An Encyclopaedia of Language

Edited by
N. E. Collinge

AN ENCYCLOPAEDIA OF LANGUAGE

EDITED BY

N.E.COLLINGE

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1987 while the chapter, in which he took a most friendly interest, was being written.

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EDITOR'S INTRODUCTION

In the study of language the late 1980s may be seen in retrospect as an era of consolidation. No moderately aware eye will miss the epidemic of encyclopaedias of that time, their didactic sameness masked by a variety of style, even a desperate individuality. Some spread a single topic (say, dialectology) over an ample volume; some report on a kaleidoscope of topics under a summary, not always illuminating, heading (say, grammar). Some are terse and sober lexicons; some, like advertisers, seek their targets with a fine typographic frenzy. All suggest, no doubt involuntarily, that language and its study had for the moment stood still and might, while they caught their breath, conveniently sit for their portrait. And that is not a false picture.

It is not a true one, either. The truth is, as ever, muddy. Language is, after all, the medium of human interaction. Like humans, it is very rich in associations and enterprises and achievement, and fearfully complex in its own being. Neither it, nor its pursuit by scholars, ever stands still; even in apparently dormant parts lies a restless tic. At its heart are the sounds we use, the patterns we honour (however inadequately), the meanings we exploit; and phonology, grammar and semantics are their respective sciences. In the later 1980s phonology is perhaps not offering exciting new paths to the fuller understanding of how available sounds are organised. Phonetic facts, and products, are well known and documented; and hypotheses about systems have practically come to terms with one another. The domain of description (segment or sequence?) is still debated; and a novel conception of how syllables are sequenced and stress placed is being energetically 'sold'. But preclusive devotion to specific theories has faded. Grammarians still admit to different allegiances. But they take in one another's washing with surprising readiness: such a notion as 'case' is currently to be found, comfortably at home, in several apparently competing schools. Semantics concentrates on, and refines, its delineation of the manifold relations of word-meaning; but there is an air of prevailing orthodoxy.

But it must strike the objective observer, contemporary or later, how anxious grammarians now are to handle real sentences and to construe what may occur

rather than simply prescribe what must; or again, how semantics has a brave and realistic special force of pragmaticists, happy only when accounting for actual effects of attested utterances in natural contexts. Grammar may worry that we might say what we cannot interpret, and semantics admit that we seem always to mean more than we say. Yet both betray an urge to confront reality; language, not theory, is once more the starting point of description. This mood of realism, and an accompanying unevenness in scholarly dynamism, is paralleled in the fields where language meets (or conveys) other activities of mind or behaviour. One thinks of the 'hyphenated' subdisciplines of 'psycho-' or 'neuro-' or 'socio-linguistics'; or of language in computation, in education, in the hands of the literary artist or critic. Where there is a will to encounter reality, there is ferment. Even where (at this volume's date) there is not much of either, there remains much solid old and recent progress to report and renewal of impetus to forecast. Still, what arrests the attention and quickens the pulses is (for example) the sheer fertility of inventive methods in neurological study of language in the brain, or the sociolinguists' empirical pursuit of facts of usage and mechanisms of change through recorded conversations within peer groups and social networks. Typology is pressed hard and rigorously verified; the problems of learners, or of the impaired, are precisely diagnosed; computation is applied to achievable ends; and a factual control on theoretical constructs is once again sought, without apology, in language history. Sign language, for a last example, is discovered to be no clumsy and threadbare substitute for speech but a natural language with a variety of forms and all the required design features (including its own evolution).

Such are the stances of the time, and such is this volume's background. Against that background, the lineaments of a serious survey must stand out pretty sharply. No longer does it do to pretend that the whole subject is quite unknown to, or misunderstood by, outsiders; interested and skilled practitioners of other sciences increasingly look to learn (and no doubt hope to criticise) what is at present merely unfamiliar to them in its ramifications. What has to be explained is just how the various branches of linguistics have arrived at their late 1980s position, just what past insights had better not be forgotten, just what are now the agreed aims and the respectable methods and the accepted results. Inanition and activity must equally be revealed; and what J.R. Firth somewhat archly desiderated of the most elegant hypotheses, a 'renewal of connection' with the data, must be constantly applied as a touchstone. This volume consists of attempts to offer that sort of testing review; acquainting with all that is valuable but selling nothing. It presupposes a reader's intelligent interest, successively, in the essential features of how language works, of how human experience and thought are mediated through it, of how it is learnt and taught, of how we express it and study it — and even itch to refashion it into shapes

of our own desiring. The three parts, like the individual chapters, may each be taken on its own. But everything connects with everything else, and the inevitable linkage (if only with where a hinted aspect or an implied kindred topic may be pursued more fully) is clarified by the titles, the cross-references and the guides to further reading. The essays are meant to complement, rather than corroborate, one another; they seek to fit together to form a composite demonstration of how a trade of deep disagreements and recurrent crises of faith has already, nonetheless, produced an astonishingly consensual body of knowledge about the most characteristic of all human activities. I think they succeed.

Editorial toil on a multifarious typescript has been eased by the ready co-operation of all the contributors, who have often subordinated personal preferences to the common aim. The expert service and guidance of our publishers has been of great value; Jonathan Price especially deserves, and has, my gratitude for his considerable part in shaping this volume and for much prompt and percipient advice.

N.E.Collinge
Cambridge

PART A

THE INNER NATURE OF LANGUAGE

1
LANGUAGE AS AVAILABLE SOUND: PHONETICS

M.K.C.MACMAHON

1.
SOUND

Sound is the perception of the movement of air particles which causes a displacement of the ear-drum. The air particles are extremely small—about 400 billion billion per cubic inch—and when set in motion create patterns of sound-waves. Certain concepts in acoustics (frequency, amplitude, waveform analysis and resonance) provide the bases for an understanding of the structure of these sound-waves. The subject is dealt with by Fry (1979).

2.
PHONETICS

Phonetics (the scientific study of speech production) embraces not only the constituents and patterns of sound-waves (ACOUSTIC PHONETICS) but also the means by which the sound-waves are generated within the human vocal tract (ARTICULATORY PHONETICS). PHYSIOLOGICAL PHONETICS, which is sometimes distinguished from articulatory phonetics, is concerned specifically with the nervous and muscular mechanisms of speech. The term GENERAL PHONETICS refers to a set of principles and techniques for the description of speech that can be applied to any language; it should be distinguished from a more restricted type of phonetics concerned with those principles and techniques which are required for a phonetic statement of a specific language. Hence, for example, the phonetics of English will require some theoretical constructs which are not necessary for the phonetics of Swahili, and vice versa. In this article, the aim is to present the essential features of a general phonetic theory.

The discipline of phonetics has a long history. In India, it originated in the work of certain Sanskritic linguistic scholars between about 800 and 150 BC (see Allen 1953:4–7 for details). In Europe, amongst the Classical Greek and Roman linguists it did not achieve the same importance, although the phonetic descriptions of

Aristotle, Dionysius Thrax, and Priscian merit attention (see e.g. Allen 1981). In the Middle Ages, a number of Arab and Muslim scholars showed considerable interest in phonetics (see Bakalla 1979 for a summary). From the sixteenth century onwards, especially in Britain and Western Europe, the subject attracted the attention of a number of scholars, but for a long time, until well into the nineteenth century, much of the work was carried out under the aegis of other subjects such as rhetoric, spelling reform, and language teaching. Starting in the second half of the nineteenth century and continuing into the present, the discipline has determined its own fields and methods of enquiry, building on concepts in anatomy, physiology, acoustics and psychology, and freed itself from its association with other disciplines—although its connection with linguistics remains a close one. (The articles in Asher and Henderson 1981 trace the historical development of particular aspects of phonetics.) At the present time, much of the research in phonetics is undertaken in departments and phonetic laboratories in Britain, Europe and Japan; the contribution from North America, although important, has been relatively small in relation to the number of institutions devoted to linguistics.

3.
ORGANS OF SPEECH

The sound-waves of speech are created in the VOCAL TRACT by action of three parts of the upper half of the body: the RESPIRATORY MECHANISM, the voice-box (technically, the LARYNX), and the area of the tract above the larynx, namely the throat, the mouth, and the nose. They constitute what are known collectively as the *organs of speech.* For most sounds, air is stored in and transmitted from the LUNGS (see below under *Air-Stream Mechanisms* for the exceptions). It is forced out of the lungs by action of the rib-cage pressing down on the lungs, and of the diaphragm, a large dome-shaped muscle, which lies beneath the lungs, pressing upwards on them. Air passes then through a series of branching tubes (the bronchioles and bronchi) into the windpipe (technically, the TRACHEA). At the top of the trachea is the larynx. The front of the larynx, the ADAM'S APPLE (the front of the THYROID CARTILAGE), is fairly prominent in many people's necks, especially men's. Anatomically, the larynx is a complicated structure, but for articulatory phonetic purposes it is sufficient to take account of only two aspects of it. One is its potential for movement, the other is that it contains two pairs of structures, the VOCAL FOLDS and VENTRICULAR FOLDS. The latter lie above the former, separated by a small cavity on either side. The vocal folds are often called the vocal cords (or even vocal chords) or vocal bands. They lie horizontally in the larynx, and their front ends are joined together at the back of the Adam's Apple but the rear ends remain separated. However, because of their attachments, they can

move into various positions: inwards, outwards, forwards, backwards and, tilting slightly, upwards or downwards. They are fairly thick, and when observed from the back are seen to bulge inwards and upwards within the larynx. The ventricular folds are capable of a similar, though less extensive, range of movements.

For most phonetic purposes, it is sufficient to be able to say that the vocal folds are either (i) apart—in which case the sound is said to be VOICELESS, (ii) close together and vibrating against each other—then the sound is VOICED, or (iii) totally together—in which case no air can pass between them. Further information about the action of the vocal and ventricular folds is given below in section 10.3 under *State of the Glottis and Phonation Types.*

Directly behind the larynx lies a tube running down into the stomach, the oesophagus. Both the oesophagus and the larynx open into the throat, the PHARYNX. This is a muscular tube, part of which can be seen in a mirror—the 'back of the throat' is the back wall of the central part of the pharynx. Out of sight, unless special instrumentation is available, are the lower and upper parts of the pharynx. The lower part connects to the larynx. The upper part, the NASO-PHARYNX, connects directly with the back of the NASAL CAVITIES. These are bony chambers through which air passes. At the front of the nasal cavities is the nose itself.

The contents of the mouth are critical for speech production. Starting with the upper part of the mouth, we can note the *upper lip,* the *upper teeth,* the ALVEOLAR RIDGE (a ridge of bone at the front of the upper jaw (the MAXILLA), which forms part of the sockets into which the teeth are set), the HARD PALATE and the SOFT PALATE. The soft palate (also called the VELUM because it 'veils' the nose—see below) finishes in the UVULA (Latin= 'little grape'). The soft palate, unlike the hard palate, can move, and when it is raised upwards it will make contact with the back wall of the pharynx and thereby prevent the movement of air either into the nasal cavities from the pharynx or vice versa. The movement of the soft palate can be observed by saying the vowel sound in the French word *blanc* and observing the back of the mouth in a mirror, and then saying the vowel sound in an English word like *pa*. For the French vowel, the soft palate will be lowered; for the English one, it will be raised.

The bottom part of the mouth contains the *lower lip,* the *tongue,* and the *lower jaw* (technically, the MANDIBLE), to which the tongue is partly attached. Although there is no obvious anatomical division of the tongue, in phonetics it is essential to have a method for referring to different parts of it. Hence it is traditionally divided into five parts: the TIP (or APEX), the BLADE, the FRONT (a better and more realistic term for this would be the middle), the BACK and the ROOT. An additional feature is the RIMS, the edges of the tongue. The boundaries between the five

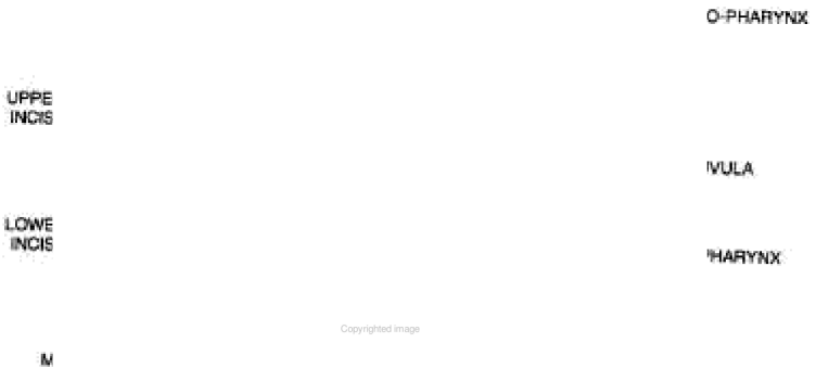
'divisions' are established on the basis of where the tongue lies in relation to the roof of the mouth when it is at rest on the floor of the mouth. The tip lies underneath the upper central teeth, the blade under the alveolar ridge, the front underneath the hard palate, and the back underneath the soft palate. The root is the part of the tongue that faces towards the back wall of the pharynx. The reader should refer to Figures 1, which shows the outline of the organs of speech in a mid-line section of the head and neck, and should identify the position of as many as possible of the speech organs in his or her own vocal tract. A dentist will be able to show the actual shape and size of the hard palate from a plaster cast. A more detailed anatomical description of the organs of speech can be found in Hardcastle 1976.

X-ray studies of the organs of speech of different individuals show quite clearly that there can be noticeable differences—in the size of the tongue, the soft palate and the hard palate, for example—yet regardless of genetic type, all physically normal human beings have vocal tracts which are built to the same basic design. In phonetics, this assumption has to be taken as axiomatic, otherwise it would be impossible to describe different people's speech by means of the same theory. Only in the case of individuals with noticeable differences from this assumed norm (e.g. very young children or persons with structural abnormalities of the vocal tract such as a cleft of the roof of the mouth or the absence of the larynx because of surgery) is it impossible to apply articulatory phonetic theory to the description of the speech without major modifications to the theory.

4.
INSTRUMENTAL PHONETICS

Information about the postures and movements of the vocal tract in speech comes from three sources: what the speaker can report as happening, what an observer can see to be happening, and what particular forms of instrumentation can reveal. Much phonetic theory is based on the first two sources; the sub-discipline of phonetics that considers objective data derived from instrumentation is known as INSTRUMENTAL PHONETICS or EXPERIMENTAL PHONETICS. In what follows, data from the latter source will be quoted and illustrated whenever appropriate. For a résumé of the range of instrumentation available to the phonetician, see Code and Ball 1984 and Painter 1979.

Figure 1. The organs of speech.



5.
SEGMENTS AND SYLLABLES

Unless we are trained to listen to speech from a phonetic point of view, we will tend to believe that it consists of words, spoken as letters of the alphabet, and separated by pauses. This belief is deceptive. Speech consists of two simultaneous 'layers' of activity. One is sounds or SEGMENTS. The other is features of speech which extend usually over more than one segment: these are known variously as NON-SEGMENTAL, SUPRASEGMENTAL or PROSODIC features. For example, in the production of the word *above,* despite the spelling which suggests there are five sounds, there are in fact only four, comparable to the 'a', 'b', 'o' and 'v' of the spelling. But when the word is said fairly slowly, the speaker will feel that the word

consists not only of four segments but also of two syllables, ‘a’ and ‘-bov’. Furthermore, the second syllable, consisting of three segments, is felt to be said more loudly or with more emphasis. (The subject of non-segmental features is dealt with below.)

The nature of the syllable has been, certainly in twentieth-century phonetics, a matter for considerable discussion and debate. Despite the fact that most native speakers of a language can recognise the syllables of their own language, there is no agreement within phonetic theory as to what constitutes the basis of a syllable. Various hypotheses have been suggested: that the syllable is either a unit which contains an auditorily prominent element, or a physiological unit based on respiratory activity, or a neurophysiological unit in the speech programming mechanism. The concept of the syllable as a phonological, as distinct from a phonetic, unit is less controversial—see, for example, O'Connor and Trim 1953; and Chapter 2, section 7.2.

6. LINGUISTIC AND INDEXICAL INFORMATION IN SPEECH

It is necessary to draw a distinction between information in the stream of speech, both segmental and non-segmental, that is linguistic in nature and information that characterises the individual speaker. Thus, a sentence like ‘When did she say she was coming?’ must be articulated in such a way that the listener hears ‘she’, not ‘he’; similarly, ‘coming’ not ‘humming’—the pronunciation of the sentence has to be such that the necessary linguistic information can be extracted from it. But simultaneously, the speaker may wish to indicate by the pronunciation that certain words are more important linguistically than others: perhaps ‘When’, ‘say’ and ‘coming’, rather than ‘When’ and ‘she’. Again, this can be seen as part of the linguistic structure of the sentence. However, the manner in which the speaker produces the sentence will provide the listener with other sorts of information: for example, about his or her sex, age, state of health, and perhaps the part of the English-speaking world he or she is from. Information of this sort about the speaker is known as INDEXICAL information. A phonetic (as distinct from a phonological) description will need to distinguish, then, between what is a linguistic and what is an indexical fact.

7. SEGMENT-BASED VERSUS PARAMETRIC PHONETICS

X-rays of speech show not only the considerable speed at which some of the speech organs move, but also the fact that in very few instances do the speech organs remain stationary during the production of a sound-segment. In other words, the

reality of speech is usually one of near-constant movement. For descriptive purposes, though, it is necessary to assume that the speech organs adopt certain positions or postures for a brief time before adjusting to new ones. However, to avoid having to make such an assumption and to introduce greater realism into the description, speech can be viewed as the product of a series of simultaneous and mainly overlapping movements of the speech organs. Such an approach, which so far has never been fully worked out, although the principles of it have been well recognised for a long time, is known as a PARAMETRIC one, and can be distinguished from the traditional type of phonetics described here (see, for example, Catford 1977:226–9). There are certain similarities between parametric phonetics and a type of phonological theory, namely prosodic (or Firthian) phonology.

8.
PHONETIC NOTATION

The alphabetic writing system of many languages has not only conditioned us to think of speech as being made up of discrete sound-segments; it has also given us the terms 'consonant' and 'vowel'. But it must be stressed that although these two terms are used in phonetics, they are defined with reference to features of the sound-segments themselves, not, as in the writing system, with reference to letter-shapes. From the point of view of the writing system of English, the letter 'y' at the end of *happy* would be a consonant; but the sound at the end of the word is a vowel. The 'e' in *above* would be a written vowel, but in speech it has no value in this particular word since no sound is pronounced after the 'v'. A clear distinction must always be made, then, between sounds described informally in terms of letters of the alphabet and scientifically in terms of phonetics. It will be seen that a notation can be provided for sounds, and although this bears certain similarities to the orthographic letters of certain languages, the phonetic values are articulatory, not orthographic.

Writers on phonetic subjects have long been aware of the limitations of traditional orthographies in providing a means of symbolising unambiguously the articulatory features of sounds. In England in the sixteenth century, Sir Thomas Smith used a modified orthography to serve as a phonetic notation: for example, he wrote *charity* as 'carite' and *cheese* as 'cës'. It was only in the nineteenth century with the growth of interest in dialect research that the general need arose for systems of considerable sophistication for the representation of speech. In Britain, the notational systems of Alexander Melville Bell, particularly his 'Visible Speech' (Bell 1867), provided the student of phonetics with detailed notational devices. Slightly earlier, in Europe, the work of the German scholar Richard Lepsius had led to the publication in 1855 of his *Standard Alphabet,* a system which was to be used by many descriptive linguists and phoneticians, especially those engaged in Christian missionary activities in

Africa and the Far East. But the major phonetic alphabet in use today originated in the work of a group of language teachers and phoneticians in Western and Northern Europe. The alphabet of the International Phonetic Association (IPA) was developed from the late 1880s onwards, and is now regarded as the standard method of phonetic notation. Over the past century, it has undergone a number of revisions, the latest of which is 'Revised to 1979'.

In what follows, the terminology and notations of this alphabet will be used as far as possible. The use of square brackets [] indicates a phonetic transcription; oblique brackets // are reserved for a phonological one (on which, see Chapter 2, section 2.1). When no ambiguity can result, some sounds will be referred to by orthographic letters.

9.
DEFINING VOWELS AND CONSONANTS

Any segment must be either a vowel or a consonant. A vowel is a sound in which there is no narrowing or obstruction between the supralaryngeal articulators, and hence no turbulence or a total stopping of the air can be perceived. The vowel sounds in words such as *sing* or *pat* illustrate the principle; compare them with the consonants in each word. Any segment, then, which is not a vowel will be a consonant. There is, however, a problematical area. Native speakers of English 'feel' that the initial segments in the following word patterns in the same way—they are all felt to be consonants: *pat, mat, hat, yes* and *wet*. In the first two there is total stopping of the air, and hence the sounds are consonants. But in the case of *hat,* depending on how forcefully the first segment is said, the speaker may feel that there is no turbulence—so the sound would be a vowel— and certainly in *yes* and *wet* the segments are vowels. The native speaker's feeling that the sounds belong to the same sound-type derives from phonological rather than strictly phonetic considerations. For this reason it is useful to introduce two additional terms, VOCOID and CONTOID (Pike 1943:78) into the discussion. These are defined in strictly articulatory/ auditory terms, leaving vowel and consonant as phonological categories. The initial segments in *yes* and *wet* are vocoids, but function as consonants. The Sanskritic phoneticians, amongst many others, recognised the dual nature of segments of this sort (Allen 1953), and from this has arisen the use for many centuries of the term 'semi-vowel'. In what follows, vowel and consonant will be retained (on the grounds of greater familiarity), although vocoid and contoid are the actual objects of the description.

10.
CONSONANTS

In the production of any consonant at least two ARTICULATORS are used. For example, for the 'p' in *pat,* both lips; for the 't' in *ten* the blade (or, depending on the speaker, the tip) of the tongue and the alveolar ridge. (Some speakers of English use the back of the upper teeth, not the alveolar ridge.) Both sounds, then, will be consonants. Consonants which use two articulators are known as SINGLE ARTICULATIONS; those with four, DOUBLE ARTICULATIONS (examples of each are given below).

Different categories of consonant are established on the basis of (i) the actual relationship between the articulators and thus the way in which the air passes through certain parts of the tract, the MANNER OF ARTICULATION, (ii) where in the vocal tract there is approximation, narrowing or obstruction, the PLACE (or POINT) OF ARTICULATION, (iii) the activity of the vocal folds, the STATE OF THE GLOTTIS (or, more specifically, the PHONATION TYPE), and (iv) the type of mechanism used to move the column of air, the AIR-STREAM MECHANISM.

To facilitate the exposition, examples of consonant sounds will be drawn as far as possible from English. For details of these articulations in a range of other languages, see Pike 1943, Abercrombie 1967, Catford 1968, 1977 and Maddieson 1984.

10.1
Manner of articulation

(1) STOP The air-flow is prevented momentarily from leaving the tract by the articulators coming together. In the production of the initial sounds [p], [t], [k] in words such as *pin, tin* and *kin* the articulators (different ones in each case) come together and form an air-tight seal. Air, however, continues to leave the lungs, and as a result pressure builds up behind the articulators. After a short time, usually about 90 milliseconds, the articulators separate and the pressurised air leaves the mouth. The sound of a stop being released has sometimes been likened to a small 'explosion'—hence the use of the term *plosive* instead of stop. (The term 'stop' is sometimes distinguished from 'plosive': see section 10.6 below, under *Air-stream Mechanisms*.) The actual way in which the air is released requires further discussion —see section 10.5 below, under *Types of Stop Release*.

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(2) FRICATIVE The articulators are positioned such that there is a small gap between them, and the air is forced through the gap with resulting turbulence ('friction'). The vocal tract can produce numerous fricatives. For example the initial consonant sounds [f], [θ], [s] and [ʃ] in the words *fin, thin, sin,* and *shin* involve setting the articulators to produce turbulence.

(3) AFFRICATE The sound consists of a stop followed immediately afterwards by a fricative at the same place of articulation. The initial sounds [tʃ] and [dʒ] and *check* and *just* are affricates. Using the term as a purely phonetic (rather than a phonological) category, it is possible to describe a number of other sounds as affricates: for example, the [ts] of *hits* (so long as the stop is made on the alveolar ridge or teeth and not in the larynx), the [dz] of *bids* and the [θ] of *eighth.*

(4) NASAL The air is directed into the nasal cavities as a result of the soft palate being lowered away from the back wall of the pharynx. In addition, there must be a total obstruction at some point in the mouth. Examples in English are the initial consonants [m] and [n] of *man* and *net* and the final consonant [ŋ] of *hang.* (Some speakers of English have a nasal followed by a stop, i.e. [ŋg], after the vowel in this and similar words.)

(5) TAP An articulator touches another articulator very briefly and lightly so that

there is a momentary interruption to the air-flow. In terms of its formation, the sound is similar to a stop, but does not last as long, nor is the contact between the articulators as firm as in a stop. Taps are used in many accents of English: for example, some speakers would use a tap [ɾ] for the 'r' sound in *merry,* others for the 'r' in *red,* others for the 'r' in *dry.* In Spanish, the 'r' of *pero* 'but' is a tap.

(6) FLAP This involves the same basic action as a tap except that the articulator that touches the other articulator then moves on to another position instead of returning, as in a tap, to its original position. A retroflex flap is used in languages of the Indian sub-continent such as Punjabi and Bengali, and may be heard in the English spoken by such speakers, in words such as *very* or *red*.

(7) TRILL A trill consists of at least two taps in quick succession. They are commonly heard in English, more from Scots than from Englishmen, in words such as *red* or *very.* The Spanish 'rr' of *perro* 'dog' is a trill [r].

(8) LATERAL An obstruction is formed between the median line of one articulator and the other articulator, but the articulators are set in such a way that air can still pass on either or both sides of the obstruction. In English the [l] sound in *land* is an alveolar (or dental) lateral: there is a median obstruction between (usually) the blade of the tongue and the alveolar ridge or the central incisor teeth, but the rims of the tongue are lowered on one or both sides, with the result that air can still pass out of the mouth.

(9) APPROXIMANT The gap between the articulators is larger than for a fricative, and no turbulence (friction) is generated. The 'r' sound in *red* is, for many speakers of English, particularly in the south of England, an approximant [ɹ]. The 'y' and 'w' sounds ([j] and [w]) in *yes* and *wet* can be analysed as approximants; they can also be analysed as vowels—see Section 9 above, under *Defining Vowels and Consonants.* This illustrates an important point: certainly in acoustic, but also to an extent in articulatory terms, the category of approximant overlaps with that of vowel. Other, older terms for approximant are FRICTIONLESS CONTINUANT and SEMIVOWEL.

10.2
Place of articulation (or point of articulation)

Consonant sounds may be produced at practically any place between the lips and the vocal folds. Fifteen places are distinguished on the IPA chart.

(1) BILABIAL Both lips are used as the articulators. Examples in English are the initial consonants [p], [b] and [m] in *pin, bin* and *man.*

(2) LABIO-DENTAL The lower lip and the biting edge of the upper central incisor teeth act as the articulators. Two examples in English are the initial fricative consonants [f] and [v] in *fat* and *vat*. Other labio-dental sounds exist in English,

depending on the accent and style of speech used by the speaker. For some speakers, the 'n' in *infant* or *fine fare* is a labio-dental nasal [ɱ]. Some speakers use a labio-dental approximant [ʋ] as the articulation of 'r' in words such as *roy* and *red.*

(3) DENTAL The back of the upper central incisors is one of the articulators. The other is usually the tip of the tongue; sometimes, depending on the accent or language, it may be the blade. Examples in English are the two 'th' sounds [θ] and [[t̪ð] in the words *thigh* and *thy;* these are dental fricatives. Dental stops can be found in English in most speakers' pronunciations of the 'd' and 't ' of *width* and *eighth,* [d] and [t] Depending on the speaker, other manners of articulation, such as nasal and lateral, can be produced at the dental place of articulation.

(4) ALVEOLAR The alveolar ridge acts as one of the articulators; the other articulator is usually the blade of the tongue, or sometimes the tip. There are a number of alveolar consonants in English, for example the [t] and [d] in *ten* and *den,* the [n] and [l] in *knell* (no 'k' sound!), the [s] of *scenic,* the [z] of *busy,* and for some speakers the 'r' of *red* if it is pronounced as a tap or a trill. The Welsh 'll' in the word *llan* is an alveolar fricative [ɬ] in which the air-flow is lateral not median.

(5) POST-ALVEOLAR This refers to the area at the rear edge of the alveolar ridge. Productions of the 'tr' and 'dr' of *try* and *dry* often involve post-alveolar articulations. A common pronunciation of the 'r' in *red* is a post-alveolar approximant, [ɹ].

(6) PALATO-ALVEOLAR This may be regarded as an alveolar place in which there is simultaneous raising of the front (=middle) of the tongue towards the hard palate. (The technical term of this raising is *palatalisation*—see section 10.4 below, under *Secondary articulations.)* The [ʃ] and [ʒ] consonants in *sheep* and *vision* are palato-alveolar fricatives. The initial consonants in *check* and *judge* are palato-alveolar affricates. Many phoneticians do not use the term, however, perferring to describe 'palato-alveolar' sounds as variants of alveolars (or post-alveolars).

(7) ALVEOLO-PALATAL Similarly, this may be described as a place where the front of the tongue forms a manner of articulation with the hard palate and there is simultaneous raising of the blade of the tongue towards the alveolar ridge *(alveolarisation*). Adult speakers of English tend not to use this place, but alveolo-palatal consonants can be heard in the speech of young children (e.g. in *she* or *chin)* and in the normal, adult speech of other languages, for example Polish and Russian.

(8) RETROFLEX Strictly speaking, the term describes the shape of the upper surface of the tongue—i.e. the tongue is curled back or retroflexed. It is used, however, to designate a place, namely the hard palate, with which the underside of the tip and blade forms a stricture. Examples in English, depending on the accent, are the 'r' of *red* (a retroflex approximant or a retroflex flap). Some Northern Scottish speakers use retroflex consonants in their pronunciation of the 'r', 's' and

't' in the word *first.*

(9) PALATAL The hard palate is one of the articulators; the other is normally the front of the tongue. The 'y' of *yes* [j] can be described as a palatal approximant—equally it can be described as a vowel sound. Many speakers use a palatal fricative [] for the 'h' at the beginning of *Hugh.* In other languages, e.g. French and Italian, other palatal manners of articulation can be found: cf the 'gne' [ɲ] of *Boulogne* and the 'gl' [ʎ] of *figli.*

(10) VELAR The soft palate (or velum) is one of the articulators. The other is usually the back of the tongue. Examples in English are the initial stop consonants [k] and [g] in *catch* and *get* and the nasal consonant [ŋ] in *hang.* The pronunciation of the Scots word *loch* contains (at least for native Scots) a velar fricative [x] after the vowel. If the tongue is set slightly further away from the soft palate than for a fricative—and therefore no turbulence results — a velar approximant will be made. A voiced velar approximant [ɰ] can be heard from some speakers of English as a production of the 'r' of e.g. *red.* The [w] sound of *wet* is also velar but it involves an additional place of articulation, and is discussed below (15).

(11) UVULAR The uvula is a relatively small object compared to the soft palate, and the production of 'uvular' sounds frequently involves not only the uvula but also the bottom half of the soft palate. The uvular fricatives [χ] and [ʁ] can occasionally be heard, for example, in certain rural Northern accents of English as realisations of the 'r' in *try* or *dry.* The sounds are standard, however, in accents of French and German and in the various accents of Arabic. A voiceless uvular stop [q] is used in, for example, Arabic. Its voiced equivalent [θ] is much more restricted: it occurs in, for example, Somali. The uvular nasal [N], although easily pronounceable, is very restricted in the world's languages. Some accents of Eskimo use it.

(12) PHARYNGEAL (or *pharyngal)* There are few sounds at this place because of the physiological difficulty (or impossibility) of manoeuvring the speech organs into the appropriate positions—a pharyngeal trill would seem to be out of the question for most vocal tracts. Arabic is a language which contains pharyngeal fricatives.

(13) GLOTTAL The vocal folds are usually employed to produce the difference between 'voiced' and 'voiceless' sounds (see also section 10.3, under *State of the glottis and phonation types).* However, they can be used as articulators to obstruct or narrow the air-flow from the lungs. The famous 'glottal stop' [ʔ] is produced with the vocal folds pushed together such that air-pressure builds up beneath the closure, which after a short time is released. The [h] in many productions of words such as *help* and *hat* can be described as a glottal fricative; an alternative, and sometimes more realistic, interpretation is that it is a type of vowel—see Section 11 below, under *Vowels.*

(14) LABIAL-PALATAL This and the next place of articulation are so-called *double articulations* because they use two separate places or articulation. To make a labial-palatal approximant, for example, two simultaneous approximants must be created: one involving both lips (hence *labial*), the other the front of the tongue and the hard palate *(palatal*). Such a sound can be heard in young children's pronunciation of the 'w' of *wet* [ÿ], or in French in a normal, adult pronunciation of the consonant following the 'l' in *lui.*

(15) LABIAL-VELAR By analogy, this will be a double place of articulation involving the lips, the back of the tongue and the soft palate. The [w] in *wet* in English is a labial-velar approximant. The consonant 'wh' of *when* in many Scottish and American pronunciations of the word is a labial-velar fricative [m]

10.3
State of the glottis and phonation types

The *glottis* is the space between the vocal folds. The term 'state of the glottis' is used more generally to refer, not to the actual space, but to the action of the folds. For simple descriptive purposes, two states are required: open (the resulting sound is voiceless) and vibrating (the sound is voiced). Sometimes the term *devoiced* is used to refer to a further state of the glottis in which there is no vibration of the folds but the volume-velocity of the air-flow is that of a voiced sound. The English word *big,* said with silence following it, will elicit a devoiced rather than a voiced [g]; compare this with the voiced [g] of *bigger.*

However, phoneticians have become increasingly aware, especially in the last 25 years, of the need for a much more rigorous descriptive and classificatory system, which will take account not only of the phonological facts of certain languages but also of the discoveries that have been made using either subjective introspective techniques of observation or instrumentation for the direct observation of the larynx (e.g. fibre-optic laryngoscopy and electromyography). Greater attention is now being paid in phonetics than previously to PHONATION TYPES, the characteristic sound-types associated with different settings of the vocal and ventricular folds. The system devised by Catford (see e.g. Catford 1977:93–116) can be regarded as central in any discussion of the subject.

A distinction is made between the type of stricture (the actual physical relationship between the folds), and the location of the stricture: does it involve the entire length of the folds, or only part? Six categories of type of stricture are set up: CLOSED GLOTTIS (as for a glottal stop), WHISPER (a slight gap is created along at least part of the edges of the folds), BREATH (a wider gap is created, and the air-pressure is relatively high), NIL-PHONATION (the folds are set as for breath, but the air-pressure is lower), CREAK (slow irregular vibration of the front end of the

folds) and VOICE (regular vibration of the folds). Combinations of these are possible: for example, breathy voice and whispery creak. Locations of stricture are less precise: the entire length of the folds, the anterior half, the posterior half, and the ventricular folds. Experience with Catford's system allows one to describe sounds such as the [b] in many pronunciations of the English word *hobby* not simply as a voiced bilabial stop, but as a whispery creaky voiced bilabial stop. A slightly different systematisation of phonation types can be found in the work of Laver (1981a). Further instrumental investigation, involving not only physiological but also aerodynamic techniques, should in due course refine the descriptive system even further.

10.4
Secondary articulations

In the production of the [s] of *see* the lips are unrounded, whereas in the [s] of *sue* they are rounded. Yet both fricatives are voiceless and alveolar. A further dimension of description is obviously required: SECONDARY ARTICULATIONS. These are settings of the articulators which produce a stricture no narrower than that of an approximant. In the case of [s] in *sue,* a bilabial approximant accompanies the alveolar fricative; the sound is said to be *labialised,* or *lip-rounded.* In the so-called 'dark l' of most English pronunciations of the 'l' of *help,* there is not only an alveolar (or dental) lateral, but also a velar approximant—the sound is VELARISED. Other categories of secondary articulation include PALATALISATION (raising the front of the tongue towards the hard palate) as in the 'clear l' of many Irish accents of English, and PHARYNGEALISATION (retracting the root of the tongue into the pharynx) as in many Arabic consonant sounds. To the list can be added NASALISATION, in which there is simultaneous air-flow through the nose as well as through the mouth, as in the [l̃] o*tfell me* (the nasalisation derives from anticipatory lowering of the soft palate for the [m]). If the nasalisation precedes the release of certain stops, the sounds are said to be PRENASALISED.

10.5
Types of stop release

The manner in which a stop sound is completed varies according to its context and, to to a lesser extent, according to the style of speaking. In English, for example, in the word *happy* the intervocalic [p] is released both orally and with the air flowing along an imaginary median line from the back to the front of the mouth (ORAL MEDIAN release). In *Atlantic,* if the first 't' is alveolar (or dental) and not glottal,

the air will be released over the sides of the tongue in anticipation of the following lateral sound and without the median line of the tongue being removed from the alveolar ridge or the teeth (LATERAL release). The 'b' of *submerge* will, on account of the following nasal consonant, be released not through the mouth but through the nose (NASAL release). In the word *lecture* where 2 stop sounds are juxtaposed ([k] and [t]), the release of the first will be held back until it is practically simultaneous with the second (DELAYED release). Depending on the speaker, a stop such as the [t] of *tin* can be released at a slower rate, and the result will be the acoustic and auditory effect of a short fricative following the stop itself (AFFRICATED release). Finally, if a stop is released and is followed by an appreciable interval of voiceless air before the onset of the following segment, then it is said to be ASPIRATED, or more accurately POSTASPIRATED. If an interval precedes the formation of the entire stop, then that sound is said to be PREASPIRATED. Many speakers of Northern Scottish would postaspirate the [k] of *cat* and preaspirate the [t]. The duration of this interval (VOT or VOICE ONSET TIME) is critical in certain circumstances for the perception of the phonological distinction of 'voiced' and 'voiceless'.

It should be emphasized that different languages (and even accents of the same language) may contain patterns of stop releases which differ in some respects from those listed above. The subject is described in detail in Abercrombie 1967:140–50.

10.6
Air-stream mechanisms

For sound-waves to be generated in the vocal tract there must obviously be motion of part of the tract. In most instances, it is the respiratory (PULMONIC) mechanism that sets an air-column in movement, and the direction of the air-flow is outwards or EGRESSIVE. (The term PLOSIVE is often reserved for a pulmonic egressive stop, leaving the term STOP as a general category for any consonant made with a total obstruction to the air-flow, or OBSTRUENT where there is some obstruction, regardless of the air-stream mechanism employed.) Consonant sounds can still be produced, albeit very quietly, if there is pulmonic INGRESSIVE air-flow: for example when counting to oneself.

A different mechanism entirely is the GLOTTALIC, in which the base of the air-column is formed at the level of the vocal folds. The folds are held together, a supralaryngeal consonantal type is made, and to force the air out egressively the larynx is moved upwards. If the sound is a stop, it is called an EJECTIVE. In many Northern and Scottish accents of English, an ejective realisation of word-final voiceless stops in certain contexts is not uncommon. In many African and North American languages, ejectives are phonologically contrastive with plosive sounds. If

the larynx is lowered, rather than raised, the stop sound will be an IMPLOSIVE.

The back of the tongue moving against the soft palate can move a column of air. If it moves backwards whilst a more anterior stop is made, then the result will be a CLICK—a velaric ingressive stop. English *tut-tut,* if said as two consonants rather than two syllables, is a geminate (=repeated) alveolar click [ǂǂ]. The equivalent egressive sound-type is produceable but rarely used in any language.

11.
VOWELS

The notion that there are five vowels in English is quite erroneous, and derives from a confusion of letter-shapes and sounds. Most accents of English contain about 40 vowel phonemes, but the number of actual vowel sounds that can be delimited in any one accent runs into hundreds. Until the mid-nineteenth century the description of vowel sounds followed the long established tradition dating back to the Indians and the Greeks of describing vowels by means of selective consonantal terminology. Thus the vowel of *good* would be 'labial' because the lips played a part in the production of the sound; the vowel of *hit* would be 'palatine' or 'palatal' because the tongue was humped underneath the hard palate in its production; and the vowel of *far,* especially in a Southern English pronunciation, would be 'guttural' (=velar/uvular/pharyngeal) because the tongue was felt to be set well back in the mouth. It was the Scottish-American phonetician Alexander Melville Bell who was to devise a radically different and workable alternative to the older method (Bell 1867). With certain modifications, this is the method of vowel description and classification used today. The English phonetician Daniel Jones was responsible for refining some of the features of the Bell system, and it is Jones's vowel theory that will be described here.

In the production of practically all vowels, the surface of the tongue is convex when looked at in a mid-line section of the mouth, as in Figure 1. The highest point of the convex line is taken as the 'marker' of the vowel, and this marker is then plotted along two axes, horizontal and vertical. In addition, the position of the lips is noted—rounded or unrounded. (In most cases, vowels are voiced. The realisation of the 'h' of *help,* however, is best regarded as a voiceless vowel with the same tongue and lip position as the following voiced vowel.) In the mouth there is only a limited area within which vowels can be produced—in other words, the tongue's 'marker' is restricted in its movements, given the necessity for the tongue to retain a convex shape. This 'vowel area' or 'vowel space' lies beneath the hard and soft palates. One of Jones's contributions to the study of vowels was to define more accurately than Bell had done the shape of the vowel area. The realistic shape of the vowel area, when viewed two-dimensionally, is similar to an oval—more precisely, it is almost

identical to two hysteresis curves in electro-magnetism. But for practical purposes, various deliberately distorted versions of the shape have been employed. Special terminology, some of it deriving from Bell, is used for the names of the lines. The trapezium shape of Figure 2 is the one to be encountered in most works on phonetics.

Jones's other, more famous contribution was to provide a set of reference points around the periphery of the area in relation to which any vowel sound of any language whatever could be plotted. These reference points are known as the Cardinal Vowels. Altogether there are 18 Cardinal Vowels, divided for reasons to do with the early history of the system into 2 sets, Primary and Secondary. (Some phoneticians have argued for the need for a further 4 central vowels; these were not included by Jones in his system.) The distance between adjacent Cardinal Vowels may not be physically the same, but there is, nevertheless, what Jones called 'auditory equidistance' between them—at least for the Primary set. It must be emphasised that the Cardinal Vowels are reference points: they are not to be seen as in any sense 'more important' than non-Cardinal vowels.

The qualities of the Cardinal Vowels cannot be learned from a verbal description. They must be acquired either from recordings, of which Daniel Jones made three, or, better still, from a phonetician who has been taught them. Ideally, there should be an unbroken 'line of descent' from Daniel Jones! With training, a student of phonetics will acquire a Jonesian pronunciation of the vowels and will then be able to apply the knowledge in the plotting on the vowel chart of any vowel sound of any language whatever.

The notation of vowel sounds which are not Cardinal in quality can be achieved by two methods. Special diacritics exist to indicate particular directions of movement away from a Cardinal Vowel. The notation of a Southern English pronunciation of *ah,* for example, could be [

+
ɑ

]. An alternative, but less accurate method for some vowel sounds is to employ a set of 'float' symbols. These refer to general areas within the vowel space, not to specific points. They are set out in Figure 3. When making a phonological transcription (see Chapter 2, section 4.1), the use of a particular Cardinal Vowel symbol does not necessarily mean that the phonological unit represented by that symbol is Cardinal in quality. The choice of a symbol for a vowel phoneme is dependent on a number of factors, including the proximity of the phoneme to a Cardinal Vowel and the availability of particular symbols on typewriter and computer keyboards.

Figure 2. The Cardiunal Vowel chart. Symbols towards the inside are for *unrounded* vowels.

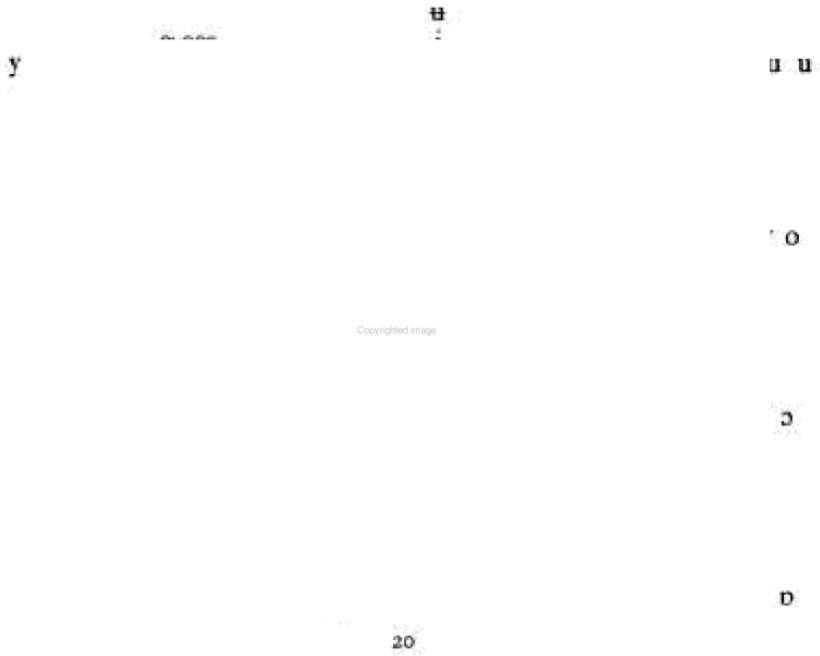

Figure 3. The ‘float’ vowel symbols and their approximate areas.

Jones's vowels are MONOPHTHONGS, that is, sounds which do not vary in quality within a syllable. Most productions of the vowel of *good* will be of this type. If, however, there is an adjustment in the quality of a vowel, as a result of tongue or lip movement or both, the sound will be a DIPHTHONG. (Some earlier phonetic descriptions often used ‘vowel’ as equivalent to ‘monophthong’, leaving ‘diphthong’ as a separate category. That distinction is no longer followed.) Articulatorily, diphthongs can be classified in two ways: in terms of tongue movement across the vowel space, and secondly in terms of changing auditory prominence. In the

production of the diphthong in the word *boy,* the tongue moves forwards and upwards in the mouth at the same time as the lips unround; whereas in many English pronunciations of the word *hear* the tongue moves into the centre of the vowel space. These and other possible types of movement lead to the setting up of the following diphthong types: FRONT CLOSING, BACK CLOSING, FRONT OPENING, BACK OPENING, and CENTRING.

The second method of classification is quite different and relies on the auditory judgement of increasing or decreasing prominence during the diphthong. For example, in the word *boy* one senses a greater degree of prominence at the beginning rather than at the end of the diphthong; the diphthong is therefore described as *falling.* (The prominence falls away or decreases. It has nothing to do with pitch movement.) The reason for the change has, in this particular case, to do with the greater sonority of the first part of the diphthong compared with the second part. In the word *tide* as pronounced by a Scottish speaker, the second part of the diphthong is more prominent, due to the speed at which the tongue moves from a more open position to a closer one, and the diphthong is therefore described as *rising*.

Any vowel sound, whatever its type, may be accompanied by certain other features. For example, if the soft palate is in a lowered position, then the vowel will be nasalised. The French phrase *un bon vin blanc* illustrates 3 (and for some speakers, 4) nasalised vowels. In English, nasalisation of vowels is fairly common if the vowel occurs between nasal consonants. Compare the nasalised quality of the vowel in *man* with the non-nasalised quality in *bad.* See, however, section 12.4 below, on *Voice quality features* for a refinement of this statement.) Secondly, since only the front or back of the tongue forms the highest point of the tongue surface during the production of vowels, the tip and blade and/or root are able to take up specific positions if need be. Thus, a vowel may be, for example, a front vowel but be simultaneously 'coloured' by retroflexion of the tip and blade. Many vowels occurring before /r/ in South Western English and in many American accents of English have this 'r-coloured' or *retroflexed* quality.

12.
NON-SEGMENTAL FEATURES

These can be divided into three sorts: first, those which involve the manipulation of the parameters of loudness, pitch and duration; second, those features which act more or less as a constant auditory background to everything a person says (voice quality), and third, those which are superimposed on the stream of speech for specific emotional reasons (voice qualifications).

12.1
Loudness

Loudness is the perceived correlate of an increase of energy in the outflow of air from the lungs. It can be measured as an acoustic phenomenon in decibels. Some accents of English, especially in the South of England, are noticeably louder than accents further north. A language like Arabic can sound louder—at least in some accents—than for example English or German.

The term STRESS is often used by describe the physical characteristics that underlie the creation of loudness. Stress depends on power, that is the power exerted by the respiratory system to move the column of air from the lungs, bearing in mind the obstructions that that column may meet on its path from the lungs to air at atmospheric pressure beyond the vocal tract (see Catford 1977:80–5 for a discussion of the concept of stress). To say, however, that the second syllable in the word *ago* is 'stressed'—as many phonetics textbooks do—is to raise a further issue, namely the role played by other prosodic features in the creation of so-called stress. Certainly, in many (if not all) accents of English, the physical constituents of stress (in the sense in which we say that the second syllable of *ago* is stressed) embrace not only respiratory power but also pitch change and to a lesser extent the duration and the relative sonority of the syllable itself. For a discussion of some of the issues involved in 'stress' in English (or, to use a preferable term, ACCENT), see Gimson 1980:221–6.

12.2
Pitch

The role that the vocal folds play in speech has already been mentioned in connection with the glottal place of articulation and phonation types. A further, and equally important, role is to mediate PITCH in speech. The subjective impression of pitch corresponds in most cases to the speed at which the vocal folds vibrate: a slow speed of movement correlates with a low pitch, a fast speed with a higher pitch. The actual physical values of the speeds associated with low and high pitches vary from individual to individual, but for an adult male the lowest pitch that might be used in normal, unemotional conservation might be c 70 Hz, and the highest might be c 120 Hz. For an adult female, the figures might be c 150 Hz and c 290 Hz respectively. From these figures can be established a range of pitch values within which the speaker will operate, the TESSITURA.

A description of pitch changes in speech can be made either instrumentally (see Figure 4 for example) or subjectively. Working subjectively, the phonetician assesses the relative position in the tessitura of the individual syllables and the contour of the pitch—either level, falling or rising. The result is then plotted on a

scale and an analysis is carried out of the patterns of pitch movements. The IPA alphabet provides certain diacritics to indicate the general pitch pattern of syllables or larger units, which can be incorporated into a transcription of the segments of speech; a tessitura-based diagram then becomes unnecessary.

Figure 4. Pitch patterns in a pronunciation of 'When did she say she was coming?'.

Source: Adult male speaker, English accent. Data derived from an electrolaryngographic analysis, Phonetics Laboratory, University of Glasgow. Gaps in the contour represent voiceless sounds.

In any discussion of pitch changes in speech, the terms TONE and INTONATION require clarification. The former refers to the use of pitch to signal a lexical difference. In Mandarin Chinese, for example, the syllable [ʒ] will convey different meanings depending on the pitch with which it is said: *clothing, aunt, chair or easy.* See Figure 5 for instrumental traces of a slow pronunciation of the four words. The majority of the world's languages are *tonal.* The term *intonation* means the use of pitch fluctuation for exclusively non-lexical purposes. Languages such as English, French, German, Russian and Japanese are 'intonation languages'.

The analysis of intonation in English would involve establishing a domain or unit within which pitch fluctuation operates: usually it is taken to be the 'tone-unit', which may or may not correspond with the grammatical phrase or clause (see Chapter 2, sections 7.6, 9.5). Within the tone-unit, the pattern of pitch movement is analysed with reference to the 'accented' syllables; possible types of movement are then set up. Once the range of pitch movements has been established, attention is focused on the relation between the various movements and grammatical and attitudinal factors. For a description of English intonation within these terms, see Crystal 1969.

12.3
Duration

Segments are traditionally described subjectively as either short, half-long or long.

Duration as a non-segmental feature is most relevant in the area of RHYTHM, the temporal organisation of stressed and unstressed syllables. The word *ago* will be felt by native speakers of English to contain a short syllable followed by a somewhat longer one. Measurements can be made of the duration of each syllable, either in milliseconds or in a musical notation (dotted crotchets etc). For most phonetic purposes, though, it is sufficient to provide a subjective assessment of the duration, using the terms 'short' and 'long', with for some languages an intermediate degree of 'medium' or 'half-long'. But the description of rhythm hinges as much on the relationship of syllables to stress as on the length of the individual syllables. One could, for example, relate the rhythm of a sentence such as 'When did she say she was coming' to the ISOCHRONOUS (equal-timed) pulsing of the stresses *when, say* and *com-,* and draw up a scheme of rhythm which emphasises the isochrony of the stresses and the effect that this has on the lengths of the individual syllables. An alternative, but related approach is to discuss the isochrony of the stressed syllables in relation to the grammatical structure of the sentence, and set up 'rhythm units' based on this. For English, at least, both approaches can be found. (See Chapter 2, section 7.5.)

12.4
Voice quality features

Listening to a speaker of any language, one is soon aware of a certain constant background colouring to everything that is said. It might be breathiness, or nasalisation, or a general 'dullness' or, conversely, strong resonance in the voice. The term *voice quality* has been given to this constant or near-constant background auditory effect. For many years, impressionistic labels have been used to try to capture the essence of the quality: for example, a 'silvery' voice, or a 'sepulchral' voice, or a 'sexy' voice (see Laver 1981). In recent years, however, attention has been focused on the phonetic constituents which together create the auditory impression of 'silveriness' etc. (The major study of the subject is Laver (1980).

Figure 5. The syllable [ɑʒi] in Mandarin Chinese said on four different tones.

Source: Adult male speaker of Mandarin Chinese. Data derived from an electrolaryngographic analysis, Phonetics Labotatory, University of Glasgow.

Three factors can be isolated. One is the distance from the larynx to the lips, which can be shortened or extended by movement of the larynx and/or the lips. A particular length of tract, maintained by the speaker more or less all the time he or she is speaking, will give rise to acoustic effects which are then judged impressionistically to relate to a certain voice quality feature. A second factor is the arrangement within the mouth and pharynx of particular articulators: a constant forward setting of the tip and blade of the tongue and raising of the front of the tongue towards the hard palate will lend a certain ‘effeminate’ quality to a male speaker's voice; raising and backing of the tongue so that the centre of gravity is higher and further back in the mouth is characteristic of many Northern English pronunciations of English; and permanent slight lowering of the soft palate, even in so-called oral sounds, will introduce a degree of nasalisation into the voice. (For a historical survey of this topic see Laver 1978.) The third factor is the habitual use of phonation types: many male speakers of English have some creak and whisperiness in their voice quality. Studies of voice quality across different accents of languages

are at a fairly early stage, but the main parameters of the descriptive system have already been established.

12.5
Voice qualifications

Finally, there are a number of voice qualification features. These differ from voice quality features in that they are not permanent, but are superimposed on speech according to specific emotional circumstances. The terms *laugh, cry, tremulousness* and *sob* will be self-evident. For further discussion of their place in the overall phonology of English, and indeed of non-segmental phonology generally, see Crystal 1969.

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2
LANGUAGE AS ORGANISED SOUND: PHONOLOGY

ERIK FUDGE

1.
INTRODUCTION

General Phonetics, as described in Chapter 1, gives an account of the total resources of sound available to the human being who wishes to communicate by speech. In its essence it is thus independent of particular languages. Phonology gives an account of, among other things, the specific choices made by a particular speaker within this range of possibilities. In the first instance, therefore, phonology is concerned with a single language, or, to be more precise, a single variety of a language. General phonological theories can be built up only at one remove, i.e. on the basis of phonological facts established for particular languages. There are thus many fundamental differences between the two disciplines.

To begin with, the data of General Phonetics are, in principle if not in fact, just about all observable; the same is, however, not true of Phonology. This has consequences which are well expounded by Fischer-J0rgensen; observing that older theories of phonology are not totally out of date, she continues (1975:2):

> In this respect there is an important difference between phonology and phonetics. Phonetics is dependent on technical apparatus; rapid and continuous technical development, especially in recent years, has resulted in a steadily increasing growth of our phonetic knowledge.... Older phonetic studies... are therefore regarded by everybody as outdated and of historical interest only.
>
> It is not quite the same with phonology.... phonological analysis does not produce new concrete facts which must be acknowledged by everybody in the same way as phonetics.. the phonological schools differ chiefly in having different general views due to the historical-philosophical context in which they are placed.

The advances in phonetic study to which Fischer-J0rgensen draws attention have proved that more and more detail is discoverable in the speech signal, and that it is very rare for two repetitions of an utterance to be exactly identical, even when spoken by the same person. At the same time, it is clear that for communicative purposes much of this

detailed variation is quite irrelevant: the fundamental assumption of linguistic study is that many utterances, even if differing in detail, are taken by members of a speech-community as being alike in form and meaning, cf. Bloomfield (1933:78).

Phonetic study also disproves a common fallacy about the nature of speech, i.e. the assumption that speech is made up of 'sounds' which are built up into a sequence like individual bricks into a wall (or letters in the printed form of a word), and which retain their discreteness and separate identity. One difficulty is that the various organs involved in the production of a particular sound move at different speeds: a slow-moving organ needs to be set in motion a fraction of a second before a quicker-moving one, or may go on moving after the quicker organ has stopped. Movements of the organs thus overlap in complicated ways, and this often makes it very difficult to say at what precise instant a sound actually begins or ends.

Again, particularly where vowel sounds (strictly VOCOIDS see Chapter 1, section 9) occur next to each other, the precise location of the boundary between them may be hard to establish. In the utterance *I see all that,* for example, the vocal tract moves from the position for [i:] in *see* to the position for [ɔ:] in *all,* but does not move instantaneously: there is a brief phase during which the vocal tract in fact moves through all the positions between [i:] and [ɔ:], and so makes all the sounds between [i:] and [ɔ:] (note, furthermore, that there is not a finite number of positions or sounds between [i:] and [ɔ:], but a continuum). Hence any decision to locate the boundary between [i:] and [ɔ:] at a specific point on that journey would be entirely arbitrary, just as it would be arbitrary to attempt to locate the boundary between two neighbouring letters in a cursive script at a precise point on the pen-stroke joining them.

The human hearer, however, is not aware of such transitions: in perceiving speech the ear has been trained to ignore phonetic facts which are unavoidable, purely automatic, consequences of the way the vocal tract functions. We assume therefore that such transitions will not be among the phonologically relevant aspects of the signal. As a first approximation, then, we could say that the phonological representation of an utterance is obtained from the totality of phonetic properties of that utterance by discarding all phonetic properties which the speaker is 'forced' to produce and concentrating on the properties which he is able to control and alter at will. If this is the case, then it is much more reasonable to regard the phonological representation as being a string of individual, discrete elements much like letters in a printed word.

As a theory of phonology, the position just outlined is in fact deficient in two important respects:

(i) A number of the properties which the speaker *can* control are also not relevant in a phonological sense (for further discussion see section 2 below);

(ii) The notion that phonologically relevant properties connected with an utterance are necessarily *physically present in the utterance* is not in fact correct (see section 4

below).

For the present, however, this over-simple theory points us in the right direction in beginning to establish the difference between Phonology and Phonetics.

There are a number of general works on phonology which can be recommended. Hyman (1975) is a widely-used textbook, and is for the most part genuinely introductory. Lass (1984) is rather more advanced, but will prove stimulating to the reader who has a grasp of the basic concepts in phonology. Fischer-Jørgensen (1975) and Anderson (1985) aim at a detailed treatment of the historical development of the subject, and the philosophical issues it raises. Fudge (1973a) is an anthology of some of the key articles in the field. Works on more specific aspects of the field will be referred to at the appropriate points in the remainder of this chapter.

2
DISTINCTIVENESS

2.1
Phoneme and allophone

In Standard English as spoken in England, the *l* of *feel* is pronounced differently from the *l* of *feeling:* in the former, the body of the tongue is bunched up towards the soft palate (velum) (see Chapter 1, sections 10.1 and 10.4), while in the latter it is not. The technical term for the former articulation is 'velarised', though the usual term applied to the velarised *l* of *feel* is 'dark [l]' (from the sound effect of lowered pitch which velarisation causes); correspondingly the non-velarised *l* of *feeling* is referred to as 'clear [l]'. Other varieties of English do not exhibit this difference: many Scots and American varieties have dark [*l*] in both *feel* and *feeling,* while many Irish varieties have clear [l] in both words. This shows clearly that the difference between the two sounds is in principle under the control of the speaker.

Further investigation, however, will show that, for the Standard English speaker, the difference between clear [l] and dark [l] is completely predictable from the phonetic context in which the *l* appears: before a vowel the pronunciation is clear [l] (cf. *feeling, leaf, law*), while in all other contexts (i.e. before a consonant, as *infield, help,* and in word-final position, as in *feel, well*) *l* is always dark. When the difference between two similar sounds is completely predictable in this way from the phonetic context, we say that they are ALLOPHONES of the same PHONEME.

Some scholars have viewed the phoneme as a family of sounds (allophones) in which (i) the members of the family exhibit a certain family resemblance, and (ii) no member of the family ever occurs in a phonetic context where another member of the family could occur. The technical terms for these two properties of allophones of the same phoneme are (i) PHONETIC SIMILARITY and (ii) COMPLEMENTARY DISTRIBUTION.

In transcriptions, if the units being transcribed are phonemes rather than allophones, it is customary to enclose the symbols in slant lines: /l/. If, on the other hand, the transcription specifies allophones, square brackets are used: [ɬ]. There is a general tendency for phonetically-based writing systems to have separate symbols for distinct phonemes, while allophones of the same phoneme are not separately represented.

It is important to notice that sounds which are allophones of the same phoneme in one language may in other languages operate as distinct phonemes. In Russian, for example, sounds very similar to clear [l] and dark [l] can make a difference of meaning: /mɔl/ 'moth' v. /mɔɬ/ 'pier'. Such differences between allophonic status and phonemic status can cause difficulties for learners; English learners of Russian will have no trouble learning Russian /mɔɬ/ 'pier', with dark [l] in the final position, but may be expected to find /mɔl/ 'moth' problematic because of the clear [l] in a position where it would not appear in English.

For the allophone v. phoneme distinction see Jones (1957), Jones (1950: chapters II–IX), Hyman (1975:5–9).

2.2
Some allophones in English

Other examples of sets of English sounds which are allophones of one phoneme include the following:

(a) At the beginning of a stressed syllable, voiceless plosives are strongly aspirated (cf. Chapter 1, section 10.5); in other words, after the lip closure of /p/ is released, the vocal cords do not begin to vibrate for the vowel immediately, but only after a perceptible delay, giving rise to a puff of breath before the vowel proper begins. When preceded by /s/, on the other hand, these plosives are unaspirated; the vocal cords in this case begin to vibrate immediately after lip closure is released, and no puff of breath intervenes. Thus *pin* is pronounced [phɪn], whereas *spin* is [spɪn]. The strongly aspirated [ph] never occurs after /s/, and the unaspirated [p] never occurs at the very beginning of a syllable. Again, at the end of a syllable, /p/ may be slightly aspirated. However, if followed by a /t/ (as in *chapter*), the closure for the /p/ is very likely not to be released until the release of the /t/ closure occurs (cf. the [k] of *lecture* in the example cited in Chapter 1, section 10.5). Again, an utterancefinal / p/ (as in *Come on up*!) is quite likely not to be released at all.

(b) Any vowel followed by a voiceless sound is shorter than the same vowel phoneme followed by a voiced sound. For example, the vowel of *beat* is shorter than that of *bead,* the vowel of *bit* is shorter than that of *bid,* and the vowel of *rice* is shorter than that of *rise.* 'Shorter vowels' of this kind are not to be confused with the 'short vowels' which *contrast* with 'long vowels' e.g. the vowel of *bid* in contrast with the vowel of *bead*. The difference between short and long in *bid/bead* is a difference between two distinct phonemes, whereas the difference between shorter and longer in *beat/bead, bit/bid,* and

rice/ rise is an allophonic one. We shall refer to the shorter vowels of the allophonic pairs as 'shortened', and to the longer members as 'non-shortened'; where necessary, the shortened allophone of /i:/ will be transcribed [i], without a length mark.

(c) English /r/ has at least four different allophones: it is voiceless after voiceless aspirated plosives (the delay in the onset of vocal cord vibration is likely to persist through most or all of the /r/ in such cases), and voiced elsewhere. After the alveolar plosives /t/ and /d/, the tongue tip is close enough to the alveolar ridge to set up turbulence in the air stream, giving a fricative sound (cf. Chapter 1, section 10.1(2); this fricative is voiceless after the aspirated /t/ and voiced after /d/. After sounds other than /t/ and /d/, or initially in a word, there is no turbulence, and the sound is an approximant (cf. Chapter 1, section 10.1(9)).

(d) For many speakers the 'long o' phoneme has a much more 'back' pronunciation before dark [l] than before other sounds: *coat* is pronounced [kəut] (where the vowel begins as a central vowel) while *coal* is [kɔuɬ] (in which the beginning of the vowel is fully back). For the terms 'central' and 'back', see Chapter 1. Section 11, Figure 2.

For some purposes, allophones of the same phoneme may need to be recognised as important—a beginner learning English as a foreign language, for example, may well have to practise making the difference between clear and dark [l], and that between 'shortened' [i] and 'non-shortened' [i:] etc., if his pronunciation is to sound right. For other purposes, however, these differences can safely be ignored: English spelling, for instance, loses nothing in clarity by noting both clear and dark [l] with the same letter l, 'shortened' [i] and 'non-shortened' [i:] with the same set of possibilities *e-e* (as in *concrete*), *ea* (as in *bead*), *ee* (as in *meet*), etc., all the allophones of /r/ with the same letter *r,* and central and back 'long *o*' *o-e* (as in *vote*), *oa* (as in *boat*), etc.

A fuller description of English allophones may be found in Gimson (1980: Part II), or O'Connor (1973: Chapter 5).

2.3
Distinctive differences

Where a particular phonetic difference does not give rise to a corresponding phonemic difference, we say that this phonetic difference is NON-DISTINCTIVE. Thus [fi:l] with a clear [l] will be perceived as an unusual pronunciation of *feel,* not as a word which is totally different from *feel;* the difference between [fi:l] and [fi.ɬ] is non-distinctive. On the other hand, differences which can give rise to a change of meaning, i.e. phonetic differences between phonemes, are referred to as DISTINCTIVE. The difference between [p] and [b] in English for example, is distinctive: *pit* and *bit, ample* and *amble, tap* and *tab,* are pairs of distinct words, not alternative pronunciations. Clearly, all distinctive differences within a language must be readily perceptible to native speakers of that language.

A few of the non-distinctive differences present in their language may also be

perceptible to native speakers: thus, many native speakers of English find it reasonably easy to become aware of the difference between clear [l] and dark [l]. Most such differences, however, can be perceived by native speakers only after some degree of phonetic training. Speakers of another language, on the other hand, may readily perceive certain non-distinctive differences in English, especially where these differences are distinctive in their own language. Russian speakers, for instance, might be expected to have no difficulty whatever in hearing the difference between English clear [l] and dark[l].

Typically, distinctive differences recur in different parts of the inventory of phonemes. Whatever the difference is between English /b/ and /p/ (traditionally called 'voicing', though as we shall see in section 2.5, it is not always signalled by the presence of vocal cord vibration), the same difference is used to distinguish /d/ from /t/, and /g/ from /k/. A very similar difference distinguishes /v/ from /f/, and /z/ from /s/. Likewise the difference between /m/ and /b/ is the same as that between /n/ and /d/ ('nasality'), and the difference between /s/ and /t/ is the same as that between /z/ and /d/ ('continuance'). The net result of this situation is that the phonemes of English fall into classes for which the distinctive features form convenient labels: /p tʧ k f θ sʃ h/ are the class of 'voiceless' sounds in English, /t d s z θ ð l nʧ ʤʃʒ r/ are the 'coronals' (sounds made with the tongue tip or blade raised—see Chapter 1, Figure 1), /m nŋ/ are the 'nasals', /i e æ ɒ ʊ ʌ/ are the 'short vowels', and so forth.

The symbols [ɪ] and [ɷ], for the vowel sounds in *big* and *good,* have the free variants [ɪ] and [ʊ].

For an account of distinctiveness and of phonological theories founded on that notion, see Hyman (1975:5–9 and Chapter 2), and Fischer-Jørgensen (1975: Chapter 3).

2.4
Distinctive features and the phonological system

These classes of phonemes can be represented as being characterised by the presence or absence of certain properties: thus voiceless sounds will all be marked 'absence of the property "voicing"', coronal sounds 'presence of the property "tongue tip or blade raising"', nasal sounds 'presence of the property "nasality"', etc. This information may be displayed in a diagram like Table 1, which lists the properties or 'features' in the left hand column, and then shows for the sound at the head of each column whether the property is present (by inserting '+' in the appropriate cell), or absent (by inserting ' −'). There is no one generally agreed assignment of feature values for English, nor even one generally agreed set of features; Table 1 represents just one possible way of analysing the English consonant system.

Table 1: One method of using distinctive features to set up natural classes of English consonant phonemes.

	p	b	f	v	w	m	k	g	h	y	ŋ	t	d	s	z	θ	ð	l	n	ʧ	ʤ	ʃ	ʒ	r
Sonorant	−	−	−	−	+	+	−	−	−	+	+	−	−	−	−	−	−	+	+	−	−	−	−	+
Nasal	−	−	−	−	−	+	−	−	−	−	+	−	−	−	−	−	−	−	+	−	−	−	−	−
Coronal	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	+	+	+	+	+	+	+	+	+
Anterior	+	+	+	+	+	+	−	−	−	−	−	+	+	+	+	+	+	+	+	−	−	−	−	−
High	−	−	−	−	+	−	+	+	−	+	+	−	−	−	−	−	−	−	−	−	+	+	+	−
Continuant	−	−	+	+	+	−	−	−	+	+	−	−	−	+	+	+	+	+	−	−	−	+	+	+
Voiced	−	+	−	+	+	+	−	+	−	+	+	−	+	−	+	−	+	+	+	−	+	−	+	+
Strident	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	−	−	−	−	+	+	+	+	−

Brief explanations of the features used:
[+sonorant]: Air flow not radically restricted.
[+nasal]: Velum lowered, allowing air through nasal passages.
[+coronal]: Tongue tip or blade raised.
[+anterior]: Constriction at alveolar ridge or further forward.
[+high]: Tongue body raised.
[+continuant]: Air flow through oral cavity not blocked.
[+voiced]: Vocal cords vibrate (but see section 2.5).
[+strident]: High level of noise ('sibilance').
Minus values of a feature mean the absence of the property.

By taking the intersections of these various classes, we obtain smaller classes: e.g. the 'voiceless fricatives' /f θ sʃ/ are the class of English sounds which in feature terms are both [−voiced] and [+continuant]; the 'coronal sonorants' /l n r/ are the class which are both [+sonorant] and [+coronal]; the 'alveolar plosives' /t d/ are the class which are [−sonorant], [+coronal], [−anterior] and [−continuant]; in the framework we have set up here, the 'labials' /p b f v w m/ are in fact the set of sounds which are both [−coronal] and [+anterior].

For more detailed accounts of the theory of distinctive features, see Hyman (1975: Chapter 2), Jakobson and Halle (1956), Fudge (1973b).

2.5
Distinctive features and acoustic cues

It appears plausible to assume that the distinctive features might be precisely the cues which enable hearers to distinguish the phonemes which, to express it in terms of the over-simplified theory put forward in section 1, occur in speech. In the past, several approaches to phonology actually made this assumption (see e.g. Jakobson and Halle 1956), but it now appears clear that the range of cues actually used by hearers is much wider than the range of distinctive features. The distinctive feature distinguishing /b/ from /p/, for example, (referred to as 'voicing' in section 2.3 above), may correspond to any of the following acoustic cues depending on the context (see Parker 1977):

(i) When preceding stressed vowels (e.g. *bat* vs. *pat*): the vocal cords begin to vibrate for /b/ significantly earlier than for / p/, aspiration (see Chapter 1 section 10.5) may occur with /p/ but not /b/, the pitch contour of the following vowel begins significantly lower for /b/ than for /p/, etc.;

(ii) When between two vowels, the second being unstressed (e.g. *ribbing v. ripping*): the silent interval between the vowels is significantly shorter for /b/ than for /p/, the vocal cords may begin to vibrate before the end of the silent interval for /b/ but not for /p/;

(iii) When word-final (e.g. *tab* v. *tap*): the preceding vowel is longer for /b/ than for /p/, and runs smoothly into the /b/, whereas it is terminated abruptly for /p/ by a closure of the vocal cords; if the plosive is released, the manner of release for /b/ is different from that for /p/.

Notice that some of these acoustic cues in fact refer to information which is *non-distinctive:* the shortening of vowels before voiceless consonants, for instance. This shows how important it is that foreign learners of a language acquire the correct ALLOPHONES of the phonemes of that language, in order to provide native hearers with the acoustic cues they expect.

3
ALTERNATIONS

3.1
Allophones and alternations

In the *feel/feeling* case which we considered earlier, the two words concerned are closely connected (being different forms of the root *feel*): the difference may be described as an ALTERNATION (the pronunciation of the root alternates between [fi:ɬ] for the infinitive and [fi:l] with a clear [l] for the participle). Allophones of the same phoneme often participate in alternations in this way. However, it is not necessary to have an alternation in order for two sounds to be allophones of the same phoneme. Indeed, there are some languages, e.g. Vietnamese, in which morphological processes like suffixation and prefixation just do not occur, but which do have allophonic variation.

Conversely, the existence of an alternation does not necessarily indicate that the alternating sounds are allophones of the same phoneme. Consider, for example, *felt,* the past tense form of the verb *feel:* assuming the -t of *felt* represents the past tense suffix (cf. *learn/learnt*), we have an alternation between *feel [fi: ɬ]* and fel- [feɬ]. This certainly does not mean that [i:] and [e] are allophones of the same phoneme: there are plenty of pairs of words like *beat/bet, sheaf/chef, reek/wreck* which use the difference between [i:] and [e] as a distinctive difference. Here, then, we have an alternation between distinct phonemes. Alternations of this kind are often termed MORPHOPHONEMIC alternations, because they are alternations between phonemes, with morphological relevance.

Certain morphophonemic alternations are more regular than others: the /i:/ v. /e/ of *feel/felt* recurs in *kneel/knelt* and *deal/ dealt,* but is not the normal case for verbs in /-i:l/: *appeal, conceal, heal, heel, keel, peel, reel, repeal, reveal, seal, squeal, wheel* all have

the same vowel /i:/ in their past tense as in their base form (*steal* is a different case again —see the next paragraph). On the other hand, the alternation between /s/ and /z/ in the regular plural suffix of English is just about totally predictable for all roots: when the immediately preceding phoneme is voiceless, the suffix has the form /s/, as in *cats* /kæts/, while if the immediately preceding phoneme is voiced, the suffix is pronounced /z/, as in *dogs* /dɒgz/ and *horses* /hɔ:sɪz/ (note that in the last example it is the (voiced) vowel /ɪ/, not the voiceless consonant /s/, which immediately precedes the consonant of the plural suffix).

A third type of case is exemplified by the verb *steal,* with past tense *stole*. Here there is no suffix to signal the past tense; this is in fact signalled by the vowel change (ABLAUT, to give it its traditional name). Thus in this case the vowel change is not an alternation in the sense we are dealing with here.

The /s/~/z/ alternation recurs in the pronunciation of the possessive ending (*cat's/kæts/* v. dog's/dɒgz/), in the third person singular ending in the present of verbs (*looks*/lʊks;/ v. *sees*/si:z/), and in the contracted forms of is and *has* (*it's arrived* /ɪts/ v. *he's arrived*/hi:z/).

Analogous to the /s/~/z/ alternation is the /t/~/d/ alternation shown by regular past tenses and past participles in English: /t/ after a voiceless sound, as in *stopped* /stɒpt/, but /d/ after a voiced sound, as in *stayed* /steɪd/ and *waited* /weɪtɪd/.

Accessible accounts of morphophonemic alternations may be found in Martinet (1973) and Lass (1984:55–62;).

3.2
Differences between varieties of the same language

So far we have been speaking of alternations between forms in the *same* variety of a language. However, as our remarks above on the pronunciation of *l* in different varieties of English begin to suggest, the situation becomes much more complex when we compare different regional or social accents. While not all speakers can consistently reproduce accents in their own speech, the overwhelming majority of speakers are able to understand a very wide range of regional and social varieties. Our understanding of other people's speech does not depend on their use of exactly the same sounds as we use in our own speech.

All this indicates clearly that it is not merely the *phonetic properties of sounds* which are important for the hearer, but also the *place* each sound holds *within the system* of sounds (see Sapir 1925). This is particularly true of vowel sounds; speakers appear to set up a series of correspondences between the differing vowel sounds of other varieties and their own vowel sounds. These correspondences, in fact, may cut clean across the correspondences which might be set up on phonetic grounds between the sounds of one variety and those of another. Thus, a Cockney's pronunciation of *know* might well be physically very similar to an RP speaker's pronunciation of *now,* while the RP speaker's

know could be just like a Scotsman's *now*. Again a Yorkshire speaker's *know* might be almost identical with the RP *gnaw*.

A further complication arises from the observation that, across varieties, *the systems themselves* may differ from one another as well as the pronunciations of the vowels within the system. Thus many Northern English speakers have a system of five short vowels instead of the six in RP and other varieties: the vowels of *put* (RP [pʊt]) and *putt* (RP [pʌt]) are not distinguished (both pronounced by some Northerners as [pʊt] and by others as [pət]). Many Scots speakers have no distinction corresponding to /ʊ/ v. /u:/ in RP: for them, *soot* and *suit* are pronounced identically, as [sʉt].

We are still not at an end of the complicating factors. A major clue in the establishment of links across systems is of course the fact that the same words tend to have the same systematic units in them: the word *know* which was our example above, for instance, consists for all the speakers mentioned of a consonant /n/ (pronounced just about identically for everyone) followed by a vowel, which is pronounced very differently in each case, but corresponds to the same systematic unit for all speakers—a unit which we might term 'long *o*'. Many other words, e.g. *boat, home,* will likewise have 'long *o*' as their vowel for all the speakers.

Sometimes, however, a word may not have the (systematically) same vowel unit across all varieties: many people begin the word *economics* with 'long *e*' (the vowel of *beat*), while others, with an equal claim to be speaking Standard English, begin it with 'short *e*' (the vowel of *bet*). Some speakers say *neither* with 'long *e*', others with 'long *i*' (the vowel of *bite*). Situations of this kind may be referred to as LEXICAL-DISTRIBUTIONAL differences between the varieties concerned (Wells 1982:78–9), or SELECTIONAL differences (O'Connor 1973:182–4).

Finally, the relationship between a careful pronunciation of a particular phrase by a particular speaker and a colloquial pronunciation of the same phrase by the same speaker may be an extremely complicated one, and raises a whole range of further problems for the phonologist. The word *extraordinary,* for example, has a whole range of pronunciations, ranging for most British English speakers from the hyper-careful ['ekstrə'ʔɔ:dɪnərɪ] through the fairly careful [] to the very colloquial ['strɔ:nrɪ].

O'Connor (1973; 152–75) gives a clear account of the range of vowel sounds which may represent particular systematic vowel units in different varieties of English. A thorough but readable account of the differences between the systems underlying different varieties is given by Wells (1982).

4.
PHONOLOGICAL REPRESENTATIONS

4.1
Types of transcription

Types of speech may vary from one occasion of speaking to another, as we have seen in section 3. Different types of transcription must also be recognised: we have already encountered PHONEMIC and ALLOPHONIC transcriptions (section 2). Under the influence of tiredness, inebriation, or perhaps even the presence of food in the mouth, utterances can be distorted from the norm for the variety concerned. In that case we can distinguish between a transcription which represents that norm, and one which attempts to represent every detail of the utterance including any distortions from the norm. The former has been termed a SYSTEMATIC transcription and the latter an IMPRESSIONISTIC transcription.

In most cases, impressionistic transcriptions will be allophonic, and phonemic transcriptions will be systematic. Allophonic transcriptions, on the other hand, may be either systematic or impressionistic. Any transcription used in the task of transcribing speech in an unknown language is by definition impressionistic: the investigator has no basis for deciding that certain features of pronunciation are norm or distortion until he becomes familiar enough with the language.

Notice that the first paragraph of this section speaks of a transcription which '*attempts* to represent every detail of the utterance': the investigator making an impressionistic transcription can never be absolutely sure he has succeeded in including every single phonetic detail, however carefully he may be aiming at such an ideal. Modern phonetic instruments may be able to give extremely detailed measurements of many features of sounds, but even then we cannot know for certain whether they are measuring every phonetic detail which could possibly be of relevance.

A third pair of terms for types of transcriptions is BROAD v. NARROW. In the strict sense, these are synonymous with phonemic and allophonic respectively: a broad transcription is one which shows no detail which is contextually predictable, while a narrow transcription is one which shows some contextually predictable detail. It is thus possible to recognise degrees of narrowness in transcriptions: one which showed clear [l] and dark [l] for English, but no other allophonic detail, would be narrow, but not very narrow, whereas one which in addition showed minute allophonic detail of vowels, aspiration and non-aspiration for voiceless stops, and voiceless [l], [r], [w] and [j] where these occurred, would be very narrow. The term 'broad' is often used in a loose sense meaning 'not very narrow'.

Thus for some phoneticians, the term 'broad phonetic transcription' is synonymous with 'phonemic transcription', whereas for others it means an allophonic transcription in which comparatively little allophonic detail is shown.

For more detail on types of transcription see Abercrombie (1964:16–24).

4.2
Morphophonemic transcription

A further type of transcription has sometimes been advocated: one which takes account

of certain common morphophonemic alternations (see section 3.1 above) and in effect incorporates them into the transcription. This results in what is known as a MORPHOPHONEMIC transcription and is often indicated by the use of braces: {…}. For example, the verbs *feel, deal* and *kneel* contain an /i:/ which alternates with /e/ in the formation of the past tense and the past participle (see section 3 above), and might therefore be transcribed as {f i:~e l) and {d i:~e l} and {n i:~e l} respectively; the notation {i:~e) indicates that the vowel of the stem is sometimes /i:/ and sometimes /e/, depending on the context in which the stem finds itself. The past tenses *felt, dealt* and *knelt* would then be transcribed {f i:~e l+t), {d i:~e l+t) and {n i:~e l+t} respectively, where '+' represents the boundary between the root and the suffix. (See Chapter 3 for these terms.)

The remaining verbs ending in /−i:l/. which form their pasts regularly (*peel* /pi:l/, *conceal* /kən'si:l/ etc.), would be transcribed with {i:}, and would therefore have a morphophonemic transcription identical with their phonemic transcription. Again, words ending in /-elt/ which were not pasts, e.g. *melt* /melt/, *felt* ('type of cloth') /felt/, would have morphophonemic transcriptions identical to the phonemic ones.

This would have the effect that the same sound in the same phonetic context might be transcribed in two different ways depending on the morphological properties of the word concerned. Thus /i:/ in *feel* would be (i:~e}, whereas the (phonetically identical) /i:/ of *peel* would be {i:}; the /e/ of *felt* (past of *feel*) would be {i:~e}, whereas the /e/ *of felt* ('type of cloth') would be {e}. In many approaches the notation {i:~e} represents a unit which is referred to as the MORPHOPHONEME.

It will be noticed that, for many segments in English, the morphophonemic transcription does not differ from the phonemic; indeed there are languages in which no differences at all between the two transcriptions will ever occur. This brings into question the need to have both transcriptions.

There are two ways of dealing with this situation. One is to say that morphophonemic transcriptions are on a different level from phonemic transcriptions, and that a truly phonological transcription does not take account of morphophonemic alternations; for those who espouse this view, the phonemic transcription is thus the only one which is of importance to phonology. The other possible approach is to say that a morphophonemic transcription is just a phonemic transcription with occasional excursions into regions beyond; *feel* and *felt* (past *of feel*) would then be transcribed /f {i:~ e} l/ and /f {i:~e} l t/ respectively. In these transcriptions, /f/, /l/, and /t/ are phonemes, while {i:~e} would represent, not a different type of unit, but an instruction to choose /i:/ in one specifiable set of contexts and /e/ in another set of contexts; for *feit* this would be 'choose /e/ for past tense or past participle, and /i:/ in all other contexts': see Lass 1984:57–8.

A modification of this second approach led in the 1950s and 1960s to the development of the theory known as 'generative phonology' (see section 5 below).

Informal speech and phonological representation

One approach to phonology takes it that the communicative essentials of an utterance may be extracted by throwing away the adventitious, purely automatic properties of the sound wave (cf. the position provisionally adopted in section 1 above). This view implies that the phonologically relevant units are in a real sense *in* the phonetic signal. This approach runs into difficulties with informal or colloquial speech, however: many of the properties which systematically are taken to be a part of the form of a word may in these contexts not be present within the speech signal at all (cf. the representations of the word *extraordinary* in section 3.2 above).

/l/ → { [l] before a vowel ; [ɬ] elsewhere }

Take, for instance, the English word *seven* (phonetically [sevən] in careful speech). The fricativeness of the segment after the [e] vowel would certainly be taken as an essential property (the distinctive feature [+continuant]) of that segment: in English the difference between [b] and [v] is distinctive, since e.g. *ban* and *van* are different words. In informal speech the word might be pronounced something like [sebm], where the segment after [e] is a plosive (and thus [−continuant]), not a fricative; the essential distinctive feature of fricativeness ([+continuant]) can no longer be found in the speech signal at this point. Indeed, in very colloquial speech the pronunciation might well be simplified to something like [sem], in which what was originally the fricative has no separate existence of its own in the speech signal.

The view that the phonologically relevant properties are *in* the speech signal would in fact require that each word of the language had to have a different phonological form for each style of utterance. In our example *seven* would have the forms / sevən/ for careful speech, /sebm/ for informal speech, and /sem/ for fast colloquial speech. This would appear to be excessively complicated.

A more illuminating approach is to view the phonological representation of an utterance as a form of prescription or plan for the utterance (see e.g. Linell 1979:47–69). The utterance might then follow the plan closely (as in careful speech) or depart from it in varying ways (as in informal or colloquial speech).

A helpful analogy here is with a yacht race. The race is defined by a series of marker buoys, which are the counterpart of the phonological representation. In the race itself, probably no two yachts steer exactly the same course, and yet every yacht's course is recognisably governed by the markers. The markers, like the elements of the phonological representation, are discrete; the courses steered are continuous, and any decision to split the course into sections which relate exclusively to one particular marker buoy will be arbitrary.

The analogy breaks down in two respects:

(a) In a race, the markers are the same for all yachts, whereas, as we have already seen (section 3.2 above), the phonological 'markers' for speech may be genuinely different across speakers.

(b) Yachts must pass outside the markers in every case, on pain of disqualification, whereas there is no such requirement in speech. In careful speech it is quite often the case that the prescription is followed closely, but, in informal and colloquial speech, the phonetic 'course steered' may often 'cut off corners', make merely token gestures towards the 'markers', or even ignore them completely. The only requirement is that, on the basis of the 'course steered' by the speaker, the hearer can guess what 'markers' the speaker has in mind. This is done on the basis of contextual information, such as the knowledge of what strings of phonemes actually form words.

5.
PHONOLOGICAL RULES

5.1
Rules linking phonemes and allophones

Phonemic and allophonic transcriptions can be related to one another by statements which are often referred to as RULES. Thus the two types of [l] in English can be related to the phoneme /l/ by a rule like the following:

This rule expresses the fact that English speakers consistently pronounce these two sounds differently, and yet at the same time treat them as if they were 'the same', finding it quite normal that one symbol in the spelling system can stand for either of the sounds. Since English speakers do not in normal circumstances produce [l]-sounds which 'break' the above rule (i.e. they do not produce dark [l] before vowels or clear [l] utterance-finally), they can be said to 'know' the rule, even though most of them will not be able to bring the contents of the rule to conscious awareness.

Other rules of English (implied by examples *(a)* to *(d)* in section 2.2 above) include the following:

$$\begin{bmatrix} -\text{sonorant} \\ -\text{continuant} \\ -\text{voiced} \end{bmatrix}$$

(a)

/p/ → { [p] after /s/ in syllable-initial position; [ph] initially in a stressed syllable; [p=] (unreleased) before another plosive

(b)

/i:/ → { [i] (shortened) before a voiceless sound; [i:] elsewhere

(c)

/r/ → { voiceless fricative after syllable-initial /t/; voiced fricative after syllable-initial /d/; voiceless approximant after syllable-initial /p/ or /k/; voiced approximant elsewhere

(d)

/ou/ → { [ɔu] before dark [l]; [əu] elsewhere

Notice that the processes stated in rule *(a)* apply to *all* voiceless plosives, and not merely to /p/. It is thus an advantage to use the distinctive feature notation introduced in section 2.4, so that /p/ to the left of the arrow is replaced by the notation for the class of voiceless plosives, i.e.:

Note too that rule *(b)* may be generalised to *all* vowels, a class which can be represented by the single feature [+syllabic] ('has the property of forming the nucleus of a syllable').

Again, rule *(c)* can be restated more illuminatingly by using distinctive features, and by recognising first, that /r/ is basically a voiced approximant, and second, that two distinct processes operate on it: (i) fricativisation (when the /r/ is preceded by any alveolar plosive), and (ii) devoicing (when the /r/ is preceded by any voiceless plosive). Where the /r/ is preceded by /t/ (the voiceless alveolar plosive) both of these processes operate.

The first part of the restated rule *(c)* would then say something like:

(c) (i) The [+sonorant] feature of /r/ becomes [−sonorant] after a sound which is [−sonorant], [+coronal], [−anterior] and [−continuant]: informally 'approximant /r/ becomes a fricative after /t/ or /d/'.

The second part would say something like:

(c) (ii) The [ff voiced] feature of /r/ becomes [fl voiced] after a sound which is

[−sonorant], [−continuant] and [−voiced]: informally, 'voiced /r/ (whether approximant or fricative) becomes voiceless after /p/, /t/ or /k/'.

As well as making it possible to refer to classes of phonemes, distinctive features can make explicit another frequently-occurring property of allophonic rules. In both *(c)* (i) and *(c)* (ii) above, the value of one feature of the segment concerned is altered to agree with the value of that same feature in the preceding segment: in *(c)* (i) the feature concerned is [sonorant] and its value changes from+to −, while in *(c)* (ii) it is [voiced] and its value again changes from+to −. Processes of this kind are cases of ASSIMILATION.

The revised form of rule *(c)* in fact comprises two rules; in the word *dry* only *(c)* (i) applies, in *cry* only *(c)* (ii), whereas in *try* both rules apply. In this particular instance, it does not matter whether *(c)* (i) applies to *try* before *(c)* (ii) or after it: the same result (a voiceless fricative pronunciation of /r/) obtains in both cases. In other cases, things may turn out to be more complex: for a discussion of problems involving the order of application of rules see Hyman (1975:125–31), Kenstowicz and Kisseberth (1979: Chapter 8), Fischer-Jørgensen (1975:257–61).

5.2
Rules handling morphophonemic alternations

We should also note that it is possible to use rules of a rather similar form to handle morphophonemic alternations (see section 3.2 above). Thus for English:

(e)

$$\{i: \sim e\} \rightarrow \begin{cases} /e/ \text{ in a past tense or past participle} \\ /i:/ \text{ elsewhere} \end{cases}$$

(f)

$$\{s \sim z\} \rightarrow \begin{cases} /s/ \text{ after a voiceless sound} \\ /z/ \text{ elsewhere} \end{cases}$$

(g)

$$\{t \sim d\} \rightarrow \begin{cases} /t/ \text{ after a voiceless sound} \\ /d/ \text{ elsewhere} \end{cases}$$

The major systematic difference between the two types of rule is that allophonic rules have phonemes as input and allophones as output, whereas morphophonemic rules have morphophonemes as input and phonemes as output. Note too that *(e),* unlike *(f)* and *(g),* involves reference to information which is not phonological: not all phonologists are agreed that this is legitimate (see section 5.3 below).

An examination of rules *(e), (f)* and *(g)* indicates that the morphophonemes {i:~e}, {s~z} and {t~d} are not strictly speaking necessary for the description of the phenomena

concerned. If we took the phoneme specified by the 'elsewhere' line of the rule and assumed that this was the one which occurred as basic in all instances of the words concerned, we could specify that it changed into the other phoneme in the relevant context. Thus the plural suffix could be given the form /z/, and rule *(f)* could be modified to say:

(f') /z/ → /s/ after a voiceless sound

Of course, *(f')* will have to be further restricted to prevent it from applying in utterances like *If Zoe comes,* in which /z/ occurs immediately after a voiceless phoneme /f/. In this particular case, all that is needed is to restrict the context to 'after a voiceless sound within the same word'.

Similarly, *felt* could be /fi:l+t/, but the rule would have to state *(e')* (actually, *(e')* applies in a number of other contexts, but this fact will be ignored for present purposes).

(e') /i:/ →/e/ in past tenses of verbs like *feel,* but not of verbs like *peel*

This is not such a simple modification, chiefly because it introduces factors which are not phonological at all, i.e. the difference in morphological behaviour between two classes of verbs: for discussion of whether this kind of information can legitimately be referred to in phonological rules, see section 5.3.

This results in the simplification of the *transcription* of utterances, but on the other hand the *rules* have to be made more complex: the information implicit in the morphophonemic notation must be made explicit in the rules themselves.

Although morphophonemic units are no longer present in rules like *(e')* and *(f'),* these rules are still normally referred to as morphophonemic rules, in that their function is very much the same as that of rules *(e), (f)* and *(g).* The situation now is that both types of rules have phonemes as input; morphophonemic rules have phonemes as output also, whereas allophonic rules have allophones as output.

It has been claimed that there are sometimes advantages in refusing to draw a strict distinction between the two types of rule. Consider, for instance, the following facts: In Russian, a voiceless obstruent (i.e. plosive, affricate or fricative: see Chapter 1, section 10.1.) becomes voiced when immediately followed by a voiced obstruent. In most cases, voicing a voiceless obstruent in Russian changes it into a distinct phoneme (/t/ becomes /d/, /k/ becomes /g/, etc.); in the cases of /ts/, /ʧ/ and velar fricative /x/, however, there is no corresponding voiced obstruent in the phonemic system. This means that the resulting sounds [dz], [ʤ] and [ɣ] occur *only* before voiced obstruents, while the sounds [ts], [ʧ] and [x] *never* occur in that context: the three voiced sounds are therefore allophones of the /ts/, /ʧ/ and /x/ phonemes respectively. Thus for these sounds the process of voicing will have to be an allophonic rule, while for all other obstruents the process of voicing will have to be a morphophonemic rule: the result of this is that one and the same phonological process (assimilatory voicing) has to be stated twice:

(ii)

/ts/ → [dz]
/tʃ/ → [dʒ]
/x/ → [ɣ]
} before a voiced obstruent

[An allophonic rule]

Furthermore, there is no simple way of specifying the class of phonemes '/ts/, /ʧ/ and /x/' by using distinctive features, so that rule (ii) has to be stated in terms of individual cases; still less is it possible for the class of phonemes 'voiceless obstruents other than /ts/, /ʧ/, /x/' to be simply and naturally specified, which makes (i) above a very complex rule to state.

What happens if the process is stated as a single process of assimilation? In this case the rule we need is (iii):

(iii) A voiceless obstruent becomes voiced before another voiced obstruent.

This rule has much greater generality than (i) and (ii), and is much simpler to state. If we adopt it as preferable, however, an important consequence follows: the distinction between allophonic and morphophonemic rules is blurred. This in turn brings into question the status of the phonemic representation, and hence the status of the phoneme as defined in section 2 above.

On the grounds of the existence of situations like the voicing of obstruents in Russian, the 'generative phonologists' have fully accepted the consequence described in the previous paragraph, and have recognised just *two* significant levels of representation, neither of which corresponded exactly to the phonemic:

(a) A kind of morphophonemic representation which they term 'systematic phonemic representation'.

(b) A fully-specified allophonic representation which they refer to as 'systematic phonetic representation'. (Note that the general theoretical question of determining when a phonetic representation has become 'fully-specified' (cf. section 4.1 above) has not been treated by the generative phonologists.) No other kind of representation had any real significance, and in particular the 'pure phonemic' transcription (not taking account of alternations) was an artefact with no systematic status. For a full discussion see Fischer-Jørgensen (1975:280–6), Halle (1959), Chomsky (1964): for an exhaustive application of the approach to English see Chomsky and Halle (1968).

(i) A voiceless obstruent other than /ts/, /ʧ/, /x/ becomes the corresponding voiced obstruent phoneme before a voiced obstruent.

[A morphophonemic rule]

5.3
The use of non-phonological information in rules

Phonologists have disagreed fundamentally on the question of how far it is legitimate for phonological rules to refer to facts other than those of pronunciation. The traditional linguistic description places phonology first, morphology second, and syntax third. There is some practical justification in doing this, as putting phonology first enables the reader to pronounce the words which are involved in the later sections. Similarly, putting morphology before syntax focuses attention on the words themselves before considering the constructions in which they are involved.

Some phonologists have taken this to imply that in stating the phonology of a

(i) Syllable;
(ii) Word;
(iii) Stress-group;
(iv) Foot;
(v) Tone-group.

Units (i), (ii), (iii) and (v) form a hierarchy: a tone-group consists of an integral number of stress-groups, a stress-group of an integral number of words, a word of an integral number of syllables, and a syllable of an integral number of segments. These units have a particularly important role to play in connection with suprasegmentals (see sections 9 and 10 below). In addition, (i) and (ii) are the domains over which phonotactic constraints operate (see section 8 below).

Unit (iv), the foot, fits in in a rather different manner: a tone-group consists of an integral number of feet, and a foot of an integral number of syllables. However, the foot does not relate in a simple fashion to words and stress-groups (see section 7.5 below). The foot is an important unit in determining the rhythmic properties of utterances.

Every approach to phonology has paid some attention to these larger units, although in some theories this attention has been piecemeal, making no reference to the hierarchical relations between the units. In such theories the accent has been upon the study of linear strings of segments, and any larger units have been regarded as secondary. Such approaches may be referred to as LINEAR approaches to phonology. Views in which the larger units are a primary and integral part of the phonological theory are then referred to as NON-LINEAR. Van der Hulst and Smith (1982) and Durand (1986) contain some useful discussion of several approaches within non-linear phonology, while Hogg and McCully (1987) provide a clear introduction to many of the essential concepts.

7.2
The syllable

As implied in Chapter 1 (section 5), native speakers tend to recognise a unit intermediate between the segment and the word, i.e. the SYLLABLE. The functions of the syllable appear to be threefold:

(a) To carry the phonetic manifestations of the ‘suprasegmentals’ (see section 9 below) such as stress or tone;

(b) To be the chief domain of patterns of arrangement of phonemes, or ‘phonotactics’ (see section 8 below);

(c) To act as a unit of organisation in the process of speech production.

The exact physical or physiological basis of the syllable is still a matter of uncertainty. Perhaps the most likely theory is that the syllable arises from the alternating opening and closing of the vocal tract during speech, resulting in an alternation of

vowel-like and consonant-like articulations. The consonantal articulations, especially plosives, are often signalled phonetically as modifications to the vowel-like ones, and this results in the typical structure of the syllable—consonants grouped around a vowel. All languages have syllables of the form CV (vowel preceded by consonant); in addition many languages have patterns of greater complexity, with CVC (vowel flanked by a consonant on each side) being the most frequent.

It is useful to have terms for the various positions within the syllable. The central position, occupied by the V element, is normally referred to as the PEAK (or sometimes the NUCLEUS, though this lends itself to confusion with the intonational unit described in section 9.5 below). The initial C element is called the ONSET, and the final C element the CODA.

The Onset position in the syllable is normally stronger than the Coda, in several respects. To begin with, syllables in normal speech show a decrease in loudness from Onset to Coda (thus, when tape-recorded speech is played backwards, the syllables show an increase in volume, which sounds unnatural). Again, consonants in an Onset position tend to show greater resistance to assimilation and to historical change than do those in Coda position. Most theorists recognise this greater strength by giving the Onset position more independence, and by recognising that Peak+Coda forms a further unit, usually referred to as the RHYME.

In certain languages, two or more classes of syllables must be recognised, on the grounds of the amount of material in the Rhyme of the syllable (a parameter known as SYLLABLE WEIGHT or SYLLABLE STRENGTH): the Onset of the syllable is normally of no relevance for this parameter. Syllables with comparatively little material in the Rhyme are called *light* or *weak* syllables, while those with significantly more material are referred to as *heavy* or *strong*. In Latin, for instance, (cf. Allen 1973), light syllables have a rhyme consisting of a short vowel and no coda; any syllable with a long vowel, or with a short vowel and one or more consonants in the coda, is a heavy syllable. The difference between light and heavy syllables in Latin may affect the placement of word-stress (see section 9.2 below). Other scholars have accounted for differences of syllable weight by postulating a unit called the MORA: a light syllable is said to have one mora, while heavy syllables may have two or more morae.

Further complexity arises in some languages from the fact that the C and V positions in syllabic structures may be occupied by more than one element: up to four in the case of the C in some languages. English, for instance, permits up to three elements in the Onset of the syllable (see section 8.1 below).

For the place of the syllable in phonology, see further Hyman (1975:188–93), Lass (1984: Chapter 10), Selkirk (1982).

7.3
The word

The word is one of the points at which grammar and phonology meet. Grammatically, words can be regarded as the units which enter into syntactic constructions, and which are made up of morphemes (roots, prefixes and suffixes) combined according to the rules of inflectional and derivational morphology: for more details of these constructions see Chapter 3 below. Phonologically, words can be characterised as the minimal forms which can be pronounced in isolation: thus, *happiness* is a word, and so is *happy,* whereas *-ness* is not a word because it is not normally pronounced on its own. The *happi-* of *happiness* is phonetically identical with *happy* (the difference of spelling is immaterial), but does not constitute a word in that context, since *-ness* cannot be split off as a separate word.

One consequence of being able to stand alone in this way is that words must consist of an integral number of syllables. Native speakers of a language can often say unequivocally how many syllables a word contains, and in a very large number of cases will agree among themselves how many. Some types of words may lead to doubt or disagreement, however: for example, some English speakers will say *fire* has one syllable, others will say it has two.

When words stand next to one another in connected speech, the syllabic organisation which they exhibit in isolation may sometimes be modified. The English word *but* is a good example of this. Basically this consists of a syllable /bʌt/, with the /t/ in Coda position and thus receiving a syllable-final pronunciation (slightly aspirated or unreleased, and accompanied by glottal closure: see section 2.5 above): *but never* is normally pronounced [bəʔt=. nev.ə]. When it occurs before a word beginning with a vowel, however, the /t/ may move over into the onset position of the syllable containing the vowel: *but always* is normally pronounced [bə. thɔ:l. wɪz], with the /t/ receiving the stronger aspiration typical of Onset position. Such processes of resyllabification are more marked in some languages than in others. In French they are very pervasive; the 'linking' consonants in liaison are always phonologically a part of the following syllable, not the preceding one. The phrase *bons amis* 'good friends' is invariably syllabified /bɔ. za. mi/, and never /bɔz. a. mi/.

As implied in the first paragraph above, words can be broken down into morphemes as well as into syllables. It is important to note that the two types of subdivision do not lead to the same results. Even in English, where similar subdivisions may occur relatively frequently (e.g. *goodness* is *good-ness* from both points of view), significant differences occur. Some words can be split into syllables but not into morphemes, e.g. *window,* while others may be split into morphemes but not into syllables, e.g. *goes* (*go* +3rd person singular suffix *-es,* but one single syllable /gouz/); still others show splits in different places on the two levels; e.g. *mistake* is morphologically *mis+take* (cf. past tense *mistook)* but syllabically *mistake* (since the / t/ is unaspirated: to divide after the /s/ would mean that the /t/ would be aspirated—see section 2.2 above).

In certain other languages, the principles for morphemic division differ from those for

syllabic division even more strikingly than they do in English. Many major lexical items (nouns, verbs and adjectives) in Iraqi Arabic split morphemically into a root, consisting of the consonants, and affixes, one of which consists of a vowel pattern. Thus /keteb/ 'he wrote' is /k-t-b/ 'write' plus a vowel pattern /-e-e-/ signalling past tense; /jiktab/ 'he writes' is the same root, plus a prefix /ji-/ signalling 'he' in this form of the verb, and a vowel pattern /-o-a-/ signalling non-past tense (o indicates no vowel at this position). Syllabically, however, the words split into non-overlapping pieces, just as in English: /ke.teb/, /jik.tab/.

7.4
The stress-group

In many languages, not all words in an utterance receive a stress (for the term 'stress' see sections 9.2, 9.4 below). English is a case in point: in uttering the sentence *Bill was at a conference,* a speaker is very likely to leave the words *was, at,* and *a* unstressed (consequently giving them each the vowel quality [ə]). There will thus be two stresses in the sentence: on *Bill,* and on (the first syllable of) *conference*. The unstressed words can in this instance be associated with the stressed word that follows them (though sometimes such words may be associated with the stressed word that precedes them, as in *Mary looked at us,* where *at* and *us* are associated with *looked*). The string of words *was at a conference* (and likewise *looked at us*) then forms a further phonologically relevant unit, often referred to as a STRESS-GROUP (though sometimes, rather confusingly, as a 'phonological word'—Chomsky and Halle 1968:367–9).

Sometimes, as in our two examples so far, division into stress-groups coincides with division into syntactic units: the stress-groups here coincide with the subjects and predicates of the two sentences. This, however, is not necessarily the case. Sometimes the division clearly differs from a syntactic one, as in Chomsky and Halle's example *The book was in an unlikely place;* here there are three stress-groups: *the book* (which happens to coincide with the subject), *place* (which happens to consist of a single word), and *was in an unlikely* (which corresponds to no syntactic unit in the sentence). Even more important, however, is the fact that one and the same sentence may be uttered with a varying number and composition of stress-groups. All of the following are possible utterances of our first example (with varying emphases or contrasts implied), but are to be divided quite differently (=here representing stress-group boundary):

(i) Bill=*was* [wɒz]=at a conference (but he is no longer there)

(ii) Bill=was *at* [æt]=a conference (not GOING to one, but actually AT one)

(iii) Bill=was at *a* [ei]=conference (but not the one you mentioned)

(iv) Bill=*was* =at *a* =conference (but not the one you mentioned)

7.5
The foot

Like the stress-group, the FOOT is a unit consisting of a stressed syllable together with a number of unstressed syllables. While the stress-group relates to higher-level phonological structure, the foot relates to rhythmic organisation. Within the stress-group, the stressed syllable may be accompanied by unstressed syllables before and/or after it. The foot, however, is a rhythmic unit rather like the bar in music—just as the bar begins with an accented note, which may then be followed by unaccented ones, so a foot begins with a stressed syllable, which may be followed by unstressed syllables. Thus in English, stress-group divisions respect word-boundaries, and hence a stress-group consists of an integral number of words. Foot-divisions on the other hand, may cut across words, and a foot does not necessarily consist of an integral number of words.

We may illustrate this with the sentence used by Chomsky and Halle (1968: 367–8—see section 7.4 above): *The book was in an unlikely place*. The stressed syllables here are *book,–like-,* and *place,* and these therefore begin the feet, which consist of *book was in an un-, -likely,* and *place*. The word *the* with which the sentence begins belongs in its own foot, which is incomplete, not having a stress within it.

One important role of the foot in English relates to a basic principle of English rhythm, i.e. that stresses tend to recur at approximately equal intervals of time (ISOCHRONOUS stress). In any utterance, then, the feet will be of approximately equal length: only 'approximately', because we need not expect phonologically relevant units to be physically locatable *in* the signal (see section 4.3 above). All we need is that the underlying representation should contain feet which are equal in length; the variations in length will then be accounted for by the influence of other factors. For example, a foot consisting of a stressed syllable plus three unstressed syllables is likely to be longer in duration than one consisting of a stressed syllable alone; again, the general speed of utterance is capable of being modified in the course of utterance.

7.6
The tone-group

The TONE-GROUP (O'Connor and Arnold 1973) is the largest unit directly relevant to phonological structure and organisation. A variety of other terms are used to denote this unit, notably 'breath-group' (Hyman 1975:194), 'phonological phrase' (Chomsky and Halle 1968:60) and 'intonation-group' (Cruttenden 1986:35–6). It sometimes coincides with what from the point of view of syntax would be described as a clause. For instance, a normal way of uttering the sentence *When it stops raining, I'll go to town* would have tone-groups coinciding with clauses: in this kind of utterance one might expect a rising intonation on *raining* and a second, falling, intonation on *town* (for more detail on intonation, see section 9.5). It would, however, also be possible to utter the whole sentence in one tone-group, with no pitch-movement or slackening of speed on *raining*. Sometimes, too, clauses can be split into two or more tone-groups. Frequently an emphatic utterance may split off the subject of a clause and make it into a separate tone-

in English may be manifested by similar combinations of loudness, pitch and duration (for a fuller account see section 9.2 and 9.4 below).

The phonological categories we shall be dealing with are:

(i) Word-stress;
(ii) Tone;
(iii) Sentence-stress;
(iv) Intonation;
(v) Quantity.

For a general account of these properties, see Hyman (1975: Chapter 6).

9.2
Word-stress

In most languages, words of more than one syllable are characterised by the fact that one of the syllables tends to be stronger than the others, and that for a particular word, the syllable concerned is always the same one. The English word *en.cyc.lo.'pe.di.a,* for example is always stressed on the last syllable but two; *pan.o.'ra.ma* on the last but one; and *kan.ga.'roo* on the final syllable. (Single dots indicate syllable divisions, and the stressed syllable is shown by a vertical mark standing before it.)

Languages differ as to the principles by which word-stress is placed within their words. Some languages place stress on a particular syllable of the word in all cases: Czech and Hungarian, for example, place stress on the initial syllable, Polish on the last syllable but one. Others pay attention to particular properties of syllables: thus Latin in words of three or more syllables stresses the last syllable but one (*a.'ma:.mus* 'we love', *a.'man.te.s* 'loving (plural)'), unless that syllable is light (i.e. ends in a short vowel with no consonant in the coda position: see section 7.2 above), in which case the last syllable but two is stressed: *'a.ni.mus* 'mind'.

All the languages cited in the previous paragraph pay attention solely to phonetic and phonological facts in determining where word-stress falls. Such languages are often referred to as FIXED-STRESS languages. In other languages, facts of morphology (i.e. the make-up of a word in terms of prefixes, roots and suffixes) may influence stress placement. Russian appears to work very much in this way (cf. Garde 1973:315–6). Languages of this sort may be referred to as FREE-STRESS languages (a term not to be taken as implying that stress can fall on any syllable according to the speaker's whim, but merely that phonological facts are not sufficient to determine stress-placement).

A large number of languages combine both principles. Thus German is basically a language in which the initial syllable is stressed, but there is a class of prefixes which cannot take stress, as in *ver' stehen* 'to understand'. Arguably, English also combines the two principles (see Fudge 1984)—even where a basically fixed-stress approach is followed (see e.g. Chomsky and Halle 1968), reference has to be made to specific

suffixes in order to arrive at correct results.

As stated in section 9.1 above, no single phonetic parameter correlates precisely with the presence of stress: for English, experiments (cf. Fry 1958) have shown that higher pitch is the most important cue for hearers, followed by increased duration, with increased loudness only in third place. Other languages may have a different balance between the three parameters, or even look for different pitch configurations; because of such differences, it is not unknown for a speaker of one language to hear a word of another language pronounced, and 'perceive' stress on a different syllable from the one on which a native speaker of that language will perceive it.

The classical treatment of word-stress placement in English is Chomsky and Halle (1968: chapters 2 and 3); a clear summary of this approach is to be found in Hogg and McCully (1987: Chapter 1). Chapter 3 of this latter work introduces the rather different account given by the theory known as 'metrical phonology'.

9.3
Tone

TONE is the use of suprasegmental parameters to differentiate lexical items. The parameter most frequently in evidence is pitch (cf. Chapter 1, section 12.2), though the others may often play a part in the differentiation process (see Kratochvil 1968: 35–47; for a discussion of Mandarin Chinese). Normally each morpheme (root, prefix or suffix) has its own tonal pattern associated with the string of phonemes of which it is made up. Just as segmental elements may undergo processes of changes (often assimilation) because of neighbouring elements (cf. the alternations between voiced and voiceless sounds in English plurals and regular past tenses—see rules *(f)* and *(g)* in section 5.1 above), so tones may also be modified because of neighbouring tones.

Sometimes a morpheme may consist purely of a tonal pattern with no segmental material (phonemes) associated with it. Thus in many languages, different tenses of a verb may be differentiated by tonal means alone. Again, in some languages relative clauses are signalled by tonal differences rather than by the presence of relative pronouns realised by phonemes.

From the phonological point of view, word-stress and tone have a great deal of overlap: the interplay of tone and stress in Mandarin Chinese is discussed by Kratochvil (1968:40–4). Norwegian and Swedish (though not Swedish as spoken in Finland) have two possible tonal patterns ('word-accents') associated with the stressed syllable in every word of more than one syllable.

The so-called 'pitch-accent' of languages like Japanese (see Hyman 1975: 231–2) is in many ways an intermediate case between word-stress and tone.

9.4
Sentence-stress

Where word-stress picks out one syllable within the word or similar stretch of speech, SENTENCE-STRESS picks out one word within the sentence or similar stretch of speech. The main functional difference between the two is that the function of word-stress is to determine the rhythm of the utterance, whereas the function of sentence-stress is to indicate which meaningful elements are of most importance. Sentence-stress does, however, interact with rhythm, as shown by Hogg and McCully (1987: chapters 4 to 6).

Word-stress does not move freely from one syllable of a word to another: as we have seen (section 9.2), the word *encyclopedia* always has stress on the syllable *-pe-*. Sentence-stress, on the other hand, is much more mobile; all of the following six stressings of the given sentence can occur, with different implications:

(i) I've never actually seen Edward playing *golf* (though I have seen him playing football)

(ii) I've never actually seen Edward *playing* golf (though he talks a lot about it)

(iii) I've never actually seen *Edward playing* golf (though I've seen a lot of other people doing so)

(iv) I've never actually *seen* Edward playing golf (though people have told me he does)

(v) I've *never actually* seen Edward playing golf (you're wrong if you say I have)

(vi) *I've* never actually seen Edward playing golf (though a lot of other people have)

In most of these cases, the operative factor is a contrast with some other element: golf v. football in (i), playing v. talking about it in (ii), Edward v. other people in (iii), etc. The contrast may be made explicit (as it would be if the parenthesised material in (i) to (vi) were actually spoken), or may be left implicit (if the parenthesised material is not spoken): in this latter case, the contrast is quite as clear to the hearer as in the former, and is signalled by the place of the sentence-stress. This particular type of sentence-stress is referred to as CONTRASTIVE STRESS.

Where there is no contrastive stress in a sentence, the sentence-stress usually falls on the last noun, verb or adjective in the sentence: *It was an unusually dark NIGHT* (where there is no implied contrast with *day, morning* etc.). Certain sentence-types, however, may be exceptions to this principle: *Somewhere a DOG barked*. For a fuller account see Cruttenden (1986:80–95), Gussenhoven (1983).

The syllable bearing the main sentence-stress is often referred to as the NUCLEAR syllable, since it is the bearer of the intonation nucleus (see section 9.5 below). If the word on which the main sentence-stress falls is a monosyllable, then clearly that single syllable is the nuclear one. If, however, the word bearing sentence-stress has more than one syllable, the place of the nuclear syllable within that word will have to be determined; it normally falls on that syllable of the word where word-stress is placed. Thus if *Edward* is the word picked out in (iii) above, then *Ed-* is the nuclear syllable.

Intonation

As stated in Chapter 1 (section 12.2), intonation is 'the use of pitch fluctuation for non-lexical purposes'. A good general account of intonation may be found in Cruttenden (1986). Just about all languages use intonation, including tone languages, though in these the range of possible distinctions is comparatively restricted, as might be expected given the simultaneous use of pitch for lexical purposes. For a clear account of how tone and intonation interact in Mandarin Chinese, see Kratochvil (1968:39–40).

The most prominent feature of intonation, and the one which permits of the most variety, is the final pitch pattern, or NUCLEUS. In English, this normally affects the whole of the tone-group (see section 7.6 above) from the nuclear syllable onwards (see section 9.4). For standard British English (RP) the primary distinction is between rising nuclei and falling ones, with further differentiation within each type; other varieties of English, however, may show quite different patterns. It is often stated that falling nuclei correlate with statements and rising ones with questions, but this is in fact not at all the case: each pattern can co-occur with statements, with questions and with commands, as shown by O'Connor and Arnold (1973), and may convey a variety of attitudes in each context.

A certain amount of variety within the overall intonation pattern is also possible in the HEAD, i.e. that part of the tone-group beginning from the first stress and leading up to the nuclear syllable. A level pattern is the least emphatic, while other types of pattern may contrast with this; for fuller details see O'Connor and Arnold (1973:18–22).

Other factors which can be used by the speaker to convey attitudes include pitch range (wide v. narrow), general pitch level, voice quality, and speed of utterance. Detailed accounts may be found in Crystal (1969) and Laver (1980).

9.6
Quantity

The term QUANTITY is applied to phonemic differences of duration (though once again pitch may also enter into the matter), such as that between English *bid* and *bead;* it is not used for allophonic differences of duration such as that between English *beat* and *bead* (see section 2.2 above). In many languages quantity is not a suprasegmental, but merely a distinctive feature of vowel segments: English is basically of this type, though there is some interaction with word-stress.

In some languages, however, there are restrictions on possible combinations of syllables containing long vowels. Slovak, for example, has a rule (the 'rhythmic law') which prevents consecutive syllables from containing long vowels: an accessible statement of the basic facts may be found in Kenstowicz and Kisseberth (1979:99–109). In these cases, the occurrence of quantity is partly determined by rhythmic considerations operating over longer stretches, rather as stress in English and many other languages is governed by a principle of alternating weak and strong units. In these cases,

quantity certainly operates like a suprasegmental element.

10
ILLUSTRATIVE EXAMPLES

Figures 6 and 7 illustrate the interaction of the various phonological units discussed in this chapter, and the way in which this interaction accounts for certain phonetic features of English utterances.

Figure 6 represents the unemphatic utterance of the sentence *John's driving to London* as a statement. The tone-group has no special marking, and this shows up phonetically as a falling nucleus. The stress-groups likewise have no special marking, since no element of the sentence is being emphasised or contrasted; in this situation, the falling nucleus is located on the last major lexical item, which is *London*. Notice that the stress-group boundaries do not follow syntactic divisions here: *John 's* is a single stress-group (and a single word), even though the—'*s* represents *is,* which must be part of the predicate of the sentence, and *John* is the subject of the sentence. At word level, the zero on *to* specifies that this word loses its independence and forms a single stress-group with the word *London*. The phonetic consequence of this is that *to* is pronounced [tə] rather than [tu:].

The syllables marked with *'/'* are those which bear word-stress within their stress-groups. This means in particular that the nucleus will fall on the first syllable of *London*. The symbols O, P, and C within the syllables denote Onset, Peak and Coda respectively. The three stressed syllables give rise to three feet, the second of which will probably be slightly longer than the others because it will contain two unstressed syllables in addition to the stressed one. Stressed syllables are represented in the 'Pitch and rhythm' section by 'o', unstressed by '/'.

The phonological rules then operate on the vowel and consonant phonemes, including the following:

(i) The *-'s* of *John's* is pronounced [z] after the (voiced) /n/ (section 3.1, and rule *(f),* section 5.2);

(ii) The /r/ of *driving* is pronounced as a voiced fricative (rule (*c*), sections 2.2, 5.1);

(iii) The /l/ of *London* is a clear [l] since it is immediately followed by a vowel (sections 2.1, 5.1);

(iv) The /t/ of *to* is initial in an unstressed syllable, and is therefore slightly aspirated (rule *(a),* sections 2.2, 5.1).

Figure 7 represents the utterance of the same sentence as an echo-question (implying 'Did you say that John's driving to London?'), with special emphasis on the element *driving;* the overall implication of this utterance is something like 'I know John's going to London, but do I understand you as saying that he's going by car?'

Echo-questions are normally accompanied by a high rising nucleus, and this is especially marked at tone-group level. Stress-groups, and the zero on the word *to,* are as

Figure 7. Utterance of *John's driving to London* as an echo-question, emphasising *driving*.

PITCH
AND
RHYTHM

3
LANGUAGE AS FORM AND PATTERN: GRAMMAR AND ITS CATEGORIES

D.J.ALLERTON

1.
WHAT IS GRAMMAR?

A language is basically a system of signs, i.e. of institutionalised sensory patterns that 'stand for' something beyond themselves, so that they 'mean' something. Linguistic signs are arbitrary sound patterns (or, in the case of written language, visual patterns) which have a particular meaning in the language in question, for example:

(1) (*a*) Watch!
(*b*) Shall I cook this meal for you?

The word 'grammar' when applied to the study of these patterns is used in two slightly different ways: whereas 'a grammar' may cover a language in all its aspects, 'grammar' (without any article) covers only part of it. Let us try to specify which part.

Phonology studies the nature of the sound patterns used as linguistic signs—the kinds of sound, how they differ, how they combine, etc. Semantics studies the meanings that can be conveyed in this way—the kinds of meaning, how they differ, how they combine, etc. What then is left for grammar to study? Roughly, the signs themselves and their relationships to each other, particularly the relations between simple and complex signs, and between different kinds of complex sign. Hence, whereas phonology makes contact with the outside world in describing speech sounds, and semantics does so in describing meanings, grammar is more of a language-internal study. It studies form and pattern in a more abstract sense.

Let us look at the linguistic signs of (1)*(a)* and *(b)* a little more closely. They are both potential utterances and would count as 'sentences'. The second is clearly a

complex sign and can be broken down into a number of smaller signs. Each of the words, for instance, has a meaning of its own, even *this* (by contrast with *that* or *a*). We can also recognise *this meal, cook this meal, for you,* and possibly also *shall I,* as constituent signs; we can further appreciate that the relationship between *cook* and *this meal* is a special one that is retained if we change *this meal* to *this food* but lost if we change it to *this time.* Compared with this complexity *Watch*! seems a simple sign, but its apparent simplicity is deceptive. Firstly, there are two words *watch,* but we immediately recognise this one as the one meaning 'observe' (not the one meaning 'wrist-clock'), and as the one that could be used in place of *cook* in *(i)(b),* to give a slight change of meaning. Consequently we realise that, although no other words occur with *watch* in *(I)(a),* 'you' must be understood as part of its meaning, corresponding to the *I* that occurs with *cook* in (I) (b) (as its 'subject'), and additionally something must be reconstructed from the context as the thing that is to be watched (the 'object').

All sentences, even the simplest ones, therefore have a grammatical aspect, separate from their phonology and their semantics; but this does not mean that there is no connection between these aspects. Obviously grammatical units must be expressed in some way, and, although many of them can be described quite simply as sequences of phonemes, there are more problematic modes of expression. For instance, if we change our phrase *this meal* into the plural *these meals,* we are impelled to ask what common phonological element or elements express the shared meaning of *this* and *these;* and if we compare the plural *meals* with a plural like *dishes,* we have a phonological (and orthographic) disparity in the realisation of the word-ending to account for. Such problems can be considered as part of phonology, or as part of grammar, or as the bridge-subject 'morphophonology'.

The boundary between grammar and semantics is more difficult to draw. We have noted that grammar deals with meaningful units of different sizes right up to the level of the sentence (and perhaps beyond); but so does semantics. Both subject areas take as basic a minimal meaningful unit, or 'morpheme': a word like *meals* consists of two such units, *meal* and *-s*. Again, both grammar and semantics are concerned with the question of which combinations of meaningful units may occur, and which are excluded. Consider, for instance, whether (2) and (3) involve normal, doubtful (=?) or impossible (=*) word sequences:

(2) *(a)* This reason is important.
(b) *This reason are important.
(c) *This reason is principal.

(3) *(a)* This water is (im)pure.

(b) ?This water is wet.

(c) ?This water is dry.

(d) ?This water is intelligent.

The first sentence, (2)*(a),* is unproblematic; but (2)*(b)* is unacceptable, and if, by any chance, it does occur, it will be assumed to be a mistaken version of *(2)(a)* and would be corrected to this (or just possibly to *These reasons...).* Similarly, *(2)(c)* must be corrected to. *is the/a principal one.* In both cases correction is possible, because we recognise what meaning was intended, and what grammatical rules have been transgressed: in the first case a singular subject requires a singular verb, and in the second case 'attributive-only' adjectives like *principal* (cf. also *main, only, utter)* can only occur as part of a noun phrase. Grammatical deviance is thus a matter of breaking generally valid rules.

The semantic oddity of the sequences of *(3)(b), (c)* and *(d),* compared with the normality of *(3)(a),* is different in nature. Here it is the meanings themselves that are deviant, not the manner of expressing them: (3)*(b)* is true by definition (tautologous), (3) *(c)* is false by definition (contradictory), and (3)(d) is nonsensical because of the inappropriacy of the notion of intelligence as applied in inanimate things or substances. Consequently it is not possible to propose a correct version of these hypothetical sentences. Indeed, they do not transgress a rule so much as go against a semantic tendency. It would even be possible to imagine contexts in which they might occur, albeit rarely.

The grammar-semantics dichotomy is related to a further distinction, between the grammatical and the lexical. Whereas the former is basically a distinction between formal patterns and patterns of meaning, the latter distinguishes different kinds of forms and meanings. In sentence (4), for instance:

(4) *Will the* new students aim *to* arrive *more* promptly *than* John *did?*

the main function of the non-italicised words is the lexical one of making direct reference to the shared world of speaker and listener, whereas the italicised words have a predominantly grammatical function, in that they indicate the structure of the speaker's sentence and the relations of its parts to each other. Lexical and grammatical functions are not mutually exclusive, and some words, such as prepositions like *in* and *before,* are equally important in their lexical function of referring to a particular spatio-temporal relation (and distinguishing it paradigmatically from other such relations) and in their grammatical function of marking a particular grammatical role, such as that of converting noun phrases to adverbials (and thus syntagmatically determining the nature of their neighbouring elements). Unequivocally lexical items (preeminently nouns, verbs and adjectives) typically belong to large substitution classes and can usually be replaced by

anywhere.

Assuming we wish to describe the grammar of a language as it is at a particular time, where do we find the entity ‘grammar’ that we want to describe? Grammar in this sense is obviously an abstraction based on observation by the grammarian, either of himself and what he thinks he would say (or write) or of other people actually talking (or writing) and understanding. These twin sources of information represent different aspects of the grammar distinguished by Saussure as *langue* and *parole,* which we might refer to, respectively, as the language-system itself and the use made of the language-system in the speech of individual language-users. Saussure's terms in fact quite unnecessarily link the basic distinction between the potential and the actual with the difference between the linguistic community and the individual speaker, though certainly this further variable of the language as a whole as against the dialects of individuals (so-called ‘idiolects’) is obviously an important one. Whether we look at our own intuitions about language or at the utterances of others, we are in either case dealing with individual human beings, with all their frailties. Chomsky's notion of ‘competence’ (1965:8–10; see below Chapter 4 section 2), however, is intended to designate the system of an idealised language-user, free from all the imperfections of ‘performance’ that automatically arise whenever an individual speaks or listens to others speaking; what he has in mind as factors adversely affecting linguistic performance are faults such as hesitations, repetitions, grammatical inconsistencies and incoherence (=anacolutha) rather than failure to follow the prescriptions of traditional grammarians.

A further aspect of grammatical competence that Chomsky has always stressed is its immense potential, which encompasses a myriad of sentences that never have a chance to occur in actual performance, and which means that many of those that do occur are occurring for the first time (at least for the speaker in question). Whether they are ‘new’ sentences or not, the vast majority of utterances are ‘generated’ by the individual speaker, in the sense that he uses his unconscious knowledge of the grammar of the language and of its vocabulary to construct a sentence to suit his needs for a particular occasion. He does not simply recall a previously used sentence, except in the case of rote-learnt formulae, such as greetings and other ritualised speech acts, or proverbs (e.g. *(Good) morning, Cheers, Never say die).*

Chomsky's idea that a grammar should ‘generate’ sentences (which had been present in the notion of ‘innere Sprachform’ propounded by the early-nineteenth-century grammarian-philosopher Wilhelm von Humboldt, cf. Robins 1967:175) is an important one, and grammars which merely give a rough indication of patterns with a few examples, are seriously inadequate. But as Chomsky himself has emphasised, the notion of generation is not so much intended to provide a psychological model for the speaker-writer (-the listener-reader is, after all, almost

equally important); rather, our grammar should be able to 'generate' sentences in the sense that it is so explicit that in principle it could be asked to list all the sequences that accord with its rules (even though in practice these might be infinite in number) and to provide each with a description indicating its relationship to other sentences. At the outset, however, we should note that even this limited interpretation of generativity is put at risk by the existence, first, of strings that we are unsure whether to regard as grammatical or not (e.g. *?the too heavy suitcase)* and, second, by types of structure that seem to have more than one appropriate grammatical description (e.g. *wait for John:* verb plus prepositional object, or prepositional verb plus object).

Before we embark on our study of grammar, we should know what kind of units we are going to use as the basis of our description. We can provisionally take the sentence as our highest unit of description; but it is equally important to know what kind of smaller element is going to be the basis for our analysis of sentences. Traditionally, this smaller unit has been the 'word'. In fact both Greek and Latin had a word that had the two senses of 'sentence' and 'word' (Greek *logos,* Latin *verbum,* the latter having the further sense of 'verb'). Interestingly the English word *word* (with cognates in other Germanic languages) and Latin *verbum* have a common Indo-European source, which suggests that our ancestors have had such a word for thousands of years, since before the time when European languages were first written down; admittedly, the meaning(s) of the word must have originally been very imprecise.

But words alone do not suffice as units of analysis. First, words must be structured to give grammatical patterns, and that means grouping them into phrases and other intermediate units, such as clause. Second, we have already seen the need for morphemes as minimum grammatical-semantic units in describing structures within the word. We shall now examine this question more closely.

2.
MORPHOLOGY AND THE MORPHEME: PATTERNS OF REALISATION

We have noted that a language-system contains within it the potential for a vast range of different sentences. How is this possible? First and foremost because words can be combined in a variety of different ways, and some of these ways are in principle infinitely extendable (e.g. *bacon and eggs and sausages and tomatoes and..., the house behind the pub opposite the bank next to....* These are a matter of syntactic structure.

A second reason for the vastness of a language is the fact that the vocabulary of most languages is extremely large. Large dictionaries of English, for example, have in excess of 100,000 entries, and there are many individual speakers who make use

syllable pronounced /rI-/ or /rə-/, just as in *receive, retain, resist)* with the analysable word *re-cover* 'cover again' (with initial /ri:-/ as also in *re-build, re-enter, re-marry),* and to note that the opposite of *cover* is not the (unanalysable) *discover* but rather *uncover* with the prefix *un-*.

It is therefore essential for us to be clear about our semantic criteria for morphemic status. Ideally morphemes should always be 'semantic constituents' in the sense of Cruse (1986:24f), i.e. they should be semantically identifiable on the basis of semantic parallelism (like *boys/girls* beside *boyish/girlish).* If, however, we compare the phrase *(a) black berry* with the word *(a) blackberry,* we find that, whereas the phrase passes the semantic test (cf. *(a) red berry, (a) black shoe),* the word *blackberry* does not correspond to a word **redberry* or **yellowberry,* and, although there is a contrast between *blackberry* and *blackcurrant,* both of them are equally entitled to be called 'berry'. Compound words like *blackberry* thus contain an element of the arbitrary and the idiosyncratic; but this should not blind us to the semantic contribution made by their components, which, though perhaps only 'semantic indicators' (to use Cruse's term) are still worth calling morphemes.

A more problematic case is illustrated by the now classic example *cranberry.* Comparing this word with *blackberry (or strawberry)* we find that the *-berry* element seems familiar enough and indeed seems to make the same contribution to the meaning of the compound in all cases. But what about *cran-?* Its only semantic contribution is that of distinguishing cranberries from other berries; it tells us nothing about the semantic features of the berries, because *cran-* fails to recur outside this combination. The element *cran-* and its like (the *dor-* of *dormouse,* the *bon-* of *bonfire,* etc.) are often referred to as 'unique morphemes'. These 'single context' morphemes are, however, exceptional; normally morphemes occur in a variety of contexts. Across these contexts they should have a consistent meaning. This means that cases of homonymy (see Chapter 5) such as *bank* 'company specialising in financial transactions; strip of (sloping) land acting as a border' must be regarded as representing two different morphemes, which just happen to be identical in form.

Ideally there should also be constancy in the form of a morpheme; but on this level, too, there are discrepancies. Take the case of the plural form of nouns in English, which usually seems to involve the addition of a morpheme, as exemplified by the following words for animals:

(5) *(a)* (i) cheetah/cheetahs, dog/dogs, lion/lions, seal/seals, tiger/tigers;
(ii) cat/cats, duck/ducks, goat/goats, sloth/sloths;
(iii) giraffe/giraffes, snake/snakes;
(iv) horse/horses, tortoise/tortoises;

(7) /-ɪd/ after /t, d/, e.g. *waited, wasted, waded*

/-t/ after other fortis consonants, e.g. *whipped, whacked, washed, bewitched*.

/-d/ after other lenis consonants and vowels, e.g. *wagged, wailed, waned, weighed*.

In this case the vowel is inserted to prevent a sequence of two alveolar plosives (either /-td/ or /-dd/); and again a fortis consonant, in this case /t/, is required to follow another fortis in any permitted sequence of consonants.

Such general phonological rules, requiring morphemes of a language to adapt their shape according to the phonetic context in which they appear, are common in the world's languages. In Portuguese, for instance, every morpheme ending in written *-s* (e.g. *mais* 'more') has four variant pronunciations with final / ʃ/, / ʒ/, /z/ or with no final consonant, depending on the nature of the initial phoneme of the following word. Similarly in Turkish, a language with 'vowel harmony', nearly every suffix has a variable vowel, and some have a variable consonant as well.

Some cases of allomorphy are phonologically conditioned but cannot be subsumed under a general phonological rule. A well-known example is the English indefinite article, which has two forms *a* /ə/ and *an* /ən/. Their occurrence is clearly determined by the phonetic nature of the immediately following sound—whether it is a consonant (including /w/ and /j/, even in words like *onestep* and *use*!) or a vowel. On the other hand, English has no general rule for inserting /n/ between a final unstressed vowel and an initial vowel in a following word (-if anything /j/, /w/, /r/ or a glottal stop is inserted); and equally no rule exists for dropping /n/ before an initial consonant. This alternation, though phonologically conditioned, is therefore word-specific; it can be compared with the variation in Latin of *ā* (only before consonants) and *ab* (most commonly before vowels) for the preposition meaning 'away from', beside the invariability of prepositions like *infrā* 'below' and *sub* 'under'. Even generative grammarians, following Chomsky (1964) and Chomsky and Halle (1968), accept the need to specify such variations on a partly individual basis in what they call 'spelling rules' or 're-adjustment rules' (cf. Dell 1980:62–3).

There is more disagreement, however, about cases of variation which affect several or many morphemes, but not all. Generative phonologists have made alternations like /t/ with / ʃ/ *(president—presidential)* or /k/ with /s/ *(elastic—elasticity)* the basis for wide-ranging phonological rules for English, but although these rules apply to many words, these are limited in number and also in origin—they are all of Latin-French origin and rely on the orthographic-phonetic correspondences for such words. (Imagine a formation *Warwickism* ('following the cause of Warwick'): this would preserve its /k/, unlike *Gallicism,* which has the alternation to /s/.)

sequence /w-n/ without a vowel, although the present *win* /wɪn/ clearly has one. The case of *bent* can be looked at similarly, but this time it involves the addition of final /-t/ to an allomorph /ben-/ of the basic form /bend/. Both *win/won* and *bend/bent* (and many similar verbs) appear to involve replacement of part of the original morpheme rather than simply addition of a new morpheme. Verbs of this kind with their apparently replacive morphemes (whether medial or final) are often cited as evidence of the need for a non-segmentational approach to morphological analysis. In this approach addition and replacement are regarded as alternative 'processes' to which basic words or morphemes can be subjected. Particularly striking evidence is afforded by some cases of replacement that involve changing a single phonetic feature of the final consonant like *bend/bent* (=devoicing) (cf. also verbs formed from nouns, such as *shelf/shelves, sheath/ sheathe,* etc. (=voicing), because if we insist that morphemes are segments, we overlook the importance of such features.

A further alternative process might be subtraction, as perhaps illustrated by *bit,* which has orthographically lost an *e* compared with *bite,* and phonologically has /ɪ/ in place of the diphthong (aɪ/, which superficially means loss of the phonetic segment [a]. In a similar vein Bloomfield (1935:217) once suggested that the feminine forms of most French adjectives like *laide* / lɛd/, *grise* /griz/ could serve as the basis for deriving the masculine forms by a simple rule of subtraction of the final consonant (providing that every item spelt with *-e* in both forms, e.g. *riche,* is lexically recorded as an exception and thus distinguished from cases like *blanc(he)*.

But a model of morphological description (sometimes called the IP (= Item and Process) model) which uses the various processes we have discussed, addition, replacement and subtraction (and presumably also zero-change), while side-stepping some of the problems of segmentation, forces us to make a division between 'derived' forms (like the past tense) and 'basic forms' (like the infinitive) and often gives us insufficient guidance as to what the precise shape of the basic form should be.

Our different past tense formations raise a further point of interest: the difference between the regular and the irregular forms. Of our past tense forms the first three were regular, and, what is more, subsumable under a phonological rule. But in all the other cases the choice of past tense form is not even phonologically conditioned, because knowing the phonological structure of the verb does not enable us to predict the type of past tense formation, whereas such information for nouns enables us to predict the form of the indefinite article (despite the idiosyncratic forms this takes). We need to know the individual verb involved before we can say precisely what the past tense form is; this point is well demonstrated by the three past tenses that can be formed from verbs with the phonological structure /rɪŋ/, viz. *rang, wrung* and *ringed*. English past tense formation is this a blend of regular phonological rule (e.g.

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