, dʒ, ʒ, etc.]. All we have to say is that in English the feature ***Voice*** is contrastive.

Some features are used by nearly everyone working within a generative framework; relatively few are embroiled in controversy. I have tried to synthesize, as far as possible, some of the many recent contributions to the study of segment internal structure. Right now it is enough for you to know what most of these features are.

Perhaps, now is the right time for you to find the DFs for different phonemes of English, so do the following activity and see how well you have understood the concept of DFs.

Activity D

By now you already know how to describe sounds in terms of their three-term labels. In case you do not, please read the relevant portion from your course on Phonetics and Spoken English and then try to do this activity.

The present activity is very simple. All you have to do is to describe the nasal sounds of English /m, n, ŋ/ in terms of their distinctive features discussed earlier in the above section.

You may need 30-40 minutes for this activity.

_____
_____
_____
_____
_____
_____

Discussion

You should first know the three-term label for each sound. You should then look at the entire list of distinctive features to see which features characterise these three sounds. You should take care not to mention any feature that is not absolutely necessary for its description. For example, the feature [voice] is redundant for /m, n, ŋ/ because they are [+sonorant]. Recall we said earlier that all sonorants are naturally voiced.

Activity E

Describe the following sounds of English using the distinctive features.

[k], [p], [l], [ɔ/ɒ] and [i]

_____
_____
_____
_____
_____

Discussion

Keeping in mind the three-term labels for these sounds, try to categorise the given sounds in such a way that your list of distinctive features does not describe any other sound.

Review question VI

Write the following rules using distinctive features. Here, instead of writing /p/ you have to mention its features. Similarly, instead of writing /p^h/ you have to write its features.

a. p → p^h / ----------v
b. l → ɬ / ----------c

(Dark [ɬ] has the specification [+back] since the back of the tongue is raised in the production of this sound.) It is velarised.

_____
_____
_____
_____
_____
_____
_____

1.5 Summary

In this unit, I have shown that as phonologists moved from the structural to the generative framework, there was a shift from treating the phoneme as the minimal unit of phonological analysis, to treating the distinctive features as the smallest, irreducible unit of phonological structure.

In the latter half of this unit, I tried to define all the features and describe all the phonemes of English in terms of their DFs. It was shown that although features are normally constructed as psychological entities, they are defined in terms of specific patterns of acoustic and articulatory realization which provide crucial link between the cognitive representation of speech and its physical manifestation.

We also saw that segments can be analysed into collections of privative and binary features. Segments may also be unspecified

for certain features either because the feature is irrelevant for the class of segments, like [+, -strid] in the case of vowels, or because the feature is privative and the segment does not have it, like [labial] in the case of [t].

Feature theory has emerged as one of the major results of linguistic science in this century. It has provided strong confirmation of the view that languages do not vary without limit, but reflect a single general pattern, which is rooted in the physical and the cognitive capacities of the human species.

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1.7 Recommended reading

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1.8 Answer to review questions

Review question I

[d]	is	[+cons],	[+obst]	or	[-son]
[i]	is	[-cons],	[+son]	or	[-obst]
[m]	is	[+cons],	[+son]	or	[-obst]
[l]	is	[+cons],	[+son]	or	[-obst.]
[w]	is	[-cons],	[+son]	or	[-obst]
[tʃ]	is	[+cons],	[+obst]	or	[-son]

Review question II

[z]	is	[cor],	[+ant],	[+strid],	[-distr]
[w]	is	[lab],			
[t]	is	[cor],	[+ant],	[-strid],	[-distr]
[f]	is	[lab],			
[ʃ]	is	[cor],	[-ant],	[+strid],	[+distr.]
[l]	is	[cor],	[+ant],	[-strid],	[-distr.]
[r]	is	[cor],	[+ant],	[-strid],	[-distr.]
[θ]	is	[cor],	[+ant],	[-strid],	[+distr.]

Review question III

[i]	is	[+ATR],	[-back],	[-low], [+high]
[ɔ]	is	[-ATR],	[+back],	[-low], [-high]
[e]	is	[+ATR],	[-back],	[-low], [-high]
[æ]	is	[-ATR],	[-back],	[+low],[-high]
[u]	is	[+ATR],	[+back],	[-low], [+high]
[ʊ]	is	[-ATR],	[+back],	[-low], [+high]

Review question IV

[h]	is	[-voice],	[spread]
[p^h]	is	[-voice],	[spread]
[ʔ]	is	[-voice],	[constr.]
[j]	is	[+voice]	

Review question V

[tʃ]	is	[-cont]	[del.rel.]
[l]	is	[+lat],	[-cont]
[m]	is	[nas],	[-cont]
[r]	is	[-lat],	[+cont]
[b]	is	[-cont]	
[w]	is	[+cont]	

Review question VI

a. [+cons, +obst, -cont, -voice, labial] → [+spread] /---------- [-cons]

b. [+cons, +lat] → [+back] /---------- [+cons]